

# VIVEKANANDHA





(An Autonomous Institution Affiliated to Anna University - Chennai Approved by AICTE - Accredited by NBA New Delhi and ISO 9001:2008 Certified) Elayampalayam, Tiruchengode – 637 205, Namakkal District, Tamilnadu.

# **B.E. ELECTRONICS AND COMMUNICATION** ENGINEERING

# **CURRICULA & SYLLABI**

# **REGULATION 2019**

### (After 14th BoS)

Curriculum and Syllabus (1 to 8 Semester)

(Applicable to the students admitted from the academic year 2021 – 2022 onwards)

# CHOICE BASED CREDIT SYSTEM

# [CBCS]

Belun Signature of BOS Chairman ECE



## VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN (Autonomous Institution, Affiliated to Anna University Chennai)



#### **COLLEGE VISION**

To impart value based education in Engineering and Technology to empower young women to meet the societal exigency with a global outlook.

#### **COLLEGE MISSION**

- To provide holistic education through innovative teaching-learning practices
- To instill self confidence among rural students by supplementing with co-curricular and extra-curricular activities
- To inculcate the spirit of innovation through training, research and development
- To provide industrial exposure to meet the global challenges
- To create an environment for continual progress through lifelong learning

#### **DEPARTMENT VISION**

• To Produce Innovative, Creative, Ethical and Socially responsible Electronics and Communication women engineers to meet the global challenges

#### **DEPARTMENT MISSION**

- To create a unique learning environment in Electronics and Communication Engineering to mould a strong engineer with professional ethics
- To provide practical exposure to compete in the global market
- Fostering culture of innovation, research and lifelong learning

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#### **B.E. ELECTRONICS AND COMMUNICATION ENGINEERING**

**Regulation 2019** 

#### CHOICE BASED CREDIT SYSTEM

#### **PROGRAM EDUCATIONAL OBJECTIVES (PEOs):**

PEO1: To offer strong theoretical and practical knowledge with managerial skills and entrepreneurial competencies.

PEO2: To impart analytic and questioning skills to broaden innovative ideas for Research and Development based on Industry requirements.

PEO3: To achieve a high level technical expertise in Electronics and Communication Engineering and inculcate professional ethics and social concern

#### **PROGRAM OUTCOMES (POs):**

- PO 1. Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- PO 2. Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- PO 3. Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- PO 4. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

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- PO 5. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
- PO 6. Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
- PO 7. Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- PO 8. Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- PO 9. Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- PO 10. Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- PO 11. Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
- PO 12. Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

#### **PROGRAM SPECIFIC OUTCOMES (PSOs):**

At the end of this program, graduate will be able to:

PSO 1: Comprehend the basic concepts of electronics and communication and apply in the day to day life to design and execute complete engineering systems.

PSO2: Design, verify and validate electronic functional elements for numerous applications including signal processing, communications, computer networks and VLSI.

PSO 3: Demonstrate the intellectual level with peer engineers and others to work together to arrive at a cost-effective, appropriate solution for various problems.

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# MAPPING OF PROGRAM EDUCATIONAL OBJECTIVES WITH PROGRAM OUTCOMES:

PROGRAM					PRO	GRAM	OUTC	OMES				
EDUCATIONAL	PO 1	РО	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	РО	РО	РО
OBJECTIVES	101	2	105	104	105	100	107	100	10,	10	11	12
PEO 1	~	~	~	~	~	~				✓	~	
PEO 2	✓	✓	✓	✓		✓	✓			✓		
PEO 3				✓		✓		~	✓		✓	✓

Sem	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
	Calculus	✓	✓	~			✓						✓
	English for Communication- I						✓	✓	~	✓	✓	~	✓
	Engineering Chemistry	✓	~	~			✓						✓
Ι	Programming for Problem Solving	~	~	~			~						~
	Engineering Graphics	~	~	~			~						
	Mandatory Course-II												
	Chemistry Laboratory	~	~			~			~	~	~		
	Computer Practices Laboratory	~	~			~			~	~	~		
	Linear Algebra and Ordinary Differential Equations	~	~	~			~						~
	English for Communication- II						~	✓	~	~	~	~	✓
	Engineering Physics	~	~	~			~						✓
	Basic Civil and Mechanical Engineering	~	~	~				~	~				~
II	Basic Electrical and Electronics Engineering	~	~	~			~						~
	Electric Circuit Theory	~	~	~			~						
	□□□□□□□□/Heritage of Tamils <sup>&amp;</sup>												
	Mandatory Course-I												
	Physics Laboratory	~	~			~			~	~	~	~	~
	Engineering Practices Laboratory	~	~			~			~	~	~	~	~
	Transforms and Partial differential Equations	~	~	~								~	~
III	Electron Devices	~	✓	~			✓						✓
	Electronic Circuits -I	~	~	~								~	✓
	Digital System Design	✓	~	✓			~						✓

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	Signals and Systems	✓	✓	✓		✓						
	Data Structures	✓	✓	✓								✓
	and Technology <sup>&amp;</sup>											
	Mandatory Course-III											
	Digital System Design Laboratory	~	~		~				~	~	~	
	Electron Devices and Circuits Laboratory	~	~		~				~	~	~	
	Data Structures Laboratory	~	✓		$\checkmark$				$\checkmark$	$\checkmark$	~	
	Probability and Random Processes	~	~	~							~	~
	Electronic Circuits-II	✓	✓	~		~						✓
	Digital Signal Processing	~	~	~		~						~
	Electromagnetic Fields	✓	✓	✓		✓						✓
	Linear Integrated Circuits	✓	✓	✓		✓						✓
IV	Measurements and Instrumentation	~	~	~			~					
	Mandatory Course-IV											
	Analog and Linear Integrated Circuits Laboratory	~	~		~			~	~	~	~	~
	Digital Signal Processing Laboratory	~	~		~			~	~	~	~	~
	Communication Skills Laboratory					~	~	~	~	~		~
	Control Systems	~	$\checkmark$	$\checkmark$		$\checkmark$						$\checkmark$
	Microprocessor and Microcontroller	~	~	~		~					~	~
	Transmission Lines and Waveguides	~	~	~		~						~
v	Analog and Digital Communication	~	~	~		~						~
v	Professional Elective -I											
	Open Elective -I											
	Mandatory Course-V											
	Microprocessor and Microcontroller Laboratory	~	~		~			~	~	~	~	~
	Analog and Digital Communication Laboratory	~	~		~			~	~	~	~	~
	VLSI Design	✓	✓	✓		✓	✓					✓
	Computer Networks	~	~			~					~	~
VI	Antenna and Wave Propagation	~	~	~		~						
	Professional Elective-II											
	Open Elective-II											

	Mandatory Course-VI												
	Computer Networks Laboratory	~	~			~			~	~	~	~	~
	VLSI Laboratory	~	~			~			~	~	~	~	~
	Mini Project	✓	✓	~	~	~	$\checkmark$	~	$\checkmark$	✓	✓	~	✓
	Principles of Management								~	✓			✓
	RF and Microwave Engineering	~	~	~	~		~						
	Professional Elective-III												
	Professional Elective-IV												
VII	Professional Elective – V												
	Open Elective-III												
	High Frequency Communication and Simulation Laboratory	~	~			~			~	~	~	~	~
	Internship Training and Summer Project	~	~	~	~	~	~	~	~	~	~	~	~
	Professional Elective – VI												
VIII	Open Elective - IV												
	Project Work	✓	✓	✓	✓	✓	~	✓	✓	~	~	✓	✓

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	VIVEKANAN (Autonomo	ous Institu	DLLEGE OI tion, Affiliat palayam, Ti	ed to Ai	nna Uni	iversity	, Chenna		TÜVRheinland CERTIFIED	50 5011-2015
Programme	<b>B.E.</b>		Programme	Code		103	Regul	lation	20	19
Department	ELECTRON	ICS AND ENGINI		ICATI	ON		Sen	nester	]	[
			CURR			•				
	(Applicable to the	students	admitted from			•				
Course Code	Course N	ame	Category		ods / W		Credit	-	aximum N	
			<b>.</b>	L	Т	P	C	CA	ESE	Total
			TH	EORY	1					
U19MA101	Calculus *		BSC	3	1	0	4	40	60	100
U19EN101	English For Communicati	on- I *	HSC	3	0	0	3	40	60	100
U19CH105	Engineering Chemistry <sup>@</sup>		BSC	3	0	0	3	40	60	100
U19CS101	Programming Problem Solv		ESC	3	0	0	3	40	60	100
U19GE101	Engineering Graphics*		ESC	2	0	3	3	40	60	100
			PRAC	CTICAI	L					
U19CH106	Chemistry Laboratory <sup>@</sup>		BSC	0	0	4	2	60	40	100
U19CS102	Computer Pra Laboratory*	ctices	ESC	0	0	4	2	60	40	100
			MANDATO	ORY CO	OURSE					
	Mandatory cou	rse - II	MC	3	0	0	0	100		100
				J	Fotal C	redits	20	420	380	800

BSC - Basic Science Courses, ESC- Engineering Science Courses, PCC- Professional core courses, PEC-Professional Elective courses, OEC- Open Elective courses, MC-Mandatory courses, HS-Humanities and Social Sciences, EEC- Employability Enhancement Courses, SI- Summer Industry Internship, PROJ-IT-Project, CA- Continuous Assessment, ESE - End Semester Examination.

\* Common for all branches

@ Common for ECE, EEE, BME

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	VIVEKANANDHA CO (Autonomous Institut Elayam		l to An	na Un	iversity	y, Chennai)	N	ISO 8011.2 TÜVRheinland CERTIFIED	
Programme	<b>B.E.</b>	Programm	ne Cod	e 1	03 F	Regulation		201	9
Department	ELECTRONICS AND C ENGINEE		ATION	N	<b>I</b>	Semes	ter	II	
	(Applicable to the students	CURRI admitted from			ic yeaı	c 2021 – 2022	onward	s)	
Course Code	Course Name	Category	Per	ods / `	Week	Credit	Max	timum M	Iarks
Course Code	Course Maine	Category	L	Т	Р	С	CA	ESE	Total
		THE	ORY						
U19MA202	Linear Algebra and Ordinary Differential Equations *	BSC	3	1	0	4	40	60	100
U19EN202	English For Communication- II *	HSC	3	0	0	3	40	60	100
U19PH207	Engineering Physics \$	BSC	3	0	0	3	40	60	100
U19EE201	Basic Electrical and Electronics Engineering	ESC	3	0	0	3	40	60	100
U19GE202	Basic Civil and Mechanical Engineering *	ESC	3	0	0	3	40	60	100
U19EC201	Electric Circuit Theory	PCC	3	0	0	3	40	60	100
U19TA201	/Heritage of Tamils <sup>&amp;</sup>	HSC	2	0	0	1	40	60	40
		PRAC	TICA	_					
U19PH208	Physics Laboratory\$	BSC	0	0	4	2	60	40	100
U19GE203	Engineering Practices Laboratory *	ESC	0	0	4	2	60	40	100
		MANDATO	RY CO	DURS	E				
	Mandatory course - I	МС	3	0	0	0	100		100
	ous Assessment. ESE - End				Credi	t 23+1=24	500	500	1000

CA- Continuous Assessment, ESE - End Semester Examination.

\* Common for all branches

\$ Common for ECE,EEE,BME

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		NDHA COLLEGE ous Institution, Affil Elayampalayam,	iated to A	nna Ui	nivers	ity, C		Ň	TÜVRheinland CERTIFIED	
Programme	B.E.	Program	me Code	103			Regulation	on	2019	9
Department	ELECTR	ONICS AND COM ENGINEERIN		TION			Semest	er	ш	
	I	CUI	RRICULU	JM						
	(Applicable to	the students admitted	from the	acader	nic ye	ear 20	)21-2022 or	nwards	)	
Course	Cou	rse Name	Category		eriod Weel		Credit	Мах	kimum N	Marks
Code				L	Т	Р	С	CA	ESE	Total
		]	THEORY	•	•					
U19MA303	Transforms an differential Eq		BSC	3	1	0	4	40	60	100
U19EC302	Electron Devic	ces	PCC	3	0	0	3	40	60	100
U19EC303	Electronic Ci	rcuits-I	PCC	3	0	0	3	40	60	100
U19EC304	Digital System	Design	PCC	3	0	0	3	40	60	100
U19EC305	Signals and Sy	rstems	PCC	3	0	0	3	40	60	100
U19CS304	Data Structure	S	ESC	3	0	0	3	40	60	100
U19TA302	தமிழரும்தொழில்ந Technology <sup>&amp;</sup>	<b>نوست</b> ر/Tamils and	HSC	2	0	0	1	40	60	100
		PR	RACTICA	L						
U19EC306	Digital System Laboratory	Design	PCC	0	0	2	1	60	40	100
U19EC307	Electron Devic Laboratory	es and Circuits	PCC	0	0	2	1	60	40	100
U19CS308	Data Structure	s Laboratory	ESC	0	0	4	2	60	40	100
		MANDA	TORY C	OURS	E					
	Mandatory Co	urse-III	MC	3	0	0	0	100		100
				Tota	l Cre	dits	23+1=24	520	480	1000

CA - Continuous Assessment, ESE - End Semester Examination, BSC - Basic Science Courses, ESC -Engineering Science Courses, PCC – Professional Core Courses, MC- Mandatory courses

\* Common Syllabus for ECE, EEE &BT

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	VIVEKANANI (Autonomou	s Institution,		Anna	Univers	ity, C			TÜVRheisland CERTIFED	5 <sup>15</sup>
Programme	B.E.	Pr	ogramme Co	ode	103		Regulatio	on	201	9
Department	ELECTR	ONICS AND ENGINH		ICAT	ION		Semest	er	IV	
	(Applicable to the	students adm	CURRICU		lemic ve	ar 202	21-2022 or	wards	)	
					iods / W		Credit	-	, kimum l	Marks
Course Code	Course N	Jame	Category	L	Т	Р	С	CA	ESE	Total
	l		THEOR	Y	1		1	1		
U19MA407	Probability and Processes	Random	BSC	3	1	0	4	40	60	100
U19EC410	Electronic Circu	its-II	PCC	3	0	0	3	40	60	100
U19EC411	Digital Signal P	* rocessing	PCC	3	1	0	4	40	60	100
U19EC412	Electromagnetic	Fields	PCC	3	0	0	3	40	60	100
U19EC413	Linear Integrate	d Circuits	PCC	3	0	0	3	40	60	100
U19EC414	Measurements a Instrumentation	nd	PCC	3	0	0	3	40	60	100
			PRACTIC	CAL						
U19EC415	Analog and Line Integrated Circu Laboratory		PCC	0	0	2	1	60	40	100
U19EC416	Digital Signal P Laboratory	rocessing	PCC	0	0	2	1	60	40	100
U19EN401	Communication Laboratory	Skills	HSC	0	0	2	1	100		100
		MA	NDATORY	COUI	RSE					
	Mandatory Cour	rse-IV	MC	3	0	0	0	100		100
	ous Assassment E		·		Total C			560	440	1000

CA - Continuous Assessment, ESE - End Semester Examination, BSC - Basic Science Courses, PCC – Professional Core Courses ,HSC - Humanities and Social Science Courses, MC- Mandatory courses \*

Common Syllabus for ECE & BME

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	VIVEKANANDHA COL (Autonomous Instituti Elayamp		to Ann	a Univers	sity, C			ISO 9001: TÜVRheinland CERTIFIED	n s
Programme	B.E.	Programme	Code	103		Regulatio	on	201	9
Department	ELECTRONICS A ENG	ND COMMU INEERING	JNICA	TION		Semeste	er	V	
	(Applicable to the students	CURRIC			200	1 2022		\ \	
	(Applicable to the students			riods / W		Credit	-	) kimum ]	Mantra
Course Code	Course Name	Category			1				
Code			L	Т	Р	C	CA	ESE	Total
		THEC	ORY						
U19EC518	Control Systems	PCC	3	0	0	3	40	60	100
U19EC519	Microprocessor and Microcontroller	PCC	3	0	0	3	40	60	100
U19EC520	Transmission Lines and Waveguides	PCC	3	0	0	3	40	60	100
U19EC521	Analog and Digital Communication *	PCC	3	1	0	4	40	60	100
	Professional Elective -I	PEC	3	0	0	3	40	60	100
	Open Elective -I	OEC	3	0	0	3	40	60	100
		PRACT	ICAL						
U19EC522	Microprocessor and Microcontroller Laboratory	PCC	0	0	2	1	60	40	100
U19EC523	Analog and Digital Communication Laboratory	PCC	0	0	2	1	60	40	100
	Ν	IANDATOR	Y COL	JRSE			I		1
	Mandatory Course-V	MC	3	0	0	0	100		100
			I	Total C	Credits	s 21	460	440	900

CA - Continuous Assessment, ESE - End Semester Examination, PCC – Professional Core Courses, PEC - Professional Elective Courses, OEC-Open Elective Courses, MC- Mandatory courses

\* Common Syllabus for ECE & BME

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	VIVEKANANDHA CO (Autonomous Institu Elayar		to Ann	a Univer	sity, C			ISO 9001:2 TÜVRheinland CERTIFIED	
Programme	B.E.	Programme	Code	103		Regulatio	on	201	9
Department	ELECTRONICS EN	AND COMM GINEERING	UNICA	TION		Semest	er	VI	
	(Applicable to the student	CURRIC s admitted from			ear 202	21-2022 or	wards)	)	
Course		Gatagoria	Pe	riods / W	eek	Credit	Max	timum l	Marks
Code	Course Name	Category	L	Т	Р	С	CA	ESE	Total
		THE	ORY	•			•	•	L
U19EC625	VLSI Design	PCC	3	0	0	3	40	60	100
U19EC626	Computer Networks	PCC	3	0	0	3	40	60	100
U19EC627	Antenna and Wave Propagation	PCC	3	0	0	3	40	60	100
	Professional Elective-II	PEC	3	0	0	3	40	60	100
	Open Elective-II	OEC	3	0	0	3	40	60	100
		PRACT	TICAL						
U19EC628	Computer Networks Laboratory	PCC	0	0	2	1	60	40	100
U19EC629	VLSI Laboratory	PCC	0	0	2	1	60	40	100
U19EC630	Mini Project	EEC	0	0	4	2	100	-	100
		MANDATOR	RY COU	URSE	-		•		<u>.</u>
	Mandatory Course-VI	MC	3	0	0	0	100		100
				Total (	Credits	s 19	520	380	900

CA - Continuous Assessment, ESE - End Semester Examination, PCC – Professional Core Courses , PEC - Professional Elective Courses , EEC - Employability Enhancement Courses, OEC-Open Elective Courses, MC-Mandatory courses

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	VIVEKANANDHA COI (Autonomous Institutio Elayamp		to Ann	a Univers	sity, C			ISO 9001-2 TÜVRheinland CERTIFIED	
Programme	B.E.	Programme	Code	103		Regulatio	n	201	9
Department	ELECTRONICS A ENG	ND COMMU NEERING	UNICA	TION		Semeste	er	VI	[
		CURRIC					•		
	(Applicable to the students a	dmitted from	the aca	ademic ye	ear 202	21-2022 on	wards)	)	
Course Code	Course Name	Cotocom	Per	riods / W	eek	Credit	Max	kimum l	Marks
Course Code	Course Name	Category	L	Т	Р	С	CA	ESE	Total
		THE	ORY			1		·	
U19BA701	Principles of Management	HSC	3	0	0	3	40	60	100
U19EC731	RF and Microwave Engineering	PCC	3	0	0	3	40	60	100
	Professional Elective-III	PEC	3	0	0	3	40	60	100
	Professional Elective-IV	PEC	3	0	0	3	40	60	100
	Professional Elective – V	PEC	3	0	0	3	40	60	100
	Open Elective-III	OEC	3	0	0	3	40	60	100
		PRACT	TICAL						
U19EC732	High Frequency Communication and Simulation Laboratory	PCC	0	0	2	1	60	40	100
U19EC733	Internship Training and Summer Project	EEC	0	0	4	4	100	-	100
				Total C	Credits	23	400	400	800

CA - Continuous Assessment, ESE - End Semester Examination, PCC – Professional Core Courses , HSC - Humanities and Social Science Courses, PEC - Professional Elective Courses , EEC - Employability Enhancement Courses, OEC-Open Elective Courses, MC- Mandatory courses

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		VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOM (Autonomous Institution, Affiliated to Anna University, Chennai) Elayampalayam, Tiruchengode – 637 205								
Programme	B.E.									
Department	ELECTR	ELECTRONICS AND COMMUNICATION ENGINEERING								I
CURRICULUM (Applicable to the students admitted from the academic year 2021-2022 onwards)										
Course	Come No									Marks
Code	Course Na	ime	Category	L	Т	Р	C	CA	ESE	Total
			THE	ORY						
	Professional Elec	tive – VI	PEC	3	0	0	3	40	60	100
	Professional Elec	tive – VII	PEC	3	0	0	3	40	60	100
			PRACT	TICAL						
U19EC834	Project Work		EEC	0	0	16	8	60	40	100
	<u>.</u>			<u>.</u>	Total (	Credits	14	140	160	300

CA - Continuous Assessment, ESE - End Semester Examination, PEC - Professional Elective Courses, EEC - Employability Enhancement Courses, OEC-Open Elective Courses

Cumulative Course Credit: 166 (2021-2025 Batch)

Cumulative Course Credit: 168<sup>&</sup> (2022-2026 Batch)

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Course	Course Name	Category	Peri	ods / W	/eek	Credit Maximum I		Marks	
Code	Course Ivanie	Category	L	Т	Р	C	CA	ESE	Total
U19EN101	English for Communication- I	HSC	3	0	0	3	40	60	100
U19EN202	English for Communication- II	HSC	3	0	0	3	40	60	100
U19EN401	Communication Skills Laboratory	HSC	0	0	2	1	100		100
U19BA701	Principles of Management	HSC	3	0	0	3	40	60	100
U19TA201	of Tamils	MC	2	0	0	1	40	60	100
U19TA302	தமிழரும்தொழில்நுட்பமும்/Tamils and Technology	HSC	2	0	0	1	40	60	100

#### HUMANITIES AND SOCIAL SCIENCE COURSES (HSC)

#### **BASIC SCIENCE COURSES (BSC)**

Course	Course Name	Category	Peri	ods / W	Veek	Credit	Ma	ximum	Marks
Code	Course Ivalle	Calegory	L	Т	Р	С	CA	ESE	Total
U19MA101	Calculus	BSC	3	1	0	4	40	60	100
U19CH105	Engineering Chemistry	BSC	3	0	0	3	40	60	100
U19CH106	Chemistry Laboratory	BSC	0	0	4	2	60	40	100
U19MA202	Linear Algebra and Ordinary Differential Equations	BSC	3	1	0	4	40	60	100
U19PH207	Engineering Physics	BSC	3	0	0	3	40	60	100
U19PH208	Physics Laboratory	BSC	0	0	4	2	60	40	100
U19MA303	Transforms and Partial differential Equations	BSC	3	1	0	4	40	60	100
U19MA407	Probability and Random Processes	BSC	3	1	0	4	40	60	100

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Course	Course Name	Category	Peri	ods / We	ek	Credit	Max	imum N	Marks
Code		8,	L	Т	Р	С	CA	ESE	Total
U19CS101	Programming for Problem Solving	ESC	3	0	0	3	40	60	100
U19GE101	Engineering Graphics	ESC	3	0	0	3	40	60	100
U19CS102	Computer Practices Laboratory	ESC	0	0	4	2	60	40	100
U19GE202	Basic Civil and Mechanical Engineering	ESC	3	0	0	3	40	60	100
U19EE201	Basic Electrical and Electronics Engineering	ESC	3	0	0	3	40	60	100
U19GE203	Engineering Practices Laboratory	ESC	0	0	4	2	60	40	100
U19CS304	Data Structures	ESC	3	0	0	3	40	60	100
U19CS308	Data Structures Laboratory	ESC	0	0	2	1	60	40	100

#### **ENGINEERING SCIENCE COURSES (ESC)**

#### **EMPLOYABILITY ENHANCEMENT COURSES (EEC)**

Course			Per	riods /	Week	Credit Maximum M			Iarks
Code	Course Name	Category	L	Т	Р	С	CA	ESE	Total
U19EC630	Mini Project	EEC	0	0	4	2	100	-	100
U19EC733	Internship Training and Summer Project	EEC	0	0	4	4	100	-	100
U19EC834	Project Work	EEC	0	0	16	8	100	-	100

#### **PROFESSIONAL CORE COURSES (PCC)**

U19EC201	Electric Circuit Theory	PCC	3	0	0	3	40	60	100
U19EC302	Electron Devices	PCC	3	0	0	3	40	60	100
U19EC303	Electronic Circuits-I	PCC	3	0	0	3	40	60	100
U19EC304	Digital System Design	PCC	3	0	0	3	40	60	100
U19EC305	Signals and Systems	PCC	3	0	0	3	40	60	100
U19EC306	Digital System Design Laboratory	PCC	0	0	2	1	60	40	100

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U19EC307	Electron Devices and Circuits Laboratory	PCC	0	0	2	1	60	40	100
U19EC410	Electronic Circuits-II	PCC	3	0	0	3	40	60	100
U19EC411	Digital Signal Processing	PCC	3	1	0	4	40	60	100
U19EC412	Electromagnetic Fields	PCC	3	0	0	3	40	60	100
U19EC413	Linear Integrated Circuits	PCC	3	0	0	3	40	60	100
U19EC414	Measurements and Instrumentation	PCC	3	0	0	3	40	60	100
U19EC415	Analog and Linear Integrated Circuits Laboratory	РСС	0	0	2	1	60	40	100
U19EC416	Digital Signal Processing Laboratory	PCC	0	0	2	1	60	40	100
U19EC518	Control Systems	PCC	3	0	0	3	40	60	100
U19EC519	Microprocessor and Microcontroller	PCC	3	0	0	3	40	60	100
U19EC520	Transmission Lines and Waveguides	PCC	3	0	0	3	40	60	100
U19EC521	Analog and Digital Communication	PCC	3	1	0	4	40	60	100
U19EC522	Microprocessor and Microcontroller Laboratory	PCC	0	0	2	1	60	40	100
U19EC523	Analog and Digital Communication Laboratory	PCC	0	0	2	1	60	40	100
U19EC625	VLSI Design	PCC	3	0	0	3	40	60	100
U19EC626	Computer Networks	PCC	3	0	0	3	40	60	100
U19EC627	Antenna and Wave Propagation	PCC	3	0	0	3	40	60	100
U19EC628	Computer Networks Laboratory	PCC	0	0	2	1	60	40	100
U19EC629	VLSI Laboratory	PCC	0	0	2	1	60	40	100
U19EC731	RF and Microwave Engineering	PCC	3	0	0	3	40	60	100
U19EC732	High Frequency Communication and Simulation Laboratory	PCC	0	0	2	1	60	40	100

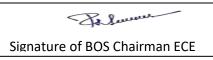
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#### MANDATORY COURSES (MC)

Course			Per	riods /	Week	Credit	Max	imum N	Iarks
Code	Course Name	Category	L	Т	Р	С	CA	ESE	Total
U19MCFY1	Environmental Science and Engineering	MC	3	0	0	0	100	-	100
U19MCFY2	Indian Constitution and Universal Human Values	МС	3	0	0	0	100	-	100
U19MCSY3	Numerical Ability	MC	3	0	0	0	100	-	100
U19MCSY4	Verbal Ability	МС	3	0	0	0	100	-	100
U19MCTY5	Logical Reasoning	MC	3	0	0	0	100	-	100
U19MCTY6	Personality Development	MC	3	0	0	0	100	-	100
U19MCEC4	Online course	МС	3	0	0	0	100	-	100
U19MCEC5	Professional Skills and Practices	МС	3	0	0	0	100	-	100
U19MCEC6	Competencies in Social Skills	MC	3	0	0	0	100	-	100
U19MCEC7	Entrepreneurial Skill Development	МС	3	0	0	0	100	-	100
U19MCEC8	Critical and Creative Thinking Skills	МС	3	0	0	0	100	-	100
U19MCEC9	Business Basics for Entrepreneurs	MC	3	0	0	0	100	-	100
U19MCEC10	Analytical and Logical Thinking Skills	МС	3	0	0	0	100	-	100
U19MCEC11	Entrepreneurship Management	МС	3	0	0	0	100	-	100
U19MCEC12	Value Education	МС	3	0	0	0	100	-	100

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		VERTICA	L COURSES For B.E.	ECE Honours (Spe	cialization) / Hon	ours / Minors	
	Vertical I	Vertical II	Vertical III	Vertical IV	Vertical V	Vertical VI	Vertical VII
S.No.	Semiconductor and VLSI Design	Signal Processing	Communication System	Embedded Systems and Internet of Things (IoT)	Networking	Artificial Intelligence	Electronics Engineering and Administration System
1	Analog IC Design	Digital Image Processing	Wireless Communication	Embedded System Design and Real Time Applications	Mobile Adhoc Networks	Artificial Intelligence and Machine Learning	Pattern Recognition
2	System-on-Chip Design	Medical Image Processing	Mobile Communication	Sensor For Industrial Application	Wireless Sensor Networks	Deep Learning	Medical Electronics
3	Semiconductor Device Modeling	Biomedical Signal Processing	Optical Communication	ARM System Architecture	Cryptography and Cyber Security	Neural Networks and its Applications	Remote Sensing
4	ASIC Design	Speech and Natural Language Processing	MIMO Communications	Cloud Technologies and its Applications	Communication Switching and Networks	Soft Computing	Automotive Electronics
5	Low Power VLSI Design	Digital Video Processing	Satellite Communication	IoT Processors	Internet Protocol Services	Computer Vision	Industry 4.0
6	Foundations of VLSI CAD	Radar Signal Processing	Green Technology	IoT Enabled Systems Design	Cyber Security	Augmented Reality/ Virtual Reality	Digital Video Processing
7.	Introduction to MEMS	DSP Architecture and Programming	Advanced Radiating Systems	Industrial IoT and Industrial 4.0	Fiber Optic Sensors	Optimization Techniques	Principles of Public Administration
8.	VLSI for Wireless Communication	Software Defined Radio	Rocketry and Space Mechanics	IoT Security and Trust	Optical Networks	Ethics in Artificial Intelligence	Administrative Theories
9.	Online Course	Online Course	Online Course	Online Course	Online Course	Online Course	Indian Administrative System



		VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOME         (Autonomous Institution, Affiliated to Anna University, Chennai)         Elayampalayam, Tiruchengode – 637 205         B.E.       Programme Code       103       Regulat										
Programme	<b>B.E.</b>	<u> </u>			03	Regula	tion	20	19			
-	ELECTRONICS ENGINEERING											
	<b>CURRICULUM</b> (Applicable to the students admitted from the academic year 2021-2022 onwards)											
	VERTICAL	LS-I SEMICO										
	Cour	Course Name Periods / Week Credit Maximum Marks										
Course Code	Cou	se i vanie	L	Т	Р	C	CA	ESE	Total			
U19ECV11	Analog IC De	esign	3	0	0	3	40	60	100			
U19ECV12	System-on-C	hip Design	3	0	0	3	40	60	100			
U19ECV13	Semiconducto Modeling	or Device	3	0	0	3	40	60	100			
U19ECV14	ASIC Design		3	0	0	3	40	60	100			
U19ECV15	Low Power V	LSI Design	3	0	0	3	40	60	100			
U19ECV16	Foundations of	of VLSI CAD	3	0	0	3	40	60	100			
U19ECV17	Introduction t	o MEMS	3	0	0	3	40	60	100			
U19ECV18	VLSI for Wir Communicati		3	0	0	3	40	60	100			
U19ECV19	Online Cours	e	3	0	0	3	40	60	100			

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	VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN (Autonomous Institution, Affiliated to Anna University, Chennai) Elayampalayam, Tiruchengode – 637 205											
Programme	B.E.	Program	me Code	e 1	03	Regula	tion	20	19			
Department	ELECTRO	ONICS AND COM ENGINEERIN	OMMUNICATIONRINGSemester									
		CURRICULUM (Applicable to the students admitted from the academic year 2021-2022 onwards) VERTICALS – II SIGNAL PROCESSING										
	VI	ERTICALS – II S					м	· ,	A.K. 1			
~ ~ ~ ~			Per	riods / W	еек	Credit	Ma	aximum	viarks			
Course Code	Cours	Course Name     L     T     P     C     CA     ESE     T										
U19ECV21	Digital Image	Processing	3	0	0	3	40	60	100			
U19ECV22	Medical Imag Processing	e	3	0	0	3	40	60	100			
U19ECV23	Biomedical S	ignal Processing	3	0	0	3	40	60	100			
U19ECV24	Speech and N Processing	latural Language	3	0	0	3	40	60	100			
U19ECV25	Digital Video	Processing	3	0	0	3	40	60	100			
U19ECV26	Radar Signal	Processing	3	0	0	3	40	60	100			
U19ECV27	DSP Architec and Programm		3	0	3	40	60	100				
U19ECV28	Software Defi Radio	ned	3	0	0	3	40	60	100			
U19ECV29	Online Course	2	3	0	0	3	40	60	100			

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	VIVEKANANI (Autonomou	TÜVRheinland CERTIFIED	001-2015									
Programme	B.E.	<b>B.E.</b> Programme Code <b>103</b> Regulation										
Department	ELECTRO	ONICS AND COM ENGINEERIN	Seme	ester								
		CURRICULUM (Applicable to the students admitted from the academic year 2021-2022 onw										
VERTICALS – III COMMUNICATION SYSTEM												
Course Code	Periods / Week Credit Maximum Marks											
Course Code	Cour	se name	L	Т	Р	C	CA	ESE	Total			
U19ECV31	Wireless Con	nmunication	3	0	0	3	40	60	100			
U19ECV32	Mobile Comr	nunication	3	0	0	3	40	60	100			
U19ECV33	Optical Com	nunication	3	0	0	3	40	60	100			
U19ECV34	MIMO Comm	nunications	3	0	0	3	40	60	100			
U19ECV35	Satellite Com	munication	3	0	0	3	40	60	100			
U19ECV36	Green Techno	ology	3	0	0	3	40	60	100			
U19ECV37	Advanced Ra	diating Systems	3	0	0	3	40	60	100			
U19ECV38	Rocketry and Mechanics	Space	3	0	0	3	40	60	100			
U19ECV39	Online Cours	e	3	0	0	3	40	60	100			

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		<b>DHA COLLEGE C</b> s Institution, Affilia Elayampalayam, T	ated to A	nna Univ	versity, (		EN	TÜVRheinland CERTIFIED	001.2015			
Programme	<b>B.E.</b>	Program	me Cod	e 1	03	Regula	tion	20	19			
Department	ELECTRONIC ENGINEERIN	CS AND COMMUN G	NICATI	ON		Seme	ester					
		the students admitte		the acade								
• • •	ERTICALS-IV	EMBEDDED SYS				1			N (1			
	Periods / Week     Credit     Maximum Marks       Course Name     L     T     P     C     CA     ESE     Total											
Course Code						-						
U19ECV41	Embedded Sy And Real Tin	re Applications	3	0	0	3	40	60	100			
U19ECV42	Sensor For In Application	dustrial	3	0	0	3	40	60	100			
U19ECV43	ARM System Archi	tecture	3	0	0	3	40	60	100			
U19ECV44	Cloud Techno Applications		3	0	0	3	40	60	100			
U19ECV45	IoT Processor	S	3	0	0	3	40	60	100			
U19ECV46	IoT Enabled S Design	Systems	3	0	0	3	40	60	100			
U19ECV47	Industrial IoT Industrial 4.0	' and	3	0	0	3	40	60	100			
U19ECV48	IoT Security	and Trust	3	0	0	3	40	60	100			
U19ECV49	Online Cours	e	3	0	0	3	40	60	100			

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		<b>DHA COLLEGE</b> s Institution, Affil Elayampalayam,	iated to A	Inna Univ	versity,		EN	TÜVRheinland CERTIFIED	001.2015				
Programme	B.E.	Program	nme Cod	e 1	03	Regula	tion	20	19				
Department	ELECTRONIC ENGINEERIN	CS AND COMMU G	INICATI	ON		Seme	Semester						
	(Applicable to	CUR the students admi	RICULU	-	lemic ye	ar 2021-2	022 or	nwards)					
	VERTICALS-V NETWORKING												
	rse Code Course Name Periods / Week Credit Maximum Marks L T P C CA ESE Total												
Course Code	Cour	-											
U19ECV51	Mobile Adho	c Networks	3	0	0	3	40	60	100				
U19ECV52	Wireless Senson Networks	sor	3	0	0	3	40	60	100				
U19ECV53	Cryptography Security	and Cyber	3	0	0	3	40	60	100				
U19ECV54	Communicati and Network	-	3	0	0	3	40	60	100				
U19ECV55	Internet Proto	col Services	3	0	0	3	40	60	100				
U19ECV56	Cyber Securit	y	3	0	0	3	40	60	100				
U19ECV57	Fiber Optic S	Sensors	3	0	0	3	40	60	100				
U19ECV58	Optical Netw	orks	3	0	0	3	40	60	100				
U19ECV59	Online Cours	e	3	0	0	3	40	60	100				

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		<b>DHA COLLEGE</b> s Institution, Affil Elayampalayam,	iated to A	nna Uni	versity,		EN	TÜVRheinland CERTIFIED	001-2015			
Programme	B.E.	Program	nme Cod	e 1	.03	Regula	tion	2019				
Department	ELECTRONIC ENGINEERIN	<mark>S AND COMMU</mark> G	JNICATI	ON		Seme	ester					
	· • •	the students admi		the acad			2022 or	nwards)				
		RTICALS-VI A					м	1	N (1			
Course Code												
U19ECV61	Artificial Inte Machine Lear	0	3	0	0	3	40	60	100			
U19ECV62	Deep Learnin	g	3	0	0	3	40	60	100			
U19ECV63	Neural Netwo Applications	orks and its	3	0	0	3	40	60	100			
U19ECV64	Soft Computi	ng	3	0	0	3	40	60	100			
U19ECV65	Computer Vis	sion	3	0	0	3	40	60	100			
U19ECV66	Augmented R Virtual Realit	-	3	0	0	3	40	60	100			
U19ECV67	Optimization Techniques		3	0	0	3	40	60	100			
U19ECV68	Ethics in Arti Intelligence	ficial	3	0	0	3	40	60	100			
U19ECV69	Online Cours	e	3	0	0	3	40	60	100			

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		<b>DHA COLLEGE (</b> s Institution, Affilia Elayampalayam, 7	ated to A	nna Uni	versity, (		EN	TÜVRheinland CERTIFIED	001.2015		
Programme	B.E.	Program	nme Code	e 1	.03	Regula	tion	20	19		
Department	ELECTRONIC ENGINEERIN	S AND COMMU G	NICATI	ON		Seme	ester				
		e to the students ad		om the a							
VERT	ICALS-VII ELI	ECTRONICS ENG				IINISTR	ATIO	N SYST	'EM		
				iods / W		Credit		aximum	Marks Total		
Course Code	Cour	Course Name L T P C CA ESI									
U19ECV71	Pattern Recogni	ion	3	0	0	3	40	60	100		
U19ECV72	Medical Electron	nics	3	0	0	3	40	60	100		
U19ECV73	Remote Sensing		3	0	0	3	40	60	100		
U19ECV74	Automotive Ele	ctronics	3	0	0	3	40	60	100		
U19ECV75	Industry 4.0		3	0	0	3	40	60	100		
U19ECV76	Digital Video P	0	3	0	0	3	40	60	100		
U19ECV77	Principles of Pul Administration	olic	3	0	0	3	40	60	100		
U19ECV78	Administrative Theories		3	0	0	3	40	60	100		
U19ECV79	Indian Administ System	rative	3	0	0	3	40	60	100		

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	VIVEKANANDHA COLL (Autonomous Institution Elayampal		o Anna	a Unive	ersity	, Chennai)	-	TÜVRheisand CERTIFIED	001.2015 0 2 5 6 0 1 2 0 1 1 0
Programme	<b>B.E.</b> ,	Programm Coc	-	.03		Regula	tion	20	19
Department	ELECTRONICS AND CO ENGINEERING	MMUNICA	TION			Seme	ster	OP ELEC	
		CURRIC	ULUM						
	(Applicable to the studen	ts admitted f	rom th	e acade	emic	year 2021-	2022	onwards)	
	LIST	OF OPEN	ELE	CTIV	E				
Course	Course Name	Category		eriods Week	/	Credit	Μ	aximum	Marks
Code		Currgory	L	Т	Р	С	C A	ESE	Total
		OPEN ELE	CTIVI	E-I					
U19ECOE1	Speech Processing	OE	3	0	0	3	40	60	100
U19ECOE2	Biomedical Instrumentation	OE	3	0	0	3	40	60	100
U19ECOE3	Automotive Electronics	OE	3	0	0	3	40	60	100
	(	)PEN ELEC	CTIVE	-II	1				1
U19ECOE4	Satellite Communication	OE	3	0	0	3	40	60	100
U19ECOE5	VLSI Design and Its Applications	OE	3	0	0	3	40	60	100
U19ECOE6	Digital Image Processing	OE	3	0	0	3	40	60	100
	0	PEN ELEC	TIVE	-III					
U19ECOE7	Basics of Communication Systems	OE	3	0	0	3	40	60	100
U19ECOE8	Wireless Sensor Networks	OE	3	0	0	3	40	60	100
U19ECOE9	PCB Design and Fabrication	OE	3	0	0	3	40	60	100

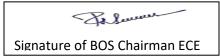
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		DHA COLLEGE OF El us Institution, Affiliated t Elayampalayam, Tiruch	o Anna U	Iniver	sity, C		EN	TÜVRheinland CERTIFIED	12015 0.200 0.000 0.000			
Programme	B.Tech.	Programme Code	105			Regulat	ion	201	19			
Department	BIOTECHNOI	LOGY				Seme	ster	-				
	(Applicable to th	CURRIC e students admitted from LIST OF OPEN	the acade			021-2022	onward	ds)				
Course Code Course Name Hours / Week Credit Maximum Marks												
Course Code	L T P C CA ESE											
		PROFESSIONAL	ELECT	IVE	- I							
U19BTOE1	Biology for En	gineers	3	0	0	3	40	60	100			
U19BTOE2	Biofuels and B	ioenergy	3	0	0	3	40	60	100			
U19BTOE3	Bio-Business		3	0	0	3	40	60	100			
		PROFESSIONAL	ELECT	IVE -	-II							
U19BTOE4	Basics of Bioir	formatics	3	0	0	3	40	60	100			
U19BTOE5	Human Health	and Nutritional Disorders	3 3	0	0	3	40	60	100			
U19BTOE6	Waste Manage	ment	3	0	0	3	40	60	100			
		PROFESSIONAL	ELECT	IVE –	III							
U19BTOE7	Food Processin Technology	g and Preservation	3	0	0	3	40	60	100			
U19BTOE8	Forensic Techr	ology	3	0	0	3	40	60	100			
U19BTOE9	Biodiversity an	d Bioprospecting	3	0	0	3	40	60	100			

		DHA COLLEGE OF E us Institution, Affiliated Elayampalayam, Tiruc	to Anna U	niver	sity, C		EN	CONTRACT CONTRACTOR CONTRACTOR D INSIGNATION			
Programme	B.E.	Programme Code	101			Regulat	ion	2019			
Department	Computer Scie	nce and Engineering				Semes	ster	-			
	(Applicable to th	CURRIC ne students admitted from		mic y	ear 20	21-2022	onwarc	ls)			
	LIST OF OPEN ELECTIVES										
Course Code		Course Name	Hou	rs / W	/eek	Credit	Ma	ximum l	Marks		
			L	Т	Р	C	CA				
U19CSOE1	Introduction to	IoT	3	0	0	3	40	60	100		
U19CSOE2	Ethical Hackin	g	3	0	0	3	40	60	100		
U19CSOE3	Smart Sensor 7	Fechnologies	3	0	0	3	40	60	100		
U19CSOE4	Web Designing	g	3	0	0	3	40	60	100		
U19CSOE5	Data Analytics	5	3	0	0	3	40	60	100		
U19CSOE6	Enterprise Java	a	3	0	0	3	40	60	100		
U19CSOE7	Open Source S	oftware	3	0	0	3	40	60	100		
U19CSOE8	Python Program	mming	3	0	0	3	40	60	100		

		DHA COLLEGE OF El us Institution, Affiliated t Elayampalayam, Tiruch	o Anna U	niver	sity, C		EN	TÜVRheinland CERTIFIED	1.2015 <b>0</b> .768 0.767 0.767 0.767				
Programme	<b>B.E.</b>	Programme Code	102			Regulat	ion	201	9				
Department	Electrical and I	Electronics Engineering				Semes	ster	-					
	/A 1 11	CURRIC			2	21.2022	·	1 \					
(Applicable to the students admitted from the academic year 2021-2022 onwards)													
	LIST OF OPEN ELECTIVES												
Course Code	(	Course Name	Hou	rs / W	/eek	Credit	Ma	aximum l	Marks				
			L	Т	Р	С	CA	ESE	Total				
U19EEOE1	Electron Devic	es	3	0	0	3	40	60	100				
U19EEOE2	Electrical Safe	ty	3	0	0	3	40	60	100				
U19EEOE3	Energy Auditir	ng	3	0	0	3	40	60	100				
U19EEOE4	Energy Storage	e Technologies	3	0	0	3	40	60	100				
U19EEOE5	Biomass Energ	y Systems	3	0	0	3	40	60	100				
U19EEOE6	Energy Efficient	nt Lighting System	3	0	0	3	40	60	100				
U19EEOE7	Soft Computing techniques30034								100				
U19EEOE8	Industrial Elect	rical Systems	3	0	0	3	40	60	100				

		VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN (Autonomous Institution, Affiliated to Anna University, Chennai) Elayampalayam, Tiruchengode – 637 205										
Programme	B.E.	Programme Code	106			Regulat	ion	2019				
Department	BIOMEDICAL	. ENGINEERING				ster	-					
		CURRIC	ULUM									
	(Applicable to the	ne students admitted from	the acade	emic y	vear 20	021-2022	onward	s)				
	LIST OF OPEN ELECTIVES											
Course Code		Course Name	Ηοι	urs / V	Veek	Credit	Ma	ximum l	Marks			
Course Code			L	Т	Р	С	CA	ESE	Total			
U19BMOE1	Biotelemetry		3	0	0	3	40	60	100			
U19BMOE2	Virtual Instrum	nentation	3	0	0	3	40	60	100			
U19BMOE3	Hospital Waste	e Management	3	0	0	3	40	60	100			
U19BMOE4	Medical Robot	ics	3	0	0	3	40	60	100			
U19BMOE5	Healthcare Ma	nagement Systems	3	0	0	3	40	60	100			
U19BMOE6	Biometric Syst Applications	ems And Their	3	0	0	3	40	60	100			
U19BMOE7	Basics of Biom	edical Instrumentation	3	0	0	3	40	60	100			
U19BMOE8	Medical Inform	atics	3	0	0	3	40	60	100			
U19BMOE9	ICU and Opera	tion Theatre Equipments	3	0	0	3	40	60	100			



		IVEKANANDHA COLLEGE OF ENGINEERING FOR WOME (Autonomous Institution, Affiliated to Anna University, Chennai) Elayampalayam, Tiruchengode – 637 205								
Programme	B.E.	Programme Code	107			Regulat	ion	201	19	
Department	Computer Scier	nce and Technology		Semester -						
		CURRICU	JLUM							
LIST OF OPEN ELECTIVES										
	(Applicable to th	e students admitted from t	he acade	mic y	vear 20	21-2022	onward	ls)		
Course Code		Course Name	Perio	ods /	Week	Credit	Ma	iximum l	Marks	
			L	Т	Р	С	CA	ESE	Total	
U19CTOE1	Fundamentals	of Artificial Intelligence	3	0	0	3	40	60	100	
U19CTOE2	Fundamentals	of Information Security	3	0	0	3	40	60	100	
U19CTOE3	Fundamentals of	f Data Science	3	0	0	3	40	60	100	
U19CTOE4	Fundamentals of	Machine Learning	3	0	0	3	40	60	100	
U19CTOE5	Fundamentals of	3	0	0	3	40	60	100		
U19CTOE6	Computer Fore	nsics	3	0	0	3	40	60	100	

		<b>EKANANDHA COLLEGE O</b> ous Institution, Affiliated to Ar Tirucheng	ina Univer	rsity, C				SD 801-005 TUrnenting CERTIFE				
Programme	B.Tech.	Programme Code	104		R	egulation			2019			
Department	INFORM	ATION TECHNOLOGY				Semester		-				
	(Appl:	CUI icable to the students admitted	RRICULU		nic year	2019-2020	) onward	ls)				
		LIST OF OPEN ELECTIVES										
Course		Course Name Hours /Week Credit Maximum Marks										
Code	L T P C CA							ESE	Total			
U19ITOE1	Mobile appli	cation development	3	0	0	3	40	60	100			
U19ITOE2	Robotics		3	0	0	3	40	60	100			
U19ITOE3	Basics of Clo	oud Computing	3	0	0	3	40	60	100			
U19ITOE4	Introduction	to Data Structures	3	0	0	3	40	60	100			
U19ITOE5	Cyber Securi	ty	3	0	0	3	40	60	100			
U19ITOE6	Information '	Technology Essentials	3	0	0	3	40	60	100			
U19ITOE7	Business inte	elligence and its Applications	3	0	0	3	40	60	100			
U19ITOE8	Internet of T	hings	3	0	0	3	40	60	100			
U19ITOE9	Introduction	to Java Programming	3	0	0	3	40	60	100			
	Introduction	to R Programming	3	0	0	3	40	60	100			
U19ITOE11	Ethical Hack	ing	3	0	0	3	40	60	100			
U19ITOE12	Cyber Foren	sics	3	0	0	3	40	60	100			
U19ITOE13	E Learning T	echniques	3	0	0	3	40	60	100			

## MINOR DEGREE VERTICALS OFFERED TO OTHER DEPARTMENT

## VERTICAL II - CYBER SECURITY

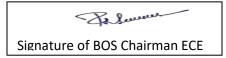
	VIVEKANANDHA COLL (Autonomous Institution Elayampal		Anna	Unive	rsity, Cl		N	Previous Stational Contraction		
Programme	B.E. / B.Tech.	Programme C	ode	101		Regulat	tion	2019		
Department	COMPUTER SCIENCE AND	ENGINEERIN	G			ster	-			
	(	CURRICUL	UM				•			
(Ap	plicable to the students admit	blicable to the students admitted from the academic year 2021-2022 onwards)								
Course	Course Name	Course Name Periods / Week Credit							Marks	
Code	Course r tunie	Category	L	Т	Р	С	CA	ESE	Total	
		THEORY								
U19CSV21	Information Security	PEC	3	0	0	3	40	60	100	
U19CSV22	Cyber Security	PEC	3	0	0	3	40	60	100	
U19CSV23	Cryptography and Network Security	PEC	3	0	0	3	40	60	100	
U19CSV24	Cyber Law and Ethical Hacking	PEC	3	0	0	3	40	60	100	
U19CSV25	Social Network Analysis	PEC	3	0	0	3	40	60	100	
U19CSV26	Semantic Web	PEC	3	0	0	3	40	60	100	
U19ITV23	Cyber Forensics	PEC	3	0	0	3	40	60	100	
U19CTV23	Biometrics Systems	PEC	3	0	0	3	40	60	100	

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### **MINOR DEGREE VERTICALS – EEE**

### **Instrumentation & Control**

	VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN (Autonomous Institution, Affiliated to Anna University, Chennai) Elayampalayam, Tiruchengode – 637 205							N	Revenue Revenue Filter	
Programme	B.E. / B.Tech. Programme Code			ode	102	Regulation			2019	
Department	Electrical & Electronics Engineering				Semester			ster	-	
CURRICULUM										
(Applicable to the students admitted from the academic year 2021- 2022 onwards)										
Course	Course Name		Category	Periods / Week		Credit	Maximum Marks			
Code				L	Т	Р	С	CA	ESE	Total
THEORY										
U19EEV31	Communication Engineering		PEC	3	0	0	3	40	60	100
U19EEV32	Computer Architecture		PEC	3	0	0	3	40	60	100
U19EEV33	Intelligence Techniques		PEC	3	0	0	3	40	60	100
U19EEV34	Bio Medical Instrumentation		PEC	3	0	0	3	40	60	100
U19EEV35	Robotics and Control		PEC	3	0	0	3	40	60	100
U19EEV36	Modern Control Theory		PEC	3	0	0	3	40	60	100
U19EEV37	PLC & SCADA		PEC	3	0	0	3	40	60	100
U19EEV38	Intellectual Property Rights		PEC	3	0	0	3	40	60	100



#### MINOR DEGREE VERTICALS – IT

## **VERTICAL IV - INTERNET OF THINGS & CLOUD COMPUTING**

	VIVEKANANDH (Autonomous In El	N	TVMeeted EEFFED VMeeted VMeete										
Programme	B.E. / B.Tech.	I	Programme C	ode	104		Regulat	tion	20	19			
Department	COMPUTER SCIEN	CE AND E	NGINEERIN	Ĵ			Seme	ster	-				
Course		ximum Mark											
Code	CA	ESE	Total										
THEORY													
U19CSV41	Embedded Systems		PEC	3	0	0	3	40	60	100			
U19CSV42	Smart Sensor Techn	ologies	PEC	3	0	0	3	40	60	100			
U19CSV43	Security in Computi	ng	PEC	3	0	0	3	40	60	100			
U19CSV44	Industry 4.0		PEC	3	0	0	3	40	60	100			
U19ITV41	Software Defined N	etworks	PEC	3	0	0	3	40	60	100			
U19ITV42	Information Storage Management	and	PEC	3	0	0	3	40	60	100			
U19CTV41	Fundamentals of Virtualization		PEC	3	0	0	3	40	60	100			
U19CTV43	Big Data Tools and Techniques		PEC	3	0	0	3	40	60	100			



## **MINOR DEGREE VERTICALS – BT**

#### VERTICAL II - ENTREPRENEURSHIP

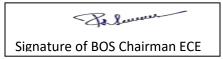
	(Autonomous	VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN (Autonomous Institution, Affiliated to Anna University, Chennai) Elayampalayam, Tiruchengode – 637 205												
Programme	B.TECH.	I	Programme Co	ode	105		Regulat	tion	20	19				
Department	BIOTECHNOLOGY	ster	-											
CURRICULUM														
(Applicable to the students admitted from the academic year 2021-2022 onwards														
Course	Course Nar	Credit	Max	ximum	Marks									
Code														
			THEORY											
U19BTV21	Principles of Mar	agement	PEC	3	0	0	3	40	60	100				
U19BTV22	Bio-Entrepreneur	ship	PEC	3	0	0	3	40	60	100				
U19BTV23	Industrial Biosafe	ety	PEC	3	0	0	3	40	60	100				
U19BTV24	Bioethics & IPR		PEC	3	0	0	3	40	60	100				
U19BTV25	Bioindustries & Entrepreneurship		PEC	3	0	0	3	40	60	100				
U19BTV26	Total Quality man	nagement	PEC	3	0	0	3	40	60	100				
U19BTV27	Audit and Regula Compliance	tory	PEC	3	0	0	3	40	60	100				
U19BTV28	Biobusiness		PEC	3	0	0	3	40	60	100				
U19BTV29	Resource Manage Lean Start-up Ma		PEC	3	0	0	3	40	60	100				

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#### **MINOR DEGREE VERTICALS – BME**

#### **VERTICALS – VI: HEALTHCARE MANAGEMENT**

	VIVEKANA (Autonor	EN	USU MONT 2015							
Programme	B.E.	Programme Code	106		Reg	ulation		2019		
Department	BIOME	DICAL ENGINEERING	3		Ser		-			
(4	Applicable to the	CURRIC students admitted from		emic	year 20	021- 202	2 onw	ards)		
			Ho	urs / V	Veek	Credit	М	aximum	Marks	
Course Code		Course Name	L	Т	Р	C	CA	ESE	Total	
U19BMV61	Clinical Enginee	ring	3	0	0	3	40	60	100	
U19BMV62	Hospital Plannin	g andManagement	3	0	0	3	40	60	100	
U19BMV63	Medical WasteM	lanagement	3	0	0	3	40	60	100	
U19BMV64	Economics and N	Anagement for Engineers	3	0	0	3	40	60	100	
U19BMV65	Bio Statistics		3	0	0	3	40	60	100	
U19BMV66	Forensic Science	in Healthcare	3	0	0	3	40	60	100	
U19BMV67	AI and Its Medic	al Applications	3	0	0	3	40	60	100	
U19BMV68	Medical Informa	tics	3	0	0	3	40	60	100	



#### **MINOR DEGREE VERTICALS - CST**

# VERTICAL III - ARTIFICIAL INTELLIGENCE & MACHINE LEARNING

	(Autonomous Institution,	VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN (Autonomous Institution, Affiliated to Anna University, Chennai) Elayampalayam, Tiruchengode – 637 205												
Programme	<b>B.E.</b>	Programme C	ode	107		Regulat	tion	20	19					
Department	COMPUTER SCIENEC AND T	ECHNOLOG	Y			Seme	ster	-						
(Ap	onwa	rds)												
Course	Course Name		Per	iods /	Week	Credit	Max	kimum	Marks					
Code		Category	L	Т	Р	С	CA	ESE	Total					
THEORY														
U19CTV31	Pattern Recognition Techniques	PEC	3	0	0	3	40	60	100					
U19CTV32	Deep Learning	PEC	3	0	0	3	40	60	100					
U19CTV33	Business Intelligentand its Analytics	PEC	3	0	0	3	40	60	100					
U19CTV34	Data Visualization	PEC	3	0	0	3	40	60	100					
U19CTV35	Natural Language Processing	PEC	3	0	0	3	40	60	100					
U19CTV36	Neuro Fuzzy and Genetic Programming	PEC	3	0	0	3	40	60	100					
U19CTV37	Knowledge Based Decision Support System	PEC	3	0	0	3	40	60	100					
U19ITV31	Data Science	PEC	3	0	0	3	40	60	100					



S.	Category		Cł	REDIT	Γ PER	SEM	ESTE	R		Credits	% of	Maximum Number of Credit Required as
No.	Cutogory	Ι	II	III	IV	V	VI	VII	VIII	Total	Credits	per AICTE
1.	HSC	3	3+1*	1&	1			3		10+2 <sup>&amp;</sup>	6.03	12
2.	BSC	9	9	4	4					26	15.66	25
3.	ESC	8	8	5						21	12.65	24
4.	PCC		3	14	18	15	11	4		65	39.16	48
5.	PEC					3	3	9	6	21	12.65	18
6.	OEC					3	3	3		9	5.42	18
7.	EEC						2	4	8	14	8.43	15
T	OTAL	20	23	23	23	21	19	23	14	166+2=168 <sup>&amp;</sup>	100	-

Cumulative Course Credit: 166 (2021-2025 Batch)

Cumulative Course Credit: 168 <sup>&</sup> (2022-2026 Batch)

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A STATEMENT	AND ALL DATE	ŀ	۷			us Inst	itution,	Affilia	ted to	GINEE Anna U gode – 6	nivers	ity ,C				TÜVRheinland CERTIFIED		
	Program	nme	B.E.				Progra	amme (	Code	103	R	egula	tion		20	19		
	Departr				ICS A							Seme	ester		]	[		
Cat	urse Coo	ła		Course		IN EIN		ods Per Veek		Credit			Ma	ximum	Marks			
COL		le	C	Jourse	Name	-	L	Т	Р	С		CA		ESE		Total		
U1	9MA10	1	Calcul	115			3	1	0	4		40		60		100		
Cours Objec	se ctive		The M	Provi Unde Demo Ident	de the i rstand i onstrate fy the j	nforma maxima Integr problen	a and m al calcu ns base	out Re iinima o ilus. d on ar	of fun ea, sui	of limits, ctions of rface and ifferenti	two v l volu	variab me.	les.	ifferent	iability	7.		
Cours Outco			CO1: 7 CO2: 7 CO3: 1 CO4: 7	end of t Apply 1 Analyz Formul Fransla	he cour Mean va e Total ate Red te Cha	se, the alue the derivat luction nge of	student eorem a tive. Formu order o	should and Tay lae. f integr	be abl lor's t	e to, theorem	Î			wledge	level K1,K3 K2,K4 K3,K5 K2,K5 K3,K5	4 5 5		
Pre-r	equisite	•S	-	Apply 1	nethoa	of vari	ation of	i param	leters.						K3,K3	)		
			2/1 indic	cates str	ength of	f correla		Strong,			CO/PSO Mapping							
	COs	PO 1	PO 2	PO 3	PO 4	Program	nme Out	PO 7	POs) PO 8	PO 9	PO	PO	PO	PSOs PO PSO1 PSO PSO				
	CO 1	3	3	103	104	103	100	107	108		10	11	12	2	2	3		
	CO 2 CO 3	3 3	3											2 2				
	CO 4	3	3											2				
	CO 5	3	3											2				
	se Asses	sment	Metho	ds														
	ect 1.Cc 2. A	ssignr				II & III	[											
Dire	2. A 3E	ssignr				II & III	[											
Dire	ect 1.Cc 2. A 3Er rect	ssignr nd-Sei	nent.	xamina		II & III	[											
Dire	ect 1.Cc 2. A 3Er rect	ssignr nd-Sei ourse -	nent. nester e end sur	xamina		II & III	[											

Limit, continuity, differentiability, rules of differentiation, differentiation of various functions, Rolle's theorem(excluding proof), Mean value theorem(excluding proof), Taylor's theorem(excluding proof), Maxima and



Minima. Physical Applications (Newton's law of cooling - Heat flow problems, Rate of decay of radioactive materials - Chemical reactions and solutions, Ohm's law, Kirchoff's law- Simple electric circuit problems) FUNCTIONS OF SEVERAL VARIABLES Unit - II Periods 12 Partial differentiation – Homogeneous functions and Euler's theorem(excluding proof) – Total derivative – Change of variables - Jacobians - Partial differentiation of implicit functions - Taylor's series for functions of two variables(excluding proof) – Maxima and minima of functions of two variables. Periods 12 Unit – III **INTEGRAL CALCULUS** Riemann integral- Fundamental theorem of calculus(excluding proof) - methods of integration (Integration by parts, Trigonometric integrals, Trigonometric substitutions, Integration of rational functions by partial fraction, Integration of irrational functions) -Reduction formula on  $\int \cos^{-n} x dx$ ,  $\int \sin^{-n} x dx$ . **MUTIPLE INTEGRALS** Periods Unit - IV 12 Double integrals – Change of order of integration – Double integrals in polar coordinates – Area enclosed by plane curves – Triple integrals – Volume of solids – Change of variables in double and triple integrals. Unit – V **ORDINARY DIFFERENTIAL EQUATIONS** Periods 12 Second order Linear ordinary differential equations with constant coefficients, Cauchy's - Euler equations(excluding proof)- Legendre's Linear differential equations(excluding proof) - Method of variation of parameters. **Total Periods** 60 **Text Books** Stewart, J. Calculus: Early Transcendentals (8<sup>th</sup> Edition), Cengage Learning, 2015. 1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 43rd Edition, 2014. 2. References 1. Kreyszig E, Advanced Engineering Mathematics (10<sup>th</sup> Edition), John Wiley (2015). Boyce W E and DiPrima R, Elementary Differential Equations (9<sup>th</sup> Edition), John Wiley (2005). 2. 3. Nishant Shukla, Elementary Integral Calculus Anton H, Calculus: Early Transcendentals, 10th Edition, Wiley (2012). 4. B V Ramana, Higher Engineering Mathematics, Tata McGraw Hill Education Pvt Ltd., New Delhi (2012) 5. **E-Resources** https://freevideolectures.com > All Courses > Calculus > UCLA 1. www.learnerstv.com/Free-engineering-Video-lectures 2. www.nptel.ac.in 3.

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WOMEN EMPOWERNENT		(Au					Affilia	ated to	Anna	a Univ			F <b>OR WO</b> l aai) Elayan		m,	,	UVReinland DERTIFIED B 110546005			
Programme		B	B.E			Pro	ogram	me Co	ode		103	;	Reg	ulation			2019			
Departmer	nt I	ELECT ENGIN			AND	CON	1MU	NICA	TION	I			Semester	r			Ι			
Course code				Co	urse n	omo				Perio	ds per v	veek	Credit		Max	kimum	Marks			
Course coue				CO		anne				L	Т	Р	C	CA	]	ESE	Total			
U19EN101	F	English	for	Comr	nunic	ation	– I			3	0	0	3	40		60	100			
Objective	7	•	To n Assi they Iden	nake l st stud may d tify ar	earner dents i engag nd beg	rs dev in the e in li gin to	elop v develo fe-lon apply	ocabu opmer g lear the la	lary a it of in ning. nguag	nd str ntellec <u>e feat</u>	ctual fle	n gram exibilit acade	nic and pr	ty, and c	cultu	ral lite vriting	eracy so that and speakin nowledge			
					•					•	•					Le	evel			
	(		Vrite	•				<b>.</b>			through gained t		ng. h reading o	of a vari	iety (	of	K2 K3			
Course Outcomes		C <b>O3:</b> U Ising ri							atical	acquis	sition a	nd thei	r knowled	ge abou	ıt	К3				
	(	C <b>O4:</b> L	isten	the a	ccents	and t	ones o	of the	langua	age pr	operly.						K2			
	0	C <b>O5:</b> C	Comp	rehen	d and	retain	the co	ontext	ual an	d syn	tax und	erstan	ding from	reading			K4			
Pre- Requisities		Nil																		
		(3/2/	1 indi	icates s	strengt	h of co	orrelati		Strong		Iedium,	1 - We	eak	CO/PS Mappi						
	CO s	PO	РО	PO	PO	Prog PO	gramm PO	e Outc	omes PO	(POs) PO	PO 10	PO	PO 12	PSOs PSO	PSO	PSO	-			
	<u>CO 1</u>	1	2	3	4	5	6 2	7	8	9 3		11		1	2 2	3	4			
	CO 1 CO 2						2			3	3		3		$\frac{2}{2}$	3	-			
	CO 3						2			3	3		3		2	3				
	CO 4 CO 5						2 2			3 3	33	1	3 3		2 2	3	4			

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Course	Assessment Methods
Direct	
	1. Continuous Assessment Test I, II & III
	2. Assignment: Simulation using tool
<b>T</b> 11	3. End-Semester examinations
Indire	
	1.Course - end survey
Conten	t of the syllabus
Uni	-I Periods 9
	ng-Introduction to Different Types of Listening, Listening to Casual Conversations, Speaking- Introduction to
develop	the Art of Speaking, Giving Self Introduction, Reading – Understanding the Basics of Reading Skills, Reading
	ions and Technical Manuals, Writing- Introduction to writing strategies, Writing Definitions, Focus on Language -
	cal terms (Jargon), Word Formation with Prefixes and Suffixes, Using Active Voice and Passive Voice, Basic
	e patterns, Tenses (past, present, perfect and continuous tenses).
Unit	- II Periods 9
Headlir	Short Conversations through Role Play Activities, <b>Reading</b> – Reading Comprehension, Reading e-mails, Reading es, Predicting the Content, <b>Writing</b> - Note making, Writing Descriptions, <b>Focus on Language</b> – Collocations, nal Use of Tenses, Subject - verb agreement
Unit	- III Periods 9
Describ gist. W Langua	ng- Listening to different kinds of interviews (Face - to - face, radio, TV and telephone interviews), Speaking- ing an Object, Asking Questions, Participating in Discussions <b>Reading</b> – Intensive reading, Reading passages for riting- Informal writing -short e-mails with emphasis on Brevity, Clarity, Coherence and Cohesion), Focus on ge –Sequential Connectives, Impersonal Passive
Unit	- IV Periods 9
informa writing	ng- Note Taking, Speaking- Improving Fluency through Narration. Reading – Reading passages for specific tion- Phone messages, Reading and Transferring Information. Writing- Effective writing strategies, Informal Writing a Memo, Focus on Language – Pronunciation Practice (Phonetic sounds - Vowels, Consonants and ngs), Cause and Effect, Conditional Statements (if - clauses and types), Usage of Modal Verbs.
Unit	
Underst purpose	ng- Listening to understand Modulation, Listening to Welcome Speeches, <b>Speaking-</b> Delivering Welcome Address, anding Segmental and Supra segmental Features-Practicing Stress, Pause and Intonation, <b>Reading</b> – Reading for a , Reading Business Documents, Interpreting Charts and Graphs, Writing- Writing Business e-mails, Describing a <b>Focus on Language</b> - Synonyms and Antonyms, Common Errors in English.
	Total Periods45
Text B	ooks:
1.	Sumant. s, Pereira Joyce, Shameem.M, Selvarajan.R-English Communication Skills, Vijay Nicole imprints Pvt.Ltd, 2015.
2.	Sokkaalingam, S.RM., The Art Of Speaking EnglishVersatile Publishing House, 2018.
Refere	ices:
1.	Dr. Padma Ravindran, Poorvadevi, M. Y. Abdur Razack- English for life, English for work, students Book, Ebek language laboratory pvt ltd, 2011.

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2.	Dutt Rajeevan, Prakash. A Course in Communication Skill (Anna University, Coimbatore edition): Cambridge University Press India Pvt.Ltd, 2007.
3.	S.P. Dhanavel, English and Communication Skills for Students of Science and Engineering, Orient Blackswan Pvt,
	Ltd, 2009.
4.	Technical English – I & II, Sonaversity, Sona College of Technology, Salem, First Edition, 2012.
5.	Meenakshmi Raman and Sangeeta Sharma- 'Technical communication English Skills for Engineers; oxford
5.	University Press, 2008.
E-Reso	urces.
1	http://www.sparknotes.com/lit/the-alchemist/summary.html
2	https://www.stephencovey.com/7habits/7habits.php
3	http://en.wikipedia.org/wiki/The_Seven_Habits_of_Highly_Effective_People

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Urogramma	B.E.	Decommon	0	537 205		Pogu	lation		2019			
Programme		Programme coordinate and COMMUNICAT		10	5	Kegu	lation		2019			
Department	ELECTRONICS	AND COMMUNICAL	IIUN			Semester			Ι			
<b>7</b>	C.		Peri	ods per	week	Credit	М	laximur	n Marks			
Course code	Co	urse name	L	Т	Р	C	CA	ESE	Total			
U19CH105	Enginee	ring Chemistry	3	0	0	3	40	60	100			
Objective	<ul> <li>To Enrich the applications.</li> <li>Familiarize at Gain knowled</li> </ul>	ledge in Polymeric mate e Knowledge of the str out the energy and diffe ge in destruction of meta complete this course suc	udents w rent types als and pro	of batt	basics teries in n for eng	of Nano 1 the engine gineering a	naterials, ering appl	lication	Knowledge			
	CO1: Implement	innovative solutions in v	waste wate	er treati	ment pro	ocess			K3			
Course	<b>CO2:</b> Identify the application of a specific polymer in the field of engineering											
Outcomes	CO3: Forecast the	e information of Nanopa	rticles and	l their i	industria	l application	ons		K2			
<b>CO4:</b> Recognize the renewable energy devices for sustainable energy.												
	CO5: Identify th	a rate of corresion of	a metal	in a gi	ven env	vironment	and find	out	K3			
	•	l techniques to avoid co	rrosion.									

		CO / PO Mapping											CO/PSO Mapping		
	(3/2/1	indica	tes stre	ngth of	f correl	ation)	3-Stror	ng, 2 –	Mediu	m, 1 -	Weak				
COs					Progra	mme C	Outcom	es (PO	s)				PSOs		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO 2	PSO 3
CO 1	3	3	2	2		2	2				1	2	2	1	2
CO 2	3	2	2	1		2	2				1	1	2	1	1
CO 3	3	2	3	2	1	2	1				1	1	1	1	1
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CO 5	3	3	2	2	1	3	2				2	2	1	1	2

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Cours	e Assessment Methods		
	Direct		
	1.Continuous Assessment Test I, II & III		
	2.Assignment : simulation using tools		
	3.End-Semester examinations		
	Indirect		
	1.Course - end survey		
Conte	nt of the syllabus		
U	nit - I WATER TECHNOLOGY	Periods	9
Introd	uction-Sources and impurities in Water-Soft and Hard water- Water qu	uality parameters-types	of Hardness -
	nination of Hardness by EDTA method-Domestic Water Treatment. Boiler l		
	tion in boilers-Caustic embrittlement-Boiler corrosion-Treatment of boil		Ų.
	onate, Phosphate, and Calgon conditioning) external conditioning - Ion excha	ange process, Zeolite pro	ocess – Brackish
	-Water purification by Reverse osmosis.		
Ur	it - II POLYMER CHEMISTRY	Periods	9
Introd	uction - Occurrence, definitions – Functionality - Degree of Polymerization	, Classification of poly	mers – structure
	r, Branched & network polymer structure) block, random & graft copolymer		
	ular weight - number and weight average method. Types of polyme		
copoly	merization. Mechanism of polymerization: Addition - Free radical, cationic a	and anionic polymerization	on). Preparation,
proper	ties and applications of PE, PMMA, PC, nylon6, nylon 66, PET, and Bakelite.		_
Un	it - III NANO CHEMISTRY	Periods	9
	- distinction between molecules, nanoparticles and bulk materials; size		-
	luster, nanorod, nanotube (CNT) and nanowires. Synthesis: Sol-gel, Pred		
	hermal, Electro deposition, Spray Pyrolysis, Chemical Vapour deposition, Lase		
	naterials in medical and electronic devices.	, <b>I</b>	II
Un	it - IV RENEWABLE ENERGY AND STORAGE DEVICES	Periods	9
Renev	vable energy and its sources - Solar Energy - Photo voltaic cells, Importance of	Solar cells - p-n junction	ns in Solar cells -
	ng of Photovoltaic cell, Recent advances in solar cell materials, Wind energy		
Comp	onents and working of WPPs, Tidal energy - Types of Tidal power plants	(TPPs), Barrage and No	on-Barrage Tidal
-	systems.		
	ies and fuel cells: Types of batteries - Dry cells-Alkaline battery, lead storag	e battery, Ni-Cd battery,	, lithium battery,
	ell - H2-O2 fuel cell-applications.		
	it - V CORROSION AND ITS CONTROL	Periods	9
	uction, Types of corrosion - chemical and electrochemical corrosion, mecha		
	ochemical corrosion - Galvanic corrosion, Pitting corrosion, Crevice corrosio		
	ion, Factors influencing rate of corrosion, corrosion control methods - Sacrific		
	tive coatings – Paints: constituents and functions, Metallic coatings - step	os involved in cleaning	the surface for
Electr	oplating, Electroplating (Au), Electro less plating (Ni).	T ( 1 D 1 1	45
		Total Periods	45
Text ]	Books:		
1.	O.G.Palanna, "Engineering Chemistry "Tata Mc GrawHill PVT,Ltd. Second I	Edition -2017	
2.	Dr.S.Vairam ,Dr.S.Mageswari,Dr.K.Balachandran, Engineering Chemistry : 2016	First Edition, Wiley pub	lication,Reprint-
Refer	ences:		
1.	Engineering Chemistry: Jain & Jain, Dhanpat Rai Publishing Company Edition	on- 16- 2015.	
2.	Arun Bahl, B.S. Bahl, G.D. Tuli, Essentials of Physical Chemistry, Published	by S. Chand & Company	y Ltd, 2014
	St lum		48

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3.	Puri, Sharma and Pathnia, Physical Chemistry-II, Vishal Publishers, Edition- 2019.
4.	Engineering Chemistry: Sashi Chawla, Dhanpat Rai & Co (pvt.)ltd. Edition- 5- 2013.
5.	Dr.S.Vairam ,Dr.Suba Ramesh, Engineering Chemistry: First Edition, Wiley publication, Reprint-2016
E-Res	sources.
1	https://www.who.int/water_sanitation_health/dwq/arsenicun6.pdf
2	https://www.schandpublishing.com/books/tech-professional/applied-science/a-textbook-polymer- chemistry/9788121941129/#.XdZ214MzY2w
3	https://www.elsevier.com/books/nanochemistry/klabunde/978-0-444-59397-9

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			At the	end of	the cour	rse, the	student	should	be able	to,					K	Knowled Level	
Cou	rse	-	<b>CO1:</b> Write the algorithms and to draw flowcharts for solving problems.													K3	
	come	-	<b>CO2:</b> Analyze the basics of C programming language.													K4	
			CO3: Implement the C programs using arrays and strings.													K4	
		_				brograms using the functions and pointers. al time problems using Structures and union									K3		
			CO5:	Solve t	he real	time pi	roblems	using	Structu	res and	union					K3	
		(3/2	CO / PO MappingCO/PSO2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - WeakMapping											ping			
	COs	PO 1	PO 2	PO 3	PO 4	Progran	nme Out	PO 7	POs) PO 8	PO 9	PO	PO	PO	PSO PSO	s PSO	PSO	
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Ī	CO 4	3	3	3	2	2			3	3	3	3	2	3			
	CO 5	3	3	3	3	2			3	3	3	3	2	3	3		
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Con		ſ		INTR	ODUC	TION	TO PR	OBLE	M SOI	LVING			Period	ls		9	
	Unit – I	·															

Unit - II	C PROGRAMMING	Periods	9
Introduction to	C - Features - Data Types - Constants - Variables - I/O Stat	ement - Opera	ators –Expressions -
Decision Makir	g and Branching - Looping Statements - Break, Goto, Continue.		
Unit – III	ARRAYS AND POINTERS	Periods	9
Arrays: Concep	ts - Need - one dimensional array - array declaration - feat	ures – array i	nitialization - Two-
Dimensional A	rays- Multidimensional Arrays.		
	uction, pointer declaration-accessing variable through pointer-	•	•
strings - Pointe	rs structures-pointer Arithmetic - Array of Pointers - dynamic me	emory allocati	on.
Unit - IV	FUNCTIONS AND STRINGS	Periods	9
Function: Intro	luction, function declaration, defining and accessing functions	, User-defined	I Functions- storage
	prototypes-parameter passing methods-recursion.		
Strings: Concep	ts - Strings manipulation - String Input / Output Functions- Stri	ings standard f	unctions - Arrays of
Strings.			
Unit – V	STRUCTURES AND UNIONS	Periods	9
Structures-Intro	duction- nested structures- Arrays of Structures - Structures and	Functions - P	ointers to Structures
- Unions- Type	Definition – Bitfields- Enumerated Types.		
		<b>Fotal Periods</b>	45
Text Books			
1.	Kernighan BW and Ritchie DM, "The C Programming Languag	ge", 2nd Editio	on, Prentice Hall of
	india, 2015.		
2.	E. Balagurusamy, Computer Programming, First Edition, Mc Gra	aw Hill, 2016.	
References			
1.	Herbert Schildt, C: The Complete Reference, Mc Graw Hill, 4th	Edition	
	Dr.V.Rameshbabu, Dr.R.Samyutha, M.Muni Rathnan, "Compute Pvt.Ltd,	er Programmir	g", VRB Publishers
		G 1111 00	
3.	E. Balagurusamy, Programming in ANSI C, Seventh Edition, Mc	c Graw Hill, 20	)17.
	E. Balagurusamy, Programming in ANSI C, Seventh Edition, Mc	c Graw Hill, 20	)17.
E-Resources	E. Balagurusamy, Programming in ANSI C, Seventh Edition, Mc	e Graw Hill, 20	)17.
E-Resources		e Graw Hill, 20	)17.

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	CONAL MASTIN		V			nous In	stitut	ion, A	ffiliate	ed to A	nna Ui	nivers	VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN (Autonomous Institution, Affiliated to Anna University, Chennai) Elayampalayam, Tiruchengode – 637 205										
Р	rogramr	ne	В	.Е.		Ũ	amme Code			103	Regu	ulation	l				2019						
D	Departme	nt	ELECTRONICS AND COMMUNICATION ENGINEERING Semester									er	I										
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Indirect           1. Course	e - end survey		
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Concepts &	Importance of graphics in engineering applications –		
Conventions(N	Use of drafting instruments – BIS conventions and	Periods	1
ot for	specifications - Size, layout and folding of drawing	1011045	-
Examination)	sheets – Lettering and dimensioning.		
Unit – I	PROJECTION OF POINTS, LINES AND PLANE SURFACES	Periods	3+8
	ne curves, Orthographic projection – principles – projectio and plane surfaces (polygonal and circular).	n of points, straight lines	(only firs
Unit - II	PROJECTION OF SOLIDS	Periods	3+8
Projections of simplane.	ple solids like prisms, pyramids, cylinder and cone when t	he axis is inclined to one	e reference
Unit - III	SECTION OF SOLIDS	Periods	3+8
Sectioning of solid	s - prisms, pyramids, cylinder and cone in simple vertical p	osition by cutting planes	inclined to
one reference plane	e and perpendicular to the other - Obtaining true shape of sec	tion.	
Unit - IV	DEVELOPMENT OF SURFACES	Periods	3+8
	tteral surfaces of simple solids like prisms, pyramids, cyli lids involving prisms, pyramids, cylinders and cones.	inders and cones – devel	lopment o
Unit - V	ISOMETRIC PROJECTIONS, ORTHOGRAPHIC VIEWS FROM PICTORIAL VIEWS	Periods	5+10
scale - Isometric pr pictorial views.	<b>ion and Introduction to AutoCAD / Solid Edge:</b> Principle rojections of simple solids like prisms, pyramids, cylinders and	nd cones & orthographic	views fron
<b>Demonstration on</b> and demonstration	<b>ly: Computer Aided Drafting (Auto CAD / Solid Edge)</b> of their use.		
		Total Periods	60
Text book:			210
	rawal and C.M Agrawal ,"Engineering Drawing ",Tata McGu		JI9
T2 Jain and G	autam ,"Engineering Graphics & Design ",Khanna Publishin	g House, 2018	
<b>References:</b>			
R1. Dr.P.Kann	an and Dr.J.Bensam Raj, "Engineering Graphics", JBR Tri S	ea Publishers Pvt. Ltd, 20	18.
R2. K.V Natara	ajan, "Engineering Drawing and Graphics", M/s. N.Dhanalak	shmi, Chennai, 2014.	
R3. K.Venugop	oal and V. Prabhu Raja, "Engineering Graphics"New Age Int	ternational Publishers, 201	1.
	sarathy and Velamurali, "Engineering Graphics", Oxford Un	•	
R5. Bhatt N.D	and Panchal V.M, "Engineering Drawing", Charotar Publish	ing House,50 <sup>th</sup> Edition,20	10
e-RESOURCES:			
E1. http://nptel	.ac.in/courses/105104148, "Engineering Graphics" - Dr. Nih	ar Ranjan Patra , IIT Kanj	pur
E2. http://cfd.a	nnauniv.edu/webcontent.htm, "Engineering Graphics" - Dr.V	Velamurali	
-	springer.com/ "Engineering Graphics"-Springer Nature.		
цэ. [ <sup>тар.//</sup> тик.	Fringeneous Engineering Orapines Springer Patale.		



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		CO4: supply		rmine	e hard	lness	and c	lissolv	ved oxy	ygen p	oreser	nt in	don	nestic w	vater				K5
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2.	Estimation of Mixture of acid using NaOH by Conductometric titration.	CO1
3.	Estimation of Barium chloride using sodium sulphate by Conductometric precipitation titration	CO1
4	Estimation of ferrous iron by Potentiometric titration	CO2
5	Determination of HCL using NaOH by pH metry	CO1
б	Estimation of Ferric ion by Spectrophotometry	CO3
7	Determination of Total, temporary and permanent hardness of water by EDTA method.	CO4
8	Estimation of Dissolved Oxygen content in water by Winkler's method	CO4
9	Estimation of alkalinity in water sample.	CO5
10	Estimation of available chlorine in bleaching powder.	CO5
	Total Periods	45
Lab Ma	nuals suggested:	
1.	Chemistry laboratory I & II by Dr.A.Ravikrishnan,Sri Krishna Pub, Revised Edition-2017	
2.	Chemistry laboratory Manual by Dr. Veeraiyan, Revised Edition-2017	

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Course Objective	• U • D • A	Indersta Develop Articulat	and the a prog te wher	basic p ram wit e comp	earn the rogrami th a desi outer pro	ming c ired ru	onstruc ntime e	ts and xecution	articu on flov	V		-		ons to r
		world problems         At the end of the course, the student should be able to,												nowledg vel
	COI	CO1:Prepare document using word processor												K3
Course Outcome		CO2:Sketch flow of execution of C programs using algorithm and K3 flowcharts												
	CO3	<b>3:</b> Write	the sin	nple C	Program	ns using	g decisi	on and	lloopi	ng sta	temen	ts		K3
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	and	pointer	s.											
	and	pointer	s.	ams tha	t perfor	m oper	ations	using d	lerived	data	types.			K3
	and	pointer : Write	s. e progra ength of	<b>CO / PO</b> f correla	<b>D Mapp</b> tion) 3-S	<b>ing</b> Strong, 2	2 – Med				types.	CO/F Map	ping	K3
COs ( PO	and COS	pointer : Write	s. e progra ength of	<b>CO / PO</b> f correla	O Mappi	<b>ing</b> Strong, 2	2 – Med		- Weak	PO	РО	Map PSOs PSO	ping PSO	PSO
COs PO	and ] CO5 3/2/1 india	pointer : Write cates str PO 3	e progra ength of PO 4	<b>CO / P(</b> f correla Program	<b>D Mapp</b> tion) 3-S nme Outo	<b>ing</b> Strong, 2 comes (	2 – Med POs) PO 8	ium, 1 PO 9	- Weak PO 10	PO 11	PO 12	Map PSOs PSO 1	PSO 2	
COs PO CO 1 3	and ] COS 3/2/1 indic	pointer : Write cates str	s. e progra ength of	<b>CO / P(</b> f correla Program	<b>D Mapp</b> tion) 3-S nme Outo	<b>ing</b> Strong, 2 comes (	2 – Med POs)	ium, 1	- Weak PO 10 3	PO	PO 12 3	Mapy PSOs PSO 1 3	ping PSO	PSO
COs PO CO1 3	and ] CO5 3/2/1 india	PO 3	s. e progra ength of PO 4	<b>CO / P(</b> f correla Program	<b>D Mapp</b> tion) 3-S nme Outo	<b>ing</b> Strong, 2 comes (	2 – Med POs) <b>PO 8</b> 3	ium, 1 PO 9 3	- Weak PO 10	PO 11 3	PO 12	Map PSOs PSO 1	PSO 2 1	PSO
COs PO CO 1 3 CO 2 3	and CO5 3/2/1 indic	PO 3 3 3	s. ength of PO 4	<b>CO / P(</b> f correla Program	<b>D Mapp</b> tion) 3-S nme Outo	<b>ing</b> Strong, 2 comes (	2 – Med POs) PO 8 3 3	ium, 1 PO 9 3 3	- Weak PO 10 3 3	PO 11 3 3	<b>PO</b> 12 3	Map PSOs PSO 1 3 3	<b>PSO</b> 2 1 1	PSO

2. End-Semester examinations

Indirect

1. Course - end survey

#### SUGGESTED LIST OF EXPERIMENTS

1. Design an algorithm and flowchart using word processor that reads the customer number and power consumed and prints the amount to be paid by the customer. An electric power distribution company charges its domestic consumers as follows

Consumption Units Rate of Charge

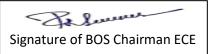
0-200

Rs.0.50 per unit



CO1

		Rs.100 plus Rs.0.65 per unit excess 200 Rs.230 plus Rs.0.80 per unit excess of 400.	
2.	Design an algorithm and flow for performing various arithm	chart for a simple calculator program using word processor etic operations such as	CO2
3.	is a palindrome or not.	ram to accept a number from the user and check whether it ber is a Palindrome which when read in reverse order is	CO3
	Example: Palindrome :11, 10		
	Not a Palindrome:12	23 , 100	
4.	Develop a C program to find in the integer that is given as i	the sum of the digits of an integer and the number of digits nput by the user.	CO3
	Test Case:		
	Sample Input: 15390		
	Sample Output:		
	Sum of the digits=18		
	No. of digits $= 5$		
	For an incorrect choice, an ap	propriate error message should be displayed.	
5.	Develop a program to perform dimensional matrices:	n the following operations using two dimensional or multi-	CO3
	a. Addition of two matric	ces (3x3)	
	b. Subtraction of two ma	trices (2x2)	
	c. Multiplication of two	matrices using dynamic memory allocation.	
6.	Write a program to find the m dimensional array.	aximum and minimum element in a set of inputs using one	CO3
7.	Write a program to count the example	total number of vowels and consonants in a string. For	CO4
	Input string: I am proud to be	an Indian	
	Output: Total vowels – 10 and	l Total consonants - 10	
			Г. <b>Т</b> . Т.



	Develop a program to perform the following string manipulations without using string functions:	CO4
	a. String copy	
	b. String Concatenate	
	c. String length	
	d. String Compare	
9.	The Fibonacci numbers are defined recursively as follows:	CO4
	F1=1	
	F2=1	
	Fn = Fn-1 + Fn-2, n > 2	
	Write a function that will generate and print the first n Fibonacci numbers.	
	Test the function for n=5,10,15	
	Write a function using pointers to exchange the values stored in two locations in the memory.	CO4
	Test Case :	
	Input : A=10, B=-5	
	Output : A= -5 , B=10	
	Develop a program to build a database of students with the following attribute: Roll no, Name, Course, Stream, Percentage, and Division. Take input for each student in all fields except division. Calculate division of each student such that those students having percentage $\geq 60\%$ are belongs to first division. Similarly, for second and third division students having conditions 50 %< =percentage<60% and 35 %< =percentage<50% respectively. If any student has percentage less than 35% then write "fail" in division field. After building the database display the database of the students. Hint: create database using structure.	CO5
	Total Periods 45	
E-Reso		
1.	https://www.programiz.com/c-programming	
2. 3.	https://www.cprogramming.com/ https://beginnersbook.com/2015/02/simple-c-programs/	
5.	mips.//ocfiniersoook.com/2015/02/simple-e-programs/	

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Program	nme	B.E	•				Progra	imme	Code		Reg	ulation		201	19			
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Course (	Code		Cour	se Nan	ne		eriods ]			Credit			kimum					
U19MC	CFY2				ion and 1 Values			T 0	P 0	C 0		CA 00	ESE -		Total 100			
Course Objectiv	e	i) ii ii	<ul> <li>he main objective of this course is to:</li> <li>i) To know about Indian constitution.</li> <li>ii) To know about central and state government functionalities in India</li> <li>iii) To know about Indian society.</li> </ul> t the end of the course, the student will be able to															
															Knowledge Lev K1			
		• Understand the functions of the Indian government												K1 K1				
Course		Understand and abide the rules of the Indian constitution												<u>KI</u> K1				
Outcome	د د	• Understand and appreciate different culture among the people																
. ucont	~	• Understanding human being as a co-existence of the sentient 'I' and the material												K1, K2				
		• 'Body' and the needs of Self ('I') and 'Body' and Ability to utilize the professional competence for augmenting universal human order and Ability to identify the scope and characteristics of people-friendly and ecofriendly Production systems																
Pre-requ	isites																	
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COs	(3/2	2/1 1nd10	cates str	ength of	correlati Program		Strong, comes (P		edium	, I - Wea	К		N	<b>lappir</b> PSOs	ng			
	PO 1	PO 2	PO 3	PO 4		PO 6	PO 7	PO	8 PO	9 PO	PO	PO	PSO	PSO	PSO			
CO 1						3		3	2	10	11	12	1	2	3			
CO 1 CO 2						3		3	3									
						3		3	2									
CO 3						3		3	3						1			
CO 3 CO 4						3	+	3	3		-	1						

Direct

- 1.Continuous Assessment Test I, II & III
- 2.Assignment: Simulation using tool
- 3.End-Semester examinations

## Indirect

1.Course - end survey

Contont of the	a gullahua		
Content of the	e synabus		
Unit – I	INTRODUCTION	Periods	9
Historical Bac Remedies for	ckground – Constituent Assembly of India – Fundamental Rig	hts – Citizensl	hip – Constitutional
Unit - II	STRUCTURE AND FUNCTION OF CENTRAL	Periods	9
Union Gover	ment – Structures of the Union Government and Function	ons – Presiden	t – Vice President
- Prime Min	ister – Cabinet – Parliament – Supreme Court of India		
Unit – III	STRUCTURE AND FUCTION OF STATE	Periods	9
	nment – Structure and Functions – Governor – Chie		Cabinet – State
-	Judicial System in States - High Courts and other Suborc		
Unit - IV	UNIVERSAL HUMAN VALUES	Periods	9
Course Intro	duction - Need, Basic Guidelines, Content and Process for	Value Educa	tion
Unit – V	OPTOEL UNIVERSAL HUMAN VALUES - PROFESSIONAL ETHICS ECTRONICS	Periods	9
Understandi	ng Harmony in the Human Being - Harmony in Myself an	d society.	45
Text Books			
	urga Das Basu, "Introduction to the Constitution of India elhi.	", Prentice Ha	ll of India, New
2. T	anu shukla,Human Values and professional Ethics, Cenga	ge publications	
References			
1. R	.C.Agarwal, (1997) "Indian Political System", S.Chand an	ld Company, l	New Delhi
2. In	dian polity, M.Laksmikanth, Tatamchrawhill publications		
1	R Gaur, R Sangal, G P Bagaria, A foundation course in H thics,Excel books, New Delhi, 2010, ISBN 978-8-174-467		and professional
<b>E-Resources</b>			
1. ht	tps://mhrd.gov.in/		
2. ht	tps://niti.gov.in/content/niti-aayog-library		
2. 10	tps://inti.gov.in/content/inti dayog nordry		

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Progra	mme	B.E	•				Progr	amme	e Code	103	Reg	gulation	1	201	9	
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7					eduction		<b>A</b>	ic for	m.					K3, K		
Course	-		CO2: Identify vector differential calculus.K2, K3CO3: Apply Green's , Stoke's and Gauss Divergence theoremsK1, K5													
Dutcom	e	CO3: Apply Green's , Stoke's and Gauss Divergence theoremsK1, K5CO4: Identifying the analytic functionsK2, K5														
					Laplace			funit	aton a	ad unit	mnula	0		К2, К	5	
		function	•	nze tne	Laplace	trans	lorm o	i unit	step a	na unit	impuis	e		K5, K	3	
		2/1 in di	cates str		<b>CO / PO</b> correlati	on) 3-	Strong,		ledium,	1 - Wea	k		CO/PS Mappi			
	(3/				Program	nme Out	comes (P	Os)					PSOs			
COs				_	e			-								
COs	(3/	PO 2	PO 3	PO 4	e	PO 6	PO 7	PO	B PO	10	PO 11	PO 12		PSO 2		
COs CO 1				PO 4	e	PO 6	PO 7	POS	8 PO	9 PO 10	PO 11	PO 12		PSO 2	PSO 3	
CO 1 CO 2	<b>PO 1</b> 3 3	PO 2 3 3		PO 4	e	PO 6	PO 7	PO	B PO	10			1 2 2 2	•		
CO1 CO2 CO3	<b>PO 1</b> 3 3 3	PO 2 3 3.		PO 4	e	PO 6	PO 7	PO	8 PO	10			1     2       2     2       2     2	•		
CO 1 CO 2 CO 3 CO 4	PO 1 3 3 3 3 3	PO 2 3 3. 3. 3		PO 4	e	PO 6	PO 7		8 PO	10			1     2       2     2       2     2       2     2       2     2	•		
CO1 CO2 CO3	<b>PO 1</b> 3 3 3	PO 2 3 3.		PO 4	e	PO 6	PO 7		8 PO	10			1     2       2     2       2     2	•		
CO 1 CO 2 CO 3 CO 4 CO 5	<b>PO 1</b> 3 3 3 3 3 3	PO 2 3 3 3 3 3 3	PO 3	PO 4	e	PO 6	PO 7	PO 8	8 PO	10			1     2       2     2       2     2       2     2       2     2	•	PSO 3	
CO 1 CO 2 CO 3 CO 4 CO 5	<b>PO 1</b> 3 3 3 3 3 3	PO 2 3 3 3 3 3 3	PO 3	PO 4	e	PO 6	PO 7	PO	8 PO	10			1     2       2     2       2     2       2     2       2     2	•		
CO 1 CO 2 CO 3 CO 4 CO 5	PO 1 3 3 3 3 3 3 1.Con 2.Ass:	PO 2 3 3 3 3 3 3 ment M	PO 3	ment Te	PO 5		PO 7		8 PO	10			1     2       2     2       2     2       2     2       2     2	•		
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	encoding message using $2 \times 2$ matrix.		
Unit - II	VECTOR DIFFERENTIAL CALCULUS	Periods	12
	entiation: Vector and Scalar Functions- Derivatives- Curve erivative -Divergence of a Vector Field - Curl of a Vector Field	- Tangents ar	
Unit – III	VECTOR INTEGRAL CALCULUS	Periods	12
theorem(exclu parallelepiped	and Volume integrals, Green's theorem in a plane(excluding proof), Stokes theorem (Excluding proof) - simple ap s and spheres.	plications inv	olving rectangular
Unit - IV	ANALYTIC FUNCTIONS	Periods	12
Properties – I functions c+z,	tions – Necessary and sufficient conditions for analyticity in C Iarmonic conjugates – Construction of analytic function - Co cz,1/z and Bilinear transformation.	nformal mapp	ing – Mapping by
Unit – V	LAPLACE TRANSFORMS ditions – Transforms of elementary functions – Transform of ur	Periods	12
proof) – Trans	Il value theorems(excluding proof) – Inverse transforms – Conv form of periodic functions – Application to solution of linear se constant coefficients.	econd order or	dinary differential
	ľ	<b>Fotal Periods</b>	60
Text Books			2012
	Veerarajan, Engineering Mathematics, Tata McGraw Hill Educ		
2 20	avish R Sing , Mukul Bhatt, "Engineering Mathematics", Mc G 018	raw Hill Educ	ation Pvt. Ltd-
References			
I Ed	ylie, R.C. and Barrett, L.C., "Advanced Engineering Mathemat lucation Pvt. Ltd, 6th Edition, New Delhi, 2012.		
2 K	reyszig, E., Advanced Engineering Mathematics (10th Edition),	, John Wiley (	2015).
3 A	an Jefferis, Advanced Engineering Mathematics, Academic Pre-	ess- New Delh	
			i-2003
4	unus A.Cengel, William J.Palm III," Differential equations for cGraw Hill Education Pvt. Ltd, 6th Edition, New Delhi, 2012.		
4 M		Engineers & S	
4 M	cGraw Hill Education Pvt. Ltd, 6th Edition, New Delhi, 2012.	Engineers & S	
4         M           5         Jo <b>E-Resources</b>	cGraw Hill Education Pvt. Ltd, 6th Edition, New Delhi, 2012.	Engineers & S	
4         M           5         Jo           E-Resources           1.         ht	cGraw Hill Education Pvt. Ltd, 6th Edition, New Delhi, 2012. hn Bird, Higher Engineering Mathematics, Anuradha Agencies	Engineers & S	

	VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN (Autonomous Institution, Affiliated to Anna University, Chennai) Elayampalayam, Tiruchengode – 637 205													
Programme	B.E.	Progra	mme	code	103	Regu	lation	2	.019					
Department	ELECTRONICS AND ENGINEERING	D COMMUNICATION				Ser	nester		II					
Course code	Cour	se name	F	eriods week	•	Credit	M	laximum						
couc			L	Т	Р	C	CA	ESE	Total 100					
U19EN202	0	English for Communication - II30034060The main objective of this course is to:												
Objective	<ul> <li>contexts.</li> <li>To improve lea contexts</li> <li>Assist students that they may e</li> </ul>	annelized reading to make urners' vocabulary and gra in the development of int engage in life-long learnin egin to apply the langua	ımmar ellectu g.	to sup	plemen ibility,	t their lang creativity,	guage u and cu	use at pro	fessional eracy so					
		plete this course successfu	-	-			nofocci	anal	Knowled ge Level					
		nt command over language lous exposure to similar li				lemic or p	roressi	onai	K2					
Outcomes		well at a professional con		<u> </u>		sing them	to simi	lar	K3					
Jucomes	of vocabulary and stren	length at technical and pro ngthening of grammatical 1	knowl	edge.		C			K3					
		be able to ethically gather iety of written and electron			evalua	te and syn	thesize		K2					
	CO5: Students should	be proficient in oral comm	nunica	tion an	d writii	ng.			K4					
Pre- requisites	Nil													

	<b>CO / PO Mapping</b> (3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak														CO/PSO Mapping			
COs		Programme Outcomes (POs)																
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO	PO	PS	PS	PSO			
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CO 1						2			3	3		3		2	3			
CO 2						2			3	3		3		2	3			
CO 3						2			3	3		3		2	3			
CO 4						2			3	3		3		2	3			
CO 5						2			3	3		3		2	3			

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#### **Course Assessment Methods** Direct 1.Continuous Assessment Test I. II & III 2.Assignment: Simulation using tool 3.End-Semester examinations Indirect 1.Course – end survey **Content of the syllabus** Unit - I Periods 9 Listening- Listening for Cultural Awareness, Listening to Professional Conversations, Talks, Interviews and Lectures Speaking- Developing Confidence to get rid of Fear on the Dias, Discussion at a Corporate Context. Reading-Inferential Reading, Reading Short Messages and Technical Articles, Writing- Introduction to Letter Writing, Writing Formal and Informal Letters, Thanking Letters, Letters Calling for Quotations, Letters Placing an Order, Seeking clarification, Letters of Complaint. Focus on Language-Adjectives and Degrees of Comparisons Unit - II Periods 9 Listening- Listening to specific information relating to technical content, Listening for statistical information Speaking- Expressing opinions, Formal Discussions, Describing Role Play at Business Context and Consolidating Ideas. Reading-Reading Technical Articles in Journals and Comparing Articles. Writing- Letter seeking permission to undergo practical training and to undertake project work. Focus on Language- Simple, compound and complex sentences and Transformation of Sentences. Unit - III Periods 9 Listening- Listening to understand the overall meaning, Listening to Interviews and Presentations. Speaking- Giving Instructions and Showing Directions and Rephrasing Instructions. Reading- Skimming and Scanning, Reading Job Advertisements. Writing- Applying for a Job, Writing a CV. Focus on Language- Pronouns, Phrasal verbs, Restrictive and Non - restrictive clauses. Unit - IV Periods 9 Listening- Listening and retrieving Information. Speaking- Developing fluency and Coherence, Accent Neutralization, Voice Modulation, and Intonation, Improving Voice Quality. Reading-Reading and understanding Advertisements. Writing- Letters to the Editor, Letter of Complaint, Various kinds of Reports, Permission to go for Industrial visits. Focus on Language- Countable, Uncountable nouns, Recommendations, Discourse Markers and Comparative and Contrastive Connectives, Imperatives. Unit - V 9 Periods Listening- Listening to Fragmented Texts and Filling in the Blanks. Speaking-Mind Mapping, Developing Coherence and Self-Expression, Making presentations, Paralinguistic and Extra linguistic Features (body language), Reading-Predicting content, Interpreting Reports. Writing- Writing Proposals, Agenda, Minutes of the Meeting. Focus on Language-British and American Vocabulary, Editing, Error Detection, and Punctuation. **Total Periods** 45 Text books Sumant.S, Pereira Joyce, English for Communication, Vijay Nicole Imprints Pvt.Ltd., 2014. 1. Sokkaalingam, S.RM., The Art Of Speaking EnglishVersatile Publishing House, 2018. 2. **Reference** books Norman Whitby - Business Benchmark Pre-Intermediate to Intermediate, Students Book, Cambridge University 1. Press, 2008., 1997. Dutt, Rajeevan, Prakash .A Course in Communication Skills (Anna University, Coimbatore edition) :.. 2. Cambridge University Press India Pvt.Ltd, 2007. Meenakshi Raman and Sangeeta Sharma-'Technical Communication English Skills for Engineers'; Oxford 3. University Press, 2008.



4.	S.P. Dhanavel, English and Communication Skills for Students of Science and Engineering, Orient Blackswan Pvt, Ltd, 2009.
5.	Technical English – I & II, Sonaversity, Sona College of Technology, Salem, First Edition, 2012.
E-Re	sources
1	http://www.kalevleetaru.com/Publish/Book_Review_Who_Moved_My_Cheese.pdf
2	http://www.bookbrowse.com/reviews/index.cfm/book_number/304/who-moved-my-cheese
3	http://www.imdb.com/title/tt0482629/plotsummary

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	VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN (Autonomous Institution, Affiliated to Anna University, Chennai) Elayampalayam, Tiruchengode – 637 205												
Programme	B.E.		Prog	gramm	e Code	103	Regulation		2019				
Department	ECE & EE	E					Semester		II				
Course Code	C	ourse Name	Period	ls Per	Week	Credit	Maxii	num M	larks				
Course Code	C	L T P C CA											
U19PH207	Engin	Engineering Physics300340ne student should be made to,											
Course Objective	<ul> <li>identify t and applid</li> <li>correlate semicond</li> <li>categorize</li> </ul>	wledge about the conduct he different types of cry- cations of ultrasonics. better understanding t uctor. Study the propert e the types of laser and the	ystal stru he carrie ies of m fiber opt	ictures er conc odern e	and crystern cryster c	stal growt n and its	s variations wit	th temp	-				
		of the course, the stude						Le	vel				
Course		lerstand the elastic prop				<b>C</b> 1			K2				
Outcome	• det	n knowledge about the operation of the second secon	or variou				nd different		K3 K1				
		cuss the basic idea of se modern engineering mat		icting n	naterials	and reali	ze the function		K1				
	learn the optical properties of materials and its uses     K3												
Pre-requisites													

	<b>CO / PO Mapping</b> (3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak														
COs		Programme Outcomes (POs)													
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	3	2	3	1	2									2	
CO 2	3	2	3	3	1										
CO 3	3	3		3	1									2	
CO 4	3		2	1	1								3	2	
CO 5	3			1	2	2								2	

Direct           1.Continuous Assessment Test I, II & III           2.End-Semester examinations	÷		_	-				_	1
2.End-Semester examinations									
1.Continuous Assessment Test I, II & III 2.End-Semester examinations	Course Assessment M	lethods							
1.Continuous Assessment Test I, II & III 2.End-Semester examinations									
2.End-Semester examinations	Direct								
	1.Continuous	s Assessment Te	st I, II & II	Ι					
Indiract	2.End-Semes	ster examinations	5						
	Indirect								1
1.Course - end survey	1.Course - er	nd survey							1

Unit – I	PROPERTIES OF MATTER	Periods	9
			66
	Signature of BOS Chairman EC		
	Signature of BOS Chairman EC	F	

Types of moduli of elasticity - Stress - Strain Diagram - uses. Young's modulus: Experimental Elasticity: determination by non-uniform bending - Twisting couple on a wire –Application: Torsional pendulum. Viscosity: Co-efficient of viscosity - Poiseuilles' formula - Experimental determination - uses. 9 Unit - II **ELECTRONS IN SOLID** Periods Classical theory: Classical free electron theory of metals- Expressions for electrical conductivity and Thermal Conductivity of metals – Wiedemann-Franz law (Qualitative) - Success and failures. Quantum theory: de Broglie's hypothesis - Schrodinger's time independent and time dependent wave equations (Qualitative) - Particle in a one-dimensional box- Fermi – Dirac Statistics - Density of energy states (Qualitative). 9 Unit – III **CRYSTAL PHYSICS AND ULTRASONICS** Periods Crystallography - Unit cell - Crystal systems - Bravais lattices- Lattice planes - Miller indices - Inter-planar spacing in cubic lattice- Calculation of number of atoms per unit cell- Atomic radius - Coordination number-Packing Factor for HCP structures. Ultrasonics: Introduction - Magnetostriction and Piezoelectric Oscillator methods - Applications: Sound Navigation and Ranging (SONAR), Non – Destructive Testing (NDT) and Sonogram. **SEMICONDUCTING & MODERN** Unit - IV Periods 9 **ENGINEERING MATERIALS** Intrinsic semiconductor: (Qualitative only) - Carrier concentration - Fermi level - Electrical conductivity -Band gap determination. Extrinsic semiconductors: Carrier concentration in n - type and p - typesemiconductor (Qualitative) – Variation of Fermi level with temperature. Metallic glasses: preparation, properties and applications - Shape memory alloys (SMA): Characteristics and applications of NiTi alloy. Unit – V LASER AND FIBER OPTICS Periods 9 Laser: Characteristics of laser -Derivation of Einstein's A and B coefficients. Types: Nd-YAG laser -Semiconductor laser: Homo junction - Applications. Optical fiber: Principle of propagation of light through optical fiber - Numerical aperture and acceptance angle (Qualitative)-Types of optical fibers -Fiber optical communication system (block diagram) -Application: Medical endoscope. **Total Periods** 45 **Text Books** R.K. Gaur and Gupta. S.L, Engineering Physics, Dhanpat Rai Publishers, 2017. 1. 2. S.O Pillai., Solid state physics, New Age International Private Limited. 3. Dr.P.Mani, "Engineering Physics", Shri Dhanam publisher, Chennai - 600 042 References 1. B.K. Pandey, S. Chaturvedi. "Engineering Physics", 1<sup>st</sup> Edition, Cengage Learning India Pvt Ltd, (2012). Fundamentals Of Physics Extended 8/Ed 8th Edition, David Halliday, Robert ResnickJearl Walker, Wiley 2. India Pvt Ltd, 2008. Lawrence H.Vanvlack, "Elements of materials Science Engineering, 6<sup>th</sup> Edition, Pearson Publication. 3. S.O.Pillai, "Solid State Physics", New Age International Publishers 4. Dr.V.Rajendran, "Engineering Physics", Tata McGraw Hill Education Private Limited, New Delhi 5. **E-Resources** 1. www.e-booksdirectory.com 2. Home.iitk.ac.in 3. physics.cu.ac.bd/

Jalum . Signature of BOS Chairman ECE

		NANDHA COLLEG omous Institution, At Elayampalaya	ffiliated	to An	na Un	iversity,		ŗ	SO 1001 2016				
Programme	B.E.		Progra	mme (	Code	103	Regulation		2019				
Department	Common	to CSE,IT,ECE,B	T brai	nches			Semester		II				
Course Code	Co	ourse Name	-	iods P Week	er	Credit	Ma	aximum	Marks				
			L	Т	Р	С	CA	ESE	Total				
U19EE201		Basic Electrical and Electronics Engineering30034060											
Course Objective	<ul> <li>The students should made to</li> <li>Learn the basic concepts of electrical parameters and electrical machines</li> <li>Learn the electrical wiring methods</li> <li>Learn the basics about semiconductor families and digital logics</li> </ul>												
Course	CO1: Unde CO2: Unde	of the course, the stude erstand the basics of e	lectric o	circuits	and	type of th		nciple	Knowledge Level K2 K2				
Outcome	CO3: Unde	AC machines. erstand the concepts of safety measures.	of tariff,	energ	y savi	ng, illumi	nation, electri	с	K2				
		erstand the basic oper	Č.						K2				
	CO5: Unde	erstand the fundament	als of d	igital l	ogics	and integ	rated circuits.		K2				
Pre- requisites	Basic conce	pts and understanding	of mag	netic fi	elds								
(3/2/	1 indicates str	<b>CO / PO Mapj</b> ength of correlation) 3-		2 – Meo	lium,	1 - Weak	CO	/PSO M	apping				

(3	/2/1 ine	<b>CO / PO Mapping</b> indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak												CO/PSO Mapping				
		Programme Outcomes (POs)												PSOs				
COs	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	PSO 3	PSO 4		
CO 1	3	2										3	3		2			
CO 2	3	2										3	3		2			
CO 3	3											3	3		3			
CO 4	3	2										3	3		2			
CO 5	3	2										3	3		2			

#### **Course Assessment Methods**

Direct

- 1.Continuous Assessment Test I, II & III
- 2.Assignment
- 3.End-Semester examinations

Indirect

1.Course – end Survey



Content of the	syllabus								
Unit – I	INTRODUCTION OF ELECTRICAL CIRCUITS	Periods	9						
Definition of V	Voltage, Current, Power, Energy, Power factor, Circuit parameter	rs, Ohm''s law	, Kirchoff's law.						
Concepts of A	C Circuits- RMS value, Average value, Form and Peak factors, G	Concept of re	al and reactive power.						
Introduction to	three phase systems - types of connections, relationship betwee	n line and pha	se values. Concept of						
DC circuits		1							
Unit - II	INTRODUCTION OF ELECTRICAL MACHINES AND MEASUREMENTS	Periods	9						
	s of electromagnetic induction - Lens law - Fleming's left han								
	construction of AC and DC machines -Working principle								
	electrical measuring instruments – Analog and Digital Instrume								
Unit – III	WIRING AND ILLUMINATION	Periods	9						
Types of wiring-staircase and corridor wiring - wiring accessories. Different types of safety measures - Earthing. Electrical tariff - Energy conservation. Simple layout of power system-various energy resources,. The Laws of Illumination - Different types of electrical lamps.									
Unit - IV	SEMICONDUCTOR DEVICES	Periods	9						
PN junction diodes - Zener diodes - characteristics. Transistors: PNP and NPN transistors - Theory of operation - Transistor configurations -characteristics - comparison. Special semiconductor devices: FET - SCR - LED - V-I characteristics -UPS - SMPS.									
Unit – V	DIGITAL FUNDAMENTALS	Periods	9						
•	ns - Boolean Theorems – De Morgan's Theorem - Logic gates -I ntroduction to Operational Amplifier.	mplementation	n of Boolean Expression						
	ŋ	<b>Fotal Periods</b>	45						
Text Books									
	D.P. Kotharti and I.J Nagarath, Basic Electrical and Electronics Engel016.	gineering, Mc (	Graw Hill, Third Edition,						
2. N	M.S. Sukhija and T.K. Nagsarkar, Basic Electrical and Electronics E	Engineering, Ox	xford, 2016.						
References									
1. 5	S.B. Lal Seksena and Kaustuv Dasgupta, Fundaments of Electrical E	Engineering, Ca	ambridge, 2016						
2. N	Mittle, Mittal, Basic Electrical Engineering, 2nd Edition, Tata McG	raw-Hill Editio	n, 2016.						
3. 5	S.K.Sahdev, Basic of Electrical Engineering, Pearson, 2015.								
4. J	ohn Bird, —Electrical and Electronic Principles and Technology, F	ourth Edition,	Elsevier, 2010.						
5. H	K Murugesh Kumar, Elements of Electrical Engineering, Vikas Pub	lishing House l	Pvt. Ltd.2011.						
E-Resources									
1. ł	https://nptel.ac.in/courses								
2. h	https://www.electrical4u.com/electrical-engineering-articles/illumination/	ation-engineeri	ng/						
	https://ocw.mit.edu/courses/electrical-engineering-and-computer- electronics-spring-2007/lecture-notes	-science/6-002	-circuits-and-						

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CONST ENDORE		VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN (Autonomous Institution, Affiliated to Anna University, Chennai) Elayampalayam, Tiruchengode – 637 205														
Program	mme	B.E. Programme Code 103 Regulatio n											2019			
Departi	ment	ELECTRONICS AND COMMUNICATION ENGINEERING Semester											II	П		
Course C	ode	Cours	se Nan	ne				Peri	ods Per	r Week	Ci	redit	Ma	Marks		
Course C	Joue	Cours						L	Т	Р		С	CA	ES	E Tota	
U19GE	202	Basic Engir			Iechar	nical		3	0	0		3	40	60	100	
Cours Object		•	<ul> <li>Provide the exposure on the fundamental elements of civil engineering components and structures.</li> <li>Impart basic knowledge of power plants, pumps &amp; boilers.</li> <li>Study the various types of IC engines and understand the features of IC engine.</li> <li>Enable the students to distinguish the components and working principle of refrigeration and air conditioning system.</li> </ul>													
			anu	air coi	ndition	ing sys		0		mponem	5 und	working	principi		Ingeratio	
	<b>CO 1:</b> Explain the usage of civil engineering materials and measure the location of points in surveying									-			principi		nowledge	
		CO 1	e end o : Expl	of the co ain the	ourse, 1 e usage	the stud	stem. lent sh	ould be	e able t	0				K		
Cours		CO 1 points	e end o : Expl	of the co ain the veying	ourse, 1 e usage	the stuce the of cive	stem. dent sh vil eng	ould be	e able t g mate	0	measu	re the le	ocation of	K	nowledge Level	
Cours Outcon		CO 1 points CO 2:	e end o : Expl in sur : Identi	of the co ain the veying ify the	ourse, f e usage nature	the stuce of cive of built	stem. dent sh vil eng ding co	ould be ineerin	e able t g mate ents, st	o erials and	measu	re the le	ocation of	K	nowledge Level K2	
		CO 1 points CO 2: CO 3: CO 4: engine	e end o : Expl in sur : Identi : Class : Comp e.	of the co ain the veying ify the aify the pare spa	ourse, f e usage nature e variou ark ign	the stuce of cive of built us type ition ar	stem. dent sh vil eng ding co es of po nd com	ould be ineerin ompone ower p pressio	e able t g mate ents, st lant, pu on ignit	o erials and ructures a ump, turl ion of tw	measu and mat bine & o stroke	re the le erial qua boiler e and for	ocation of allities.	K	nowledge Level K2 K1	
Outcom	nes	CO 1 points CO 2: CO 3: CO 4: engine	e end o : Expl in sur : Identi : Class : Comp e.	of the co ain the veying ify the aify the pare spa	ourse, f e usage nature e variou ark ign	the stuce of cive of built us type ition ar	stem. dent sh vil eng ding co es of po nd com	ould be ineerin ompone ower p pressio	e able t g mate ents, st lant, pu on ignit	o erials and ructures a ump, turl	measu and mat bine & o stroke	re the le erial qua boiler e and for	ocation of allities.	K	nowledge Level K2 K1 K2	
	nes -	CO 1 points CO 2: CO 3: CO 4: engine	e end o : Expl in sur : Identi : Class : Comp e.	of the co ain the veying ify the aify the pare spa	ourse, f e usage nature e variou ark ign	the stuce of cive of built us type ition ar	stem. dent sh vil eng ding co es of po nd com	ould be ineerin ompone ower p pressio	e able t g mate ents, st lant, pu on ignit	o erials and ructures a ump, turl ion of tw	measu and mat bine & o stroke	re the le erial qua boiler e and for	ocation of allities.	K	nowledge Level K2 K1 K2 K2 K2	
Outcon Pre -	nes - ites	CO 1 points CO 2: CO 3: CO 4: engine CO 5: Nil	e end o : Expl in sur : Identi : Class : Comp e. : Elabo	of the co ain the veying ify the ify the bare span orate th	ourse, f e usage nature e variou ark ign e work	the stude of cive of buil- us type ition ar ing prin	stem. dent sh vil eng ding co s of po nd com nciple	ould be ineerin ompone ower p pression of refri	e able t g mate ents, st lant, pu on ignit geratic	o erials and ructures a ump, turl ion of tw	measu and mat bine & o stroke conditi	re the le erial qua boiler e and for	ocation of alities. ur stroke /stem.	K	nowledge Level K2 K1 K2 K2 K2 K.3	
Outcom Pre- requisi	nes - ites	CO 1 points CO 2: CO 3: CO 4: engine CO 5: Nil	e end o : Expl in sur : Identi : Class : Comp e. : Elabo	of the co ain the veying ify the ify the bare span orate th	ourse, f e usage nature e variou ark ign e work e work	the stude of cive of buil- us type ition ar ing prin	stem. dent sh vil eng ding co es of po nd com nciple fappin n) 3-Str	ould be ineerin ompone ower p pressio of refri	e able t g mate ents, st lant, pi on ignit geratic	o erials and ructures a ump, turf ion of tw on and air	measu and mat bine & o stroke conditi	re the le erial qua boiler e and for	ocation of alities. ur stroke /stem.	K of 	nowledge Level K2 K1 K2 K2 K2 K.3	
Outcon Pre -	nes - ites	CO 1 points CO 2: CO 3: CO 4: engine CO 5: Nil	e end o : Expl in sur : Identi : Class : Comp e. : Elabo	of the co ain the veying ify the ify the bare span orate th	ourse, f e usage nature e variou ark ign e work e work	the stuce of cive of buil- us type ition ar ing prin / PO M relation	stem. dent sh vil eng ding co es of po nd com nciple fappin n) 3-Str	ould be ineerin ompone ower p pressio of refri	e able t g mate ents, st lant, pi on ignit geratic	o erials and ructures a ump, turf ion of tw on and air	measu and mat bine & o stroke conditi	re the le erial qua boiler e and for	ocation of alities. ur stroke /stem.	PSO Ma	nowledge Level K2 K1 K2 K2 K2 K.3	

Course Assessment Methods

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Direct

CO 2

CO 3

CO 4

CO 5

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1.Continuous Assessment Test I, II & III2.Assignment3.End-Semester examinations

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Indirect			
	Course - end survey		
Content of the			I.
Unit – I	CIVIL ENGINEERING MATERIALS AND SURVEYING	Periods	9
<b>Civil Engine</b>	ering Materials: Bricks – Stones – Sand – Cement – Concrete – Ste	el sections.	
Surveying: I	ntroduction to Surveying & Leveling.		
Unit - II	BUILDING COMPONENTS AND STRUCTURES	Periods	9
Foundations	: Site selection, Foundation – Types – Requirement of good foundati	ons.	
Superstructu	<b>ire:</b> Brick masonry – Stone masonry – Beams – Columns – Lintels	- Roofing	– Flooring -
Plastering.		U	C
Unit - III	POWER PLANT ENGINEERING	Periods	9
Introduction,	Classification of Power Plants - Boiler - Working principle of stean	1 , Gas , Di	esel, Hydro-
	r, Wind and Nuclear Power plants – Merits and Demerits – Pumps		
principle of r	eciprocating pumps (single acting and double acting) – Centrifugal P	ump.	C
Unit - IV	IC ENGINES AND AUTOMOTIVE VEHICLES	Periods	9
Internal com	bustion engines as automotive power plant – Four stroke and two stro	ke cycles –	Working of
	gines - Comparison of four stroke and two stroke engines - Introduction		
	REFRIGERATION AND AIR CONDITIONING SYSTEM	Periods	9
	of refrigeration and air conditioning. Principle of vapour compressio	n and vapo	ur absorption
	system - Layout of typical domestic refrigerator - Window a		
conditioner.			•
	Tota	al Periods	45
Text book:			
T1.	Dr.P.Kannan, "Basic Mechanical Engineering", JBR Tri Sea Publishers F		
T2	Pravin Kumar, "Basic Mechanical Engineering", Pearson Publishers, New	v Delhi, 201	3.
<b>References:</b>			
R1.	Dr.S.Ramachandaran, "Basic Civil and Mechanical Engineering" Air W	alk Publicat	ion,2016
R2.	R.Gupta, "Basic Civil Engineering", RPH Publication, 2016.		
R3.	Mrs.V.Valarmathi, Mr.K.Rajasekar & Mr.T.Satheeskumar, "Basic Civil E	ngineering"	, JBR Tri Sea
	Publishers Pvt. Ltd., 2017.	· • • • •	
R4.	G.Shanmugam and M.S Palanichamy, "Basic Civil and Mechanical Engin	neering ",Ta	ta McGraw
D.C.	Hill Publishing Company Limited, New Delhi, 2014		
R5.	S.Seetharaman, "Basic Civil Engineering ", Anuradha Agencies, 2005		
e-RESOURC			
E1. E2.	https://nptel.ac.in/downloads/105105104/ https://nptel.ac.in/courses/112107216/		
E2. E3.	http://link.springer.com/ "Basic Civil and Mechanical Engineering"-Sprin	agor Notura	
EJ.	mp.//mik.springer.com/ Basic Civit and Mechanical Engineering -Sprin	iger mature.	

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	VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN (Autonomous Institution, Affiliated to Anna University, Chennai) Elayampalayam, Tiruchengode – 637 205										
Programme	B.E. Programme Code 103 Regulation 2019										
Department	ELECT ENGINI	II									
Course Code	Course Name		_	riods Pe Week	er	Credit	Maximum	Maximum Marks			
			L	Т	Р	С	CA	ESE	Total		
U19EC201	Electric	Circuit Theory	3	0	0	3	40	60	100		
Course Objective	<ul> <li>The students should made to</li> <li>To introduce electric circuits and its analysis</li> <li>Impart knowledge on solving circuits using network theorems</li> <li>Learn the phenomenon of resonance and coupled circuits.</li> <li>Learn the transient response of circuits for various inputs</li> <li>Learn about two port networks and its parameters.</li> </ul>										
	At the e		Knowledge Level								
Course	<b>CO1:</b> U solving	К2									
Outcome	CO2: U network		K2								
	CO3: U circuits.		K2								
	<b>CO4:</b> U		K2								
		nderstand the two-port							K2		
Pre-requisites	Basic co	ncepts of physics, part	icularly	about	Electr	ricity and l	Magnetism.				

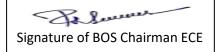
(3/	<b>CO / PO Mapping</b> (3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak										CO/PSO Mapping				
	Programme Outcomes (POs)									PSOs					
COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	РО 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO 2	PSO 3
CO 1	3	2										3	3		2
CO 2	3	2										3	3		2
CO 3	3											3	3		3
CO 4	3	2										3	3		2
CO 5	3	2										3	3		2

**Course Assessment Methods** 

Direct

- 1. Continuous Assessment Test I, II & III
- 2. Assignment and Quiz
- 3. End-Semester examinations

Indirect



1. 0	Course - end Survey		
Content o	f the Course		
Unit –	I BASIC CIRCUITS ANALYSIS	Periods	9
Fundame	ntal concepts of DC circuits, Ohm's Law and Kirchoff's law-Seri	es and Parallel circ	uits - Loop and
Nodal and	alysis, A.C circuits - Complex impedance - Phasor diagram, Real a	and Reactive powe	r .Loop and
	alysis for AC circuits. Network Topology-Graph-Tree Link and	Co-tree-Network v	ariables-
	Matrix-Tie-set-Cut set-Duality		
Unit -	II NETWORK THEOREMS	Periods	9
Norton's 7	ource –Current source transformations, Network Theorems -Super Theorem – Maximum Power Transfer Theorem – Reciprocity Th ar-Delta transformations		
Unit – I	III RESONANCE AND COUPLED CIRCUITS	Periods	9
Coefficie Coupled		•	
Unit - I	IV TRANSIENT ANALYSIS OF DC AND AC CIRCUT	TS Periods	9
	and Forced response, Transient response of RL, RC and RLC Circ	uits using Laplace	transform for
Unit –	Impulse inputs. and A.C. Sinusoidal input	Periods	9
	V TWO PORT NETWORKS Networks, Characterization of LTI two port Networks- In		
parameters	s, Transmission parameters and Hybrid parameters, Relations ctions of Two port networks		
		Total Periods	45
Text Book	ίs		
1.	William H. HaytJr, Jack E. Kemmerly and Steven M. Durbin, " Tata McGraw Hill publishers, 6 <sup>th</sup> edition, New Delhi, 2003.	Engineering Circu	its Analysis",
2.	Charles K. Alexander, Matthew N. O. Sadiku, 'Fundamentals of Hill Publications, 3rd Edition, 2007.		
3.	D. Roy Choudhury, "Networks and Systems", New Age Interna	ational Publication	s, 1998.
Reference	S		
1.	Joseph. A. Edminister, 'Electric Circuits - Schaum's outline ser 6 t h Edition, 2003.	,	,
2.	Robins & Miller, 'Circuit Analysis Theory and Practice', Delm 2012.	ar Publishers, 5th l	Edition,
E-Resource	ces		
1.	https://nptel.ac.in/courses/117106108/		_
2.	http://www.ee.iitm.ac.in/videolectures/doku.php?id=ec1010_201	l4nk:start	
3.	https://ocw.mit.edu/courses/electrical-engineering-and-computer electronics-spring-2007/lecture-notes	r-science/6-002-cire	cuits-and-

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Programme	B.E./ B.TECH	Programme coo	le			Regulation	1		2019
Department	CSE,EEE,EC	CE,IT,BT, BME & (	CST		Sen	nester			II
Course code	Course name		Per L	iods pe	er week P	Credit C	CA N	Maximu ESE	m Marks Total
U19TN201	of Tamils	🗆 🗆 🗆 🖉 Heritage	2	0	Р 0	1	40	60 ESE	100
Content of the sy	llabus			1 1			1	<u> </u>	
myF 1	nkhop kw;W	/k; ,yf;fpak;				Pe	riods		3
,yf;fpaj;jpd; rka jkpo;f; fhg;gpa ehad;khh;fs; -	ar; rhh;gw;w j q;fs; jkpofj;jp rpw;wpyf;fpaq	ouhtpl nkhopfs; - d;ik – rq;f ,yf;fpaj y; rkz ngsj;j rkac j;fs; - jkpopy; etF MfpNahhpd; gq;fsp	;jpy; q;fspd Pd ,yf	gfph;j ; jhf;	iy; mwk; fk; - gf;	jpUf;Fw jp ,yf;fp	spy; N bak;> 1	kyhz;ik Mo;thh;	f; fUj;Jf;fs; fs; kw;Wk;
myF 2	kuG – ghiw rpw;gf; fiy	Xtpaq;fs; Kjy; etP	d Xtp	aq;fs;	tiu –	Pe	eriods		3
eLfy; Kjy; etPd	rpw;gq;fs; ti	iu – Ik;nghd; rpiy	fs; go	q;Fba	pdh; kw	;Wk; mt	h;fs;	jahhpf;	Fk; iftpidg;
nghUl;fs;> nghk	;ikfs; - Njh; n	ıra;Ak; fiy - RLkz	; rpw	;gq;fs	; - ehl;L	.g;Gwj; r	ija;tq;	fs; - F	FkhpKidapy;
jpUts;Sth; rpiy	<ul><li>,irf; fUtpfs;</li></ul>	<ul> <li>kpUjq;fk;&gt; giw</li> </ul>	> tPiz	. aho	;> ehj];t	uk; - jk	ooh;fs	pd; r%f	nghUshjhu
tho;tpy; Nfhty;f	spd; gq;F.								
myF 3	ehl;Lg;Gwf;	fiyfs; kw;Wk; tPu	tpisa	hl;Lfs	•• ••	Pe	riods		3
njUf;\$j;J> fufh	l;lk;> tpy;Yg;g	ghl;L> fzpahd; \$j;	;J> x	apyhl;	lk;> Njh	y;ghitf;\$	j;J> r	pyk;ghl	;lk;> tshp>
Gypahl;lk;> jkpc	oh;fspd; tpisah	l;Lfs;.							
myF 4		jpizf; Nfhl;ghLfs;:					riods		3
jkpofj;jpd; jhtu	uq;fSk;> tpyq;	FSk; - njhy;fhg;g	pak;	kw;W	k; rq;f	,yf;fpaj;j	py; n	nfk; kv	v;Wk; Gwf;
Nfhl;ghLfs; - jk	poh;fs; Nghw;	wpa mwf;Nfhl;ghL	r	q;ffhy	j;jpy; jk	pofj;jpy;	vOj;j	wpTk;>	· fy;tpAk; -
rq;ffhy efuq;fS Nrhoh;fspd; ntw		Sk; - rq;ffhyj;jpy	; Vw	;Wkjp	kw;Wk	; ,wf;Fk	jp –	fly;fle	;j ehLfspy;
myF 5	jkpoh;fspd;						riods		3
	k; - ,e;jpa kUj	;fspd; gq;F - ,e;j ;Jtj;jpy;> rpj;j kU							
/	-					Tota Perio			15

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		VIVEKAN LLEGE OF ENGINE hous Institution Affiliate Elayampala	ERIN d to A	<b>G FOI</b> nna Ui	niversity C	hennai)	τŪV	Rheinland RTIFIED	11:2015
Programme	B.E./B.TECH	Programme code	e			Regulation	1	20	)19
Department	CSE,EEE,ECE	,IT,BT, BME & CST			Ser	nester			
Course code	Cor	1400 0000	Pe	riods p	er week	Credit	Max	kimum N	Marks
Course code		urse name	L	Т	Р	C	CA	ESE	Total
U19TN201	<b>Tamils</b>	□ □ ☑ Heritage of	2	0	0	1	40	60	100
Content of the	e syllabus			I		1		•	
UNIT I	LANGUAGE AN	DLITERATURE				P	eriods		3
Tamil —Secu Principles in T Azhwars and	lar Nature of Sar 'hirukural-Tamil   Nayanmars – f Bharathiyar and	ravidian Languages — agam Literature — Di- Epics and Impact of I Forms of minor Poet Bharathidhasan. ROCK ART PAINTIN	stribut Buddhi y –	ive Ju sm & Develo	stice in Sa Jainism in opment of	ngam Liter Tamil Lan Modem	rature – Id – Bal	- Manaş kthi Lit e in Ta	gement erature
Massive Terra	acotta sculptures Iridhangam, Para	<b>FURE</b> <ul> <li>Bronze icons – Tri</li> <li>Village deities, Thiru</li> <li>Veenai, Yazh and Na</li> </ul> ARTIAL ARTS	valluv	ar Sta	tue at Ka	ts – Art o nyakumari Temples in	f templ , Makii	e carmang of and Ec	aking – musical
Therukoothu,		u Pattu, Kaniyan Koot	hu, Oy	villatta	m, Leather				-
UNI IV	THINAI CON	CEPT OF TAMILS				P	eriods		3
Concept of Ta	mils – Education	Aham and Puram Conc and Literacy during Sa m Age – Overseas Conc	ngam	Age –	Ancient C	•			
UNI V		ON OF TAMILS TO I AND INDIAN CULTU		N NAT	FIONAL	P	eriods		3
of India Se	lf-Respect Move	in Freedom Struggle – ement –Role of Siddl Print History of Tamil	na Me	edicine					<b>.</b>

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Text & Re	ference Books
1.	jkpof tuyhW - kf;fSk; gz;ghLk; - Nf.Nf. gps;is (ntspaPL: jkpo;ehL ghlE}y; kw;Wk; fy;tpapay; gzpfs; fofk;).
2.	fzpdpj; jkpo; - Kidth; ,y. Re;juk;. (tpfld; gpuRuk;).
3.	fPob - itif ejpf;fiuapy; rq;ffhy efu ehfhpfk; (njhy;ypay; Jiw ntspaPL)
4.	nghUie - Mw;wq;fiu efhpfk;.(njhy;ypay; Jiw ntaspaPL)
5.	Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL
6.	Life of the Tamik – The Classical Period (Dr.S.Singaravelu) (Published by International Institute of Tamil Studies.
7.	Historical Heritage of the Tamils (Dr.S.V.Subatamarnan, Dr.K.D.Thirunavukkarasu) (Published by International Institute of Tamil Studies}.
8.	The Contributions of the Tamils to Indian Cultur e(Dr.M.Valarmath1) (Published by.International Institute of Tamil Studies.)
9.	Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Pubhs.hed by:Department ofArchaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10.	Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.P1llay)
11.	Porurai Civilzation (Jointly Published by : Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
12.	Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

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Outcome					nd mea				vaveler	ngths c	of me	rcury		K3			
		CO <sub>4</sub>	4: Illus	strate t	he cond locity o	luctivi	ty of b	ad con			know	v how	to		K3		
			<b>5:</b> To t	inderst	tand the	e impo					parec	d to			K2		
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1.Prelab and post lab test 2.End-Semester examinations

### Indirect

1.Course - end survey

Experiments	СО
1. Determination of Young's modulus of the material - Uniform bending method.	C01
2. Determination of Young's modulus of the material - Non uniform bending method.	CO1
3. Determination of Rigidity modulus – Torsion pendulum.	CO1
4. Determination of Coefficient of viscosity of a liquid – Poiseuille's method.	CO2
5. Determination of thickness of a thin material – Air wedge method.	CO2
6. Determination of wavelength of mercury spectrum – spectrometer grating.	CO3
7. Determination of Dispersive power of a prism – Spectrometer.	CO3
8. Determination of thermal conductivity of metallic glass using Lee's Disc Method.	CO4
9. Determination of velocity of sound and compressibility of liquid – Ultrasonic interferome	eter. CO4
10. Determination of Wavelength and particle size using Laser.	CO5
Total Periods	45
Lab Manual	1
1. R. Jayaraman, Engineering Physics Laboratory Manual ,Pearson Pub,Edition-2018.	
2. A.K. Katiyar & C.K. PandeyEngineering Physics: Theory and Practical, Wiley Pub, 2 n	nd Edition.

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U19GE	1203	Labo	orator	·у				0	0	4		4	2	0	0	40	100
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#### Direct

1.Pre lab and Post lab test

2.Record mark

3.End- Semester Examinations

# Indirect

1.Course - end survey

### <u>GROUP A</u> (CIVIL & MECHANICAL ENGINEERING) (CIVIL ENGINEERING PRACTICE)

# **Plumbing :**

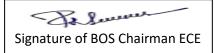
1. Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers and elbows in household fittings.	CO2
2. Hands-on-exercise: Basic pipe connections – Mixed pipe material connection – Pipe connections with different joining components	CO2
<b>Carpentry:</b> 3. a) Study of the joints in roofs, doors, windows and furniture.	CO2
b) Hands-on-exercise: Wood work, joints by sawing, planning and cutting.	CO2
MECHANICAL ENGINEERING PRACTICE	
1. Welding:	CO1
a) Preparation of arc welding of butt joints, lap joints and tee joints.	001
b) Gas welding practice	CO1
2.Basic Machining:	CO1
a) Turning and Facing.	
b) Drilling Practice	CO1
3. Sheet Metal Work:	CO1
a) Forming & Bending	
b) Model making – Tray and Basket.	CO1
4 Domenstration and	

### 4.Demonstration on:

- (a) Foundry operations like mould preparation for gear and step cone pulley.
- (b) Fitting Exercises Preparation of square fitting and vee fitting models.
- 5. Study of Air Conditioner & Centrifugal Pump.

### **GROUP B** (ELECTRICAL & ELECTRONICS ENGINEERING) III. <u>ELECTRICAL ENGINEERING PRACTICE</u>

2. Fluorescent lamp wiring.         3. Measurement of voltage, current, power & power factor using R-Load.	
3. Measurement of voltage, current, power & power factor using R-Load.	CO3
	CO3
4. Measurement of energy using single phase meter.	CO3
	CO3
5. Measurement of resistance to earth of electrical equipment.	CO3
6. Measurement of illumination to earth of electrical equipment.	CO3
7. Study of batteries.	CO3
IV. ELECTRONICS ENGINEERING PRACTICE	
1. Study of Electronic components and equipments – Resistor, colour coding.	CO4
2. Study of logic gates AND, OR, NOR, NAND and NOT.	CO4



3. G	eneration of Clock Signal.	CO4
4. So	oldering practice – Components Devices and Circuits – Using general purpose PCB.	CO5
	Total Periods	45
Refe	rence Books :	
R1.	Dr.P.Kannan, Mr.T.Satheeskumar & Mr.K.Rajasekar, —Engineering Practices Laboratory M 1st Edition, 2017	lanual.
R2.	Mr.T.Jeyapoovan, Mr.M.Saravana Pandian, —Engineering Practices Labl Manual, Vikas Pub House Pvt Ltd, 2017.	lishing

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Outcomer	CO2: Recogn	ize qual	ity, standa	rd and o	control	strateg	gies of	pollu	ted wa	ter.		K	K3		
Outcomes	CO3: Infer an	id expres	ss air pollu	tion an	d its co	ontrol.						K3			
	CO4: Acquire	•	•				on and	dispe	sal me	thod		ĸ	K3		
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	CO5:Awerane	ess abou	t populatio	on grow	/th, hui	man rig	ghts ar	nd Env	ironme	ent		K	K2		
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- 2. Assignment: simulation using tools
- 3. End-Semester examinations

Indirect

1. Course – end survey

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		Content of the syllabus		
Unit	t – I	Introduction to Environmental Science and Engineering	Periods	9
		e of environmental education- Natural Resources - (Forest, Water		
<b>.</b>		medial measures, Ecosystem and Biodiversity- Ecosystem-Structur		
-	-	neral)- Biodiversity – Definition – Conservation of Biodiversity (i	n-situ and Ex-situ)- En	vironmental
		stainable development		
Unit		Water pollution and Waste water treatment process	Periods	9
		causes, effects and control measures of water pollution- case study		
•		rry, Tertiary and desalination -Water quality parameters- Hardness, WHO and BIS.	Alkalinity, DO, COD,	BOD-water
Unit -		Air Pollution and its Control	Periods	9
Air Poll	lution – T	ypes of Air pollutants-CO2,SO2, NO2, PAN etc Sources- causes, eff	ects (Acid rain, Green h	nouse effect,
Ozone 1	ayer depl	etion and global warming)- control measures (Electro static precipita	ator, Gravitational settlin	ng chamber,
Baghous	se filter,	Wet Scrubber and cyclone separator).		
Unit -		Radioactive Pollution and Solid waste management	Periods	9
	·	utants-sources, effects , Nuclear Energy – Nuclear Fusion –Nuclear		
		wer plant- Diagram- illustration- working – pollution- impacts-and		
		Types of solid waste- Disposal method and its problem in solid v	vaste management-Sign	ificance for
		ardous waste management.	<b>D</b> · 1	0
Unit	$-\mathbf{V}$	Human population and the environment	Periods	9
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and Chi	ild welfa	re, Role of information technology in environment - Satellite, Da	, Family welfare Progra	am, Women
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Course Coue				L	Т	Р		С	C.	А	ESE	r	Fotal
U19MA303		rms and Pa tial Equation		3	1	0		4	4	0	60		100
Course Objective	• T • 7 • 7 • 7 • 7 • 7 • 7	To introduce To solve bou To acquaint sed in vario To acquaint tuations. To introduce quations that or discrete t	indary value the student ous situation the student the effect at model se ime system	ue pro nt with ns. t with ive m everal ns.	blems Fourie Fourie athema physic	by usin er serie r transf tical to cal proc	g Four s techr form te ols for esses a	rier se niques echnic	eries. 5 in sol 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	ving h ed in v 1s of p	eat flow wide va artial di	v prob riety o ifferen	lems f tial
	CO1: So plays a v	d of the cour lve differen ital role in e inderstand ho s.	tial equation	ons us g appl	sing Fo ication	urier se s.	ries ar	•		h	Knowle	K2,K4 K3,K4	4
Course Outcome	in solving	preciate the g one and tw nal wave ec	vo dimensi							es		K3,K	5
	CO4: Ur differenti	nderstand th al equations ne of the ph	e mathema s would pr	ovide	them t	he abili	ty to f		-			K2,K	5
	<b>CO5:</b> Us	e the effection	ive mather	natica	al tools	for the	soluti					K1,K	3
Pre- requisites	-												
COs ( COs PO CO 1 3		PO 3 PO 4	Programm	on) 3-8	Strong, 2		ium, 1 PO 9	- Wea PO 10	k PO 11	PO 12	CO/P Mapp PSOs PSO 1 2		PSO 3
CO 2         3           CO 3         3           CO 4         3	3 3 3 3 3										2 2 2 2 2 2		

Direct

1.Continuous Assessment Test I, II & III 2.Assignment: Simulation using tool

3.8	End-Semester examinations		
Indirect			
1.0	Course - end survey		
Content of t	the syllabus		
Unit – I	FOURIER SERIES	Periods	12
	conditions – General Fourier series – Change of interval – Oc		
	f range Cosine series – Harmonic analysis.		<i></i>
Unit - II		Periods	12
Formation o	of partial differential equations by elimination of arbitrary con	stants and arbitrary	functions – Singular
integral - Se	olution of Standard types of first order partial differential e	quations -Lagrang	ge's linear equation –
Solution of 1	homogeneous linear partial differential equations of higher or	der with constant c	coefficients.
Unit – III	APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS	Periods	12
Classificatio	on of second order quasi linear partial differential equations	– Solutions of or	ne dimensional wave
equation – 0	One dimensional heat equation - Steady state solution of two		
insulated ed			
Unit - IV		Periods	12
	gral theorem (without proof) – Fourier transform pair – Pro	· · ·	· · · · · · · · · · · · · · · · · · ·
-	tions – Fourier Sine and Cosine transforms – Properties (with	nout proof) – Con	volution theorem and
	dentity (Statement and applications only).	Daulada	10
Unit – V		Periods	<u>12</u>
	- Z-transform of some basic functions – Elementary propertie Residue method –Initial and Final value theorem- Convo		
	Solution of difference equations.	nution meorem –	Applications of Z-
transforms.	Solution of unforence equations.	Total Periods	60
Text Books	N		
	Grewal B.S., "Higher Engineering Mathematics", 43rd Edition	n. Khanna Publish	ers. Delhi. 2014.
	Churchill, R.V. and Brown, J. W., Fourier series and bound		
)	McGraw-Hill, 2011.	ary value problem	s.(o Lanion),
References			
	Veerarajan T, Engineering Mathematics, McGraw Hill Educa	tion, 2013.	
	Kreyszig, E., Advanced Engineering Mathematics (10th Editi		2015).
3.	Ramana.B.V., "Higher Engineering Mathematics"	, Tata Mc Gra	w Hill Publishing
	Company Limited, New Delhi, 2008.		
	P.R.Vittal, "Differential equations Fourier and Laplce T Edition, 1999.	Transforms", Marg	gham Publishers, 2 <sup>nd</sup>
5.	Ray Wylie. C and Barrett.C, " Advanced Engineering	Mathematics "	Tata Mc Graw Hill
	Education Pvt Ltd, Sixth Edition ,New Delhi 2012.		
E-Resource	S		
1.	https://learnengineering.in		
	www.learnerstv.com/Free-engineering-Video-lectures		
	www.nptel.ac.in		
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Programme	B.E.	Programm	e code	10	3	Regula	ation	20	019		
Department	ELECTRON ENGINEERI	ICS AND COMMUNI( ING	CATIO	N		Sem	ester	]	II		
			Perio	ods /W	/eek	Credit	Ma	ximum I	Marks		
Course code	C	ourse Name	L	Т	Р	C	CA	ESE	Total		
U19EC302	Ele	ctron Devices	3	0	0	3	40	60	100		
Course Objective	• To enh devices	<ul> <li>To deliver the knowledge about basics of semiconductor devices</li> <li>To enhance commanding skillfulness of students through understanding of devices</li> <li>To introduce and motivate students to use the advanced microelectronic devices</li> <li>To describes the foundation for forthcoming circuit design courses</li> <li>To gain knowledge about the technological importance of forthcoming circuit</li> </ul>									
Course Objective	<ul> <li>To enh devices</li> <li>To intr</li> <li>To des</li> <li>To gain</li> </ul>	ance commanding skillfus s oduce and motivate stud- cribes the foundation for	ulness o ents to u forthco cchnolog	f stude use the ming o gical ir	advar circuit nporta	rough under Iced microel design cour	standing ectronic ses	c device g circuit Kr	s design		
Course Objective	<ul> <li>To enh devices</li> <li>To intr</li> <li>To desi</li> <li>To gain</li> </ul>	ance commanding skillfus s oduce and motivate study cribes the foundation for n knowledge about the te	ulness o ents to u forthco cchnolog ould be	f stude use the ming o gical in able to	advar circuit nporta	rough under leed microel design cour nee of forth	standing ectronic ses	c device g circuit Kr	s design nowledge		
	<ul> <li>To enh devices</li> <li>To intr</li> <li>To desi</li> <li>To gain</li> </ul> At the end of t CO1: Outline t	ance commanding skillfo s oduce and motivate stude cribes the foundation for n knowledge about the te he course, the student sh	ulness o ents to u forthco cchnolog ould be diodes a	f stude use the ming o gical in able to nd its	ents the advar circuit nporta o, charac	rough under leed microel design cour nee of forth teristics	standing ectronio ses acoming	c device g circuit Kr Le	s design nowledge vel		
	<ul> <li>To enh devices</li> <li>To intr</li> <li>To desi</li> <li>To gain</li> </ul> At the end of t CO1: Outline t CO2: Illustrate	ance commanding skillfors oduce and motivate stude cribes the foundation for n knowledge about the te he course, the student sh the operation of various of	ulness o ents to u forthco cchnolog ould be diodes a	f stude use the ming o gical ir able to nd its o on Trai	ents the advan circuit nporta o, charac nsistor	rough under leed microel design cour nee of forth teristics and its char	standing ectronio ses acoming	c device g circuit Kr Le ics	s design nowledge vel K2		
Course Objective	To enh devices     To intr To desite To gain     At the end of t     CO1: Outline t     CO2: Illustrate     CO3: Demonst	ance commanding skillfors oduce and motivate stude cribes the foundation for n knowledge about the te he course, the student sh the operation of various of the operation of Bipolar	ulness o ents to u forthco cchnolog ould be diodes a : Junctic ET and N	f stude use the ming o gical ir able to nd its o on Trai	ents the advan circuit nporta o, charac nsistor ET and	rough under leed microel design cour nee of forth teristics and its char	standing ectronio ses acoming	c device g circuit Kr Le ics	s design nowledge vel K2 K2		
	<ul> <li>To enh devices</li> <li>To intr</li> <li>To dess</li> <li>To gain</li> </ul> At the end of t CO1: Outline t CO2: Illustrate CO3: Demonst CO4: Extend t	ance commanding skillfors oduce and motivate stude cribes the foundation for n knowledge about the te he course, the student sh the operation of various of the operation of Bipolar trate the operation of JFE he operation of semicono ize the operation and cha	ulness o ents to u forthco echnolog ould be liodes a : Junctic ET and N luctor d	f stude use the ming o gical ir able to nd its o on Tran MOSF	ents the advan circuit nporta o, charac nsistor ET and	rough under leed microel design cour nce of forth teristics and its char I their chara	standing ectronic ses coming acteristic	c device g circuit Kr Le ics cs.	s design nowledge vel K2 K2 K2 K2		

			(3/		CO / PO			lation)					CO/I Map		
COs				]	Program	nme Out	comes	(POs)					PSOs	5	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	3	3	2	2								1	3		1
CO 2	3	3	2	2								1	3		1
CO 3	3	3	2	2								1	3		1
CO 4	3	2	2	2	1							1	3		1
CO 5	3	2	2	2	1		1					1	3		1

	Aethods		
Direct			
	s Assessment Test I, II & III		
	nt: Case Studies, Real Time Applications		
	ster examinations		
Indirect	. J		
1.Course - e	nd survey		
Content of the syllab	us		
Unit – I	JUNCTION ANALYSIS	Periods	9
PN junction Diode	e: Basic Structure, Energy Band Diagrams, Zero Applied Bias, Forward	d Applied	Bias,
•	Bias, PN Junction current, Small signal model of PN jun		
recombination of	currents, junction breakdown, Zener Diode: Breakdown mechanisms,	Character	istics, Effect
of Temperatur	re, Application as voltage regulator and backward diode, Varactor	diode: V	Vorking and
characteristics, Tu	unnel diode: V-I Characteristics and working, TED (Transferred Ele	ectron De	vice): Basic
concept, Negative	differential resistance, V-I Characteristics and working of Gunn Diode	e, IMPAT	F: Static and
Dynamic Characte	ristics, Schottky diode: V-I Characteristics and working.		
Unit – II	<b>BIPOLAR TRANSISTOR</b>	Periods	9
	ons-Early effect-Current equations – Input and Output characteristics of Cr model, Ebers Moll Model- Gummel Poon-model, Multi Emitter Transisto		C - Hybrid $-\pi$
model - n-parameter			
Unit – III	FIELD EFFECT TRANSISTORS	Periods	9
Unit – III		Periods	
Unit – III JFET: Construction	FIELD EFFECT TRANSISTORS	Periods ductance.	Small
Unit – III JFET: Construction signal equivalent	FIELD EFFECT TRANSISTORS	Periods ductance. T: Two te	Small erminal MOS
Unit – III JFET: Construction signal equivalent structure, MOSFET	<b>FIELD EFFECT TRANSISTORS</b> a, operation and device characteristics. V-I relationship and transcond model, frequency limitation factors and cut-off frequency, MOSFE <sup>T</sup> C construction, Band diagrams under equilibrium and external bia	Periods ductance. T: Two to as, Thresh	Small erminal MOS nold Voltage,
Unit – III JFET: Construction signal equivalent structure, MOSFET V-I and CV ch	<b>FIELD EFFECT TRANSISTORS</b> a, operation and device characteristics. V-I relationship and transcond model, frequency limitation factors and cut-off frequency, MOSFE C construction, Band diagrams under equilibrium and external bia aracteristics, MESFET: Device structure, principle of operatio	Periods ductance. T: Two to as, Thresh	Small erminal MOS nold Voltage,
Unit – III JFET: Construction signal equivalent structure, MOSFET	FIELD EFFECT TRANSISTORS a, operation and device characteristics. V-I relationship and transcond model, frequency limitation factors and cut-off frequency, MOSFE C construction, Band diagrams under equilibrium and external bia aracteristics, MESFET: Device structure, principle of operatio	Periods ductance. T: Two to as, Thresh	Small erminal MOS nold Voltage,
Unit – III JFET: Construction signal equivalent structure, MOSFET V-I and CV ch High frequency per	<b>FIELD EFFECT TRANSISTORS</b> a, operation and device characteristics. V-I relationship and transcond model, frequency limitation factors and cut-off frequency, MOSFE C construction, Band diagrams under equilibrium and external bia aracteristics, MESFET: Device structure, principle of operatio formance.	Periods ductance. T: Two to as, Thresh on, V-I ch	Small erminal MOS hold Voltage, haracteristics,
Unit – III JFET: Construction signal equivalent structure, MOSFET V-I and CV ch High frequency per Unit – IV	FIELD EFFECT TRANSISTORS a, operation and device characteristics. V-I relationship and transcond model, frequency limitation factors and cut-off frequency, MOSFE C construction, Band diagrams under equilibrium and external bia aracteristics, MESFET: Device structure, principle of operatio formance. OPTICAL DEVICES	Periods ductance. T: Two to as, Thresh on, V-I ch Periods	Small erminal MOS hold Voltage, haracteristics,
Unit – III JFET: Construction signal equivalent structure, MOSFET V-I and CV ch High frequency per Unit – IV Optical absorption	FIELD EFFECT TRANSISTORS a, operation and device characteristics. V-I relationship and transcond model, frequency limitation factors and cut-off frequency, MOSFE C construction, Band diagrams under equilibrium and external bia aracteristics, MESFET: Device structure, principle of operatio formance. OPTICAL DEVICES a: Photon absorption coefficient, EHP generation rate, Solar Cells: T	Periods ductance. T: Two to us, Thresh on, V-I ch Periods 'he PN ju	Small erminal MOS hold Voltage, haracteristics, 9 nction,
Unit – III JFET: Construction signal equivalent structure, MOSFET V-I and CV ch High frequency per Unit – IV Optical absorption Hetero-junction	FIELD EFFECT TRANSISTORS  a, operation and device characteristics. V-I relationship and transcond model, frequency limitation factors and cut-off frequency, MOSFE C construction, Band diagrams under equilibrium and external bia aracteristics, MESFET: Device structure, principle of operation formance.  OPTICAL DEVICES  Photon absorption coefficient, EHP generation rate, Solar Cells: T and amorphous silicon solar cells, CCD(charge coupled device	Periods ductance. T: Two to us, Thresh on, V-I ch Periods The PN ju ce), Photo	Small erminal MOS hold Voltage, haracteristics, 9 nction, o detectors:
Unit – III JFET: Construction signal equivalent structure, MOSFET V-I and CV ch High frequency per Unit – IV Optical absorption Hetero-junction Photoconductor,	FIELD EFFECT TRANSISTORS  a, operation and device characteristics. V-I relationship and transcond model, frequency limitation factors and cut-off frequency, MOSFE C construction, Band diagrams under equilibrium and external bia aracteristics, MESFET: Device structure, principle of operatio formance.  OPTICAL DEVICES  A: Photon absorption coefficient, EHP generation rate, Solar Cells: T and amorphous silicon solar cells, CCD(charge coupled device photodiode, PIN photodiode, LASER Diode, APD (avalanche photodiode)	Periods ductance. T: Two to us, Thresh on, V-I ch Periods The PN ju ce), Photo	Small erminal MOS hold Voltage, haracteristics, 9 nction, o detectors:
Unit – III JFET: Construction signal equivalent structure, MOSFET V-I and CV ch High frequency per Unit – IV Optical absorption Hetero-junction Photoconductor, Opto-couplers: Op	FIELD EFFECT TRANSISTORS  a, operation and device characteristics. V-I relationship and transcond model, frequency limitation factors and cut-off frequency, MOSFE C construction, Band diagrams under equilibrium and external bia aracteristics, MESFET: Device structure, principle of operation formance.  OPTICAL DEVICES  A: Photon absorption coefficient, EHP generation rate, Solar Cells: T and amorphous silicon solar cells, CCD(charge coupled device photodiode, PIN photodiode, LASER Diode, APD (avalanche photodi eration, construction, specifications and applications.	Periods ductance. T: Two te as, Thresh on, V-I ch Periods The PN ju ce), Photo diode), ph	Small erminal MOS hold Voltage, haracteristics, 9 nction, b detectors: hototransistor,
Unit – III JFET: Construction signal equivalent structure, MOSFET V-I and CV ch High frequency per Unit – IV Optical absorption Hetero-junction Photoconductor, Opto-couplers: Op Unit – V	FIELD EFFECT TRANSISTORS  A, operation and device characteristics. V-I relationship and transcond model, frequency limitation factors and cut-off frequency, MOSFE C construction, Band diagrams under equilibrium and external bia aracteristics, MESFET: Device structure, principle of operation formance.  OPTICAL DEVICES  A: Photon absorption coefficient, EHP generation rate, Solar Cells: T and amorphous silicon solar cells, CCD(charge coupled device photodiode, PIN photodiode, LASER Diode, APD (avalanche photodi eration, construction, specifications and applications. POWER DEVICES	Periods ductance. T: Two to us, Thresh on, V-I ch Periods The PN ju ce), Photo diode), ph Periods	Small erminal MOS hold Voltage, haracteristics, 9 nction, b detectors: hototransistor, 9
Unit – III JFET: Construction signal equivalent structure, MOSFET V-I and CV ch High frequency per Unit – IV Optical absorption Hetero-junction Photoconductor, Opto-couplers: Op Unit – V PNPN Diode: Bas	FIELD EFFECT TRANSISTORS  A, operation and device characteristics. V-I relationship and transcond model, frequency limitation factors and cut-off frequency, MOSFE C construction, Band diagrams under equilibrium and external bia aracteristics, MESFET: Device structure, principle of operatio formance.  OPTICAL DEVICES  A: Photon absorption coefficient, EHP generation rate, Solar Cells: T and amorphous silicon solar cells, CCD(charge coupled device photodiode, PIN photodiode, LASER Diode, APD (avalanche photode eration, construction, specifications and applications.  POWER DEVICES  sic structure and characteristics, SCR: Basic structure, characteristics,	Periods ductance. T: Two te as, Thresh on, V-I ch Periods he PN ju ce), Photo diode), ph Periods , Two tra	Small erminal MOS hold Voltage, haracteristics, 9 nction, b detectors: hototransistor, 9 nsistor
Unit – III JFET: Construction signal equivalent structure, MOSFET V-I and CV ch High frequency per Unit – IV Optical absorption Hetero-junction Photoconductor, Opto-couplers: Op Unit – V PNPN Diode: Bas analogy. DIAC and	FIELD EFFECT TRANSISTORS  A, operation and device characteristics. V-I relationship and transcond model, frequency limitation factors and cut-off frequency, MOSFE C construction, Band diagrams under equilibrium and external bia aracteristics, MESFET: Device structure, principle of operatio formance.  OPTICAL DEVICES  E: Photon absorption coefficient, EHP generation rate, Solar Cells: T and amorphous silicon solar cells, CCD(charge coupled device photodiode, PIN photodiode, LASER Diode, APD (avalanche photode eration, construction, specifications and applications.  POWER DEVICES  sic structure and characteristics, SCR: Basic structure, characteristics, d TRIAC: Basic Structure and characteristics, GTO: Basic structure and	Periods ductance. T: Two to us, Thresh on, V-I ch Periods The PN ju ce), Photo diode), ph Periods , Two tra characteri	Small erminal MOS hold Voltage, haracteristics, 9 nction, b detectors: hototransistor, 9 nsistor stics
Unit – III JFET: Construction signal equivalent structure, MOSFET V-I and CV ch High frequency per Unit – IV Optical absorption Hetero-junction Photoconductor, Opto-couplers: Op Unit – V PNPN Diode: Bas analogy. DIAC and	FIELD EFFECT TRANSISTORS	Periods ductance. T: Two to us, Thresh on, V-I ch Periods The PN ju ce), Photo diode), ph Periods , Two tra characteri	Small erminal MOS hold Voltage, haracteristics, 9 nction, b detectors: hototransistor, 9 nsistor stics ion
Unit – III JFET: Construction signal equivalent structure, MOSFET V-I and CV ch High frequency per Unit – IV Optical absorption Hetero-junction Photoconductor, Opto-couplers: Op Unit – V PNPN Diode: Bas analogy. DIAC and	FIELD EFFECT TRANSISTORS  A, operation and device characteristics. V-I relationship and transcond model, frequency limitation factors and cut-off frequency, MOSFE C construction, Band diagrams under equilibrium and external bia aracteristics, MESFET: Device structure, principle of operatio formance.  OPTICAL DEVICES  I: Photon absorption coefficient, EHP generation rate, Solar Cells: T and amorphous silicon solar cells, CCD(charge coupled device photodiode, PIN photodiode, LASER Diode, APD (avalanche photodi eration, construction, specifications and applications.  POWER DEVICES  sic structure and characteristics, SCR: Basic structure, characteristics, d TRIAC: Basic Structure and characteristics, GTO: Basic structure and	Periods ductance. T: Two to us, Thresh on, V-I ch Periods The PN ju ce), Photo diode), ph Periods , Two tra characteri	Small erminal MOS hold Voltage, haracteristics, 9 nction, b detectors: hototransistor, 9 nsistor stics
Unit – III JFET: Construction signal equivalent structure, MOSFET V-I and CV ch High frequency per Unit – IV Optical absorption Hetero-junction Photoconductor, Opto-couplers: Op Unit – V PNPN Diode: Bas analogy. DIAC and	FIELD EFFECT TRANSISTORS	Periods ductance. T: Two to us, Thresh on, V-I ch Periods The PN ju ce), Photo diode), ph Periods , Two tra characteri	Small erminal MOS hold Voltage, haracteristics, 9 nction, b detectors: hototransistor, 9 nsistor stics ion
Unit – III JFET: Construction signal equivalent structure, MOSFET V-I and CV ch High frequency per Unit – IV Optical absorption Hetero-junction Photoconductor, Opto-couplers: Op Unit – V PNPN Diode: Bas analogy. DIAC and PUT: Operation ar	FIELD EFFECT TRANSISTORS	Periods ductance. T: Two to as, Thresh on, V-I ch Periods 'he PN ju ce), Photo diode), ph Periods , Two tra characteri as a relaxat	Small erminal MOS hold Voltage, haracteristics, 9 nction, b detectors: hototransistor, 9 nsistor stics ion 45



	a, Kenneth C. Smith and Arun N. Chandorkar, "Microelectronic Circuits", 7th Edition, Oxford ress, New York, 2017.
<b>REFERENCES</b>	
1.	S. M. Sze, "Semiconductor Devices: Physics and Technology", Wiley, Second Edition, 2008
2.	Sung-Mo Kang, Yusuf Leblebici, "CMOS Digital Integrated Circuits", Tata McGraw Hill, 3 <sup>rd</sup> Edition, 2012
3.	Gordon W. Roberts and Adel S. Sedra, "Spice", Oxford, Second Edition,2011
4.	Streetman and Banerjee, "Semiconductor Physics and Devices", 6 <sup>th</sup> Edition, Pearson prentice Hall, 2006.
5.	Yang, "Fundamental of Semiconductor devices", Tata McGraw Hill, International Edition, 2007
E-Resources	
1.	https://www.electronics-tutorials.ws/diode/diode_2.html
2.	https://nptel.ac.in/courses/117102061/
3.	https://www.sciencedirect.com/topics/physics-and-astronomy/optical-device

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Course C	'oda		Cour	se Nan	20	Р	Periods	Per	Week	Cree	dit		Max	imun	n Mark	S
Course C	Joue		Cour	se man	IC		L	Т	Р	C	2	(	CA	ESE Total		
U19EC3	03	Electronic Circuits-I300340The student should be made to,												60	)	100
Course Objective	e	<ul><li>Dest</li><li>Lean</li><li>Stud</li></ul>	ign amj rn abou ly high	plifiers at MOS freque	ng of BJ FET am ncy resp r amplif	plifier onse c	S			rcuits						
Course Outcome	2	CO1: CO2: CO3: CO4:	Choose Design Design Expose	e appro and an MOSI ed to hi	irse, the priate bia alyze an FET amp gh freque amplifie	asing ( nplifie lifiers ency r	circuit ers	for I	BJT and	dFET			-			
Pre- requisite	s		on Devi													
	(3/2	/1 indica	ates stre	ngth of	CO / PO correlatio	on) <b>3-S</b>	trong,			n, 1 - V	Veak	ζ.		CO/I Map	ping	
COs					Program		-		·					PSOs		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	<b>PO 7</b>	PO	8 PC		PO	PO	PO 12	PSO	PSO	PSO

						CO/PO	) Mapp	oing						CO/F	50
		(3/2	/1 indic	ates stre	ength of	correlat	ion) <b>3-</b> 8	Strong, 2	2 – Med	lium, 1	- Weal	K		Map	ping
	COs					Program	nme Out	tcomes (	(POs)					PSOs	
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PS 2
	CO 1	2	3	3	3		2							3	
	CO 2	2	3	3	3		2							3	
	CO 3	2	3	3	3		2							3	
	CO 4	2	3	3	3		2							3	
	CO 5	2	3	3	3		2							3	
С	ourse A	Assessn	nent M	[ethods											

# Direct

- 1. Continuous Assessment Test I, II & III
- 2. Assignment
- 3. End-Semester examinations

# Indirect

1. Course - end survey

# Content of the syllabus

Unit – I	BIA	ASING O	FΒ	JT AND	) FET/M	OSFET		Periods		9
BJTs:DC load	lines, Fixed	bias , En	itte	r bias, V	'oltage d	ivider bias	s and C	ollector feed	back conf	figuration,
Bias Stabilizat	tion, FET/M	OSFETs:	Fixe	ed bias,	Self bias	, Voltage	divider	biasing, De	pletion N	10SFETs,
Enhancement	MOSFETs,	Design	of	various	biasing	methods	using	BJT/FET/M	OSFET,	Practical

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application	18.		
Unit - Il	BJT AMPLIFIERS	Periods	9
Darlington	al $r_e$ model Equivalent circuit of BJT - Analysis of CE, CC and C Amplifier -Bootstrap technique - Cascade, Cascode configuration ysis and CMRR.		
Unit – II		Periods	9
Small sign	al Analysis of amplifiers, Common source amplifier, Source follow	ver and Commo	on Gate amplifiers,
Cascode ar	nplifiers, Differential amplifiers, BiMOS Cascode amplifier.		•
Unit - IV	FREQUENCY ANALYSIS OF BJT AND MOSFET AMPLIFIERS	Periods	9
	ency analysis, Miller effect, High frequency analysis of CE, Miliers, Short circuit current gain, cut off frequency – $f\alpha$ , $f_{\beta}$ , Unity G		
Unit – V		Periods	9
	s and Amplifier types, Series Fed Class A amplifier, Transforme and Circuits, Amplifier distortion, Heat sinking, Class C and Class		amplifier, Class B
	r		
		<b>Fotal Periods</b>	45
Text Book	S		
Text Book			
	s Robert L.Boylestad,Louis Nashelssky, "Electronic Devices and Circ	cuit theory", 11 <sup>t</sup>	<sup>h</sup> Edition, Pearson
1.	Robert L.Boylestad,Louis Nashelssky, "Electronic Devices and Circ 2015. Donald .A. Neamen, "Electronic Circuit Analysis and Design", 3rd I	cuit theory", 11 <sup>t</sup>	<sup>h</sup> Edition, Pearson
1. 2.	Robert L.Boylestad,Louis Nashelssky, "Electronic Devices and Circ 2015. Donald .A. Neamen, "Electronic Circuit Analysis and Design", 3rd I	cuit theory", 11 <sup>t</sup> Edition, Tata M	<sup>h</sup> Edition, Pearson cGraw Hill, 2010.
1.     2.     Reference	<ul> <li>Robert L.Boylestad,Louis Nashelssky, "Electronic Devices and Circ 2015.</li> <li>Donald .A. Neamen, "Electronic Circuit Analysis and Design", 3rd I</li> </ul>	cuit theory", 11 <sup>t</sup> Edition, Tata M lucation press, 5	<sup>h</sup> Edition, Pearson, cGraw Hill, 2010. 5th Edition,2010.
1. 2. <b>Reference</b> 1.	<ul> <li>Robert L.Boylestad,Louis Nashelssky, "Electronic Devices and Circ 2015.</li> <li>Donald .A. Neamen, "Electronic Circuit Analysis and Design", 3rd I</li> <li>s</li> <li>David A. Bell, "Electronic Devices and Circuits", Oxford Higher Ed BehzadRazavi, "Design of Analog CMOS Integrated Circuits", Tata Paul Gray, Hurst, Lewis, Meyer, "Analysis and Design of Analog</li> </ul>	cuit theory", 11 <sup>t</sup> Edition, Tata M lucation press, 5 Mc Graw Hill,	<ul> <li><sup>h</sup> Edition, Pearson</li> <li>cGraw Hill, 2010.</li> <li>5th Edition,2010.</li> <li>2007.</li> </ul>
1. 2. <b>Reference</b> 1. 2.	<ul> <li>Robert L.Boylestad,Louis Nashelssky, "Electronic Devices and Circ 2015.</li> <li>Donald .A. Neamen, "Electronic Circuit Analysis and Design", 3rd I</li> <li>s</li> <li>David A. Bell, "Electronic Devices and Circuits", Oxford Higher Ed BehzadRazavi, "Design of Analog CMOS Integrated Circuits", Tata</li> </ul>	Edition, Tata M Edition, Tata M lucation press, 5 Mc Graw Hill, g Integrated Cir	<ul> <li><sup>h</sup> Edition, Pearson</li> <li>cGraw Hill, 2010.</li> <li>5th Edition,2010.</li> <li>2007.</li> </ul>
1. 2. <b>Reference</b> 1. 2. 3.	<ul> <li>Robert L.Boylestad,Louis Nashelssky, "Electronic Devices and Circ 2015.</li> <li>Donald .A. Neamen, "Electronic Circuit Analysis and Design", 3rd I</li> <li>s</li> <li>David A. Bell, "Electronic Devices and Circuits", Oxford Higher Ed</li> <li>BehzadRazavi, "Design of Analog CMOS Integrated Circuits", Tata</li> <li>Paul Gray, Hurst, Lewis, Meyer, "Analysis and Design of Analog Willey &amp; Sons, 4th Edition, 2005.</li> <li>Millman .J. and Halkias C.C, "Integrated Electronics", McGraw I</li> </ul>	Edition, Tata M Edition, Tata M lucation press, 5 Mc Graw Hill, g Integrated Cin Hill, 2001.	<ul> <li><sup>h</sup> Edition, Pearson</li> <li>cGraw Hill, 2010.</li> <li>5th Edition,2010.</li> <li>2007.</li> <li>rcuits", John</li> </ul>
1. 2. <b>Reference</b> 1. 2. 3. 4.	<ul> <li>Robert L.Boylestad,Louis Nashelssky, "Electronic Devices and Circ 2015.</li> <li>Donald .A. Neamen, "Electronic Circuit Analysis and Design", 3rd I</li> <li>s</li> <li>David A. Bell, "Electronic Devices and Circuits", Oxford Higher Ed</li> <li>BehzadRazavi, "Design of Analog CMOS Integrated Circuits", Tata</li> <li>Paul Gray, Hurst, Lewis, Meyer, "Analysis and Design of Analog Willey &amp; Sons, 4th Edition, 2005.</li> <li>Millman .J. and Halkias C.C, "Integrated Electronics", McGraw Hill, 3</li> </ul>	Edition, Tata M Edition, Tata M lucation press, 5 Mc Graw Hill, g Integrated Cin Hill, 2001.	<ul> <li><sup>h</sup> Edition, Pearson</li> <li>cGraw Hill, 2010.</li> <li>5th Edition,2010.</li> <li>2007.</li> <li>rcuits", John</li> </ul>
1.           2.           Reference           1.           2.           3.           4.           5.	<ul> <li>Robert L.Boylestad,Louis Nashelssky, "Electronic Devices and Circ 2015.</li> <li>Donald .A. Neamen, "Electronic Circuit Analysis and Design", 3rd I</li> <li>s</li> <li>David A. Bell, "Electronic Devices and Circuits", Oxford Higher Ed</li> <li>BehzadRazavi, "Design of Analog CMOS Integrated Circuits", Tata</li> <li>Paul Gray, Hurst, Lewis, Meyer, "Analysis and Design of Analog Willey &amp; Sons, 4th Edition, 2005.</li> <li>Millman .J. and Halkias C.C, "Integrated Electronics", McGraw Hill, 3</li> </ul>	Edition, Tata M Edition, Tata M lucation press, 5 Mc Graw Hill, g Integrated Cir Hill, 2001. B <sup>rd</sup> Edition, 198	<ul> <li><sup>h</sup> Edition, Pearson</li> <li>cGraw Hill, 2010.</li> <li>5th Edition,2010.</li> <li>2007.</li> <li>rcuits", John</li> <li>9.</li> </ul>
1. 2. <b>Reference</b> 1. 2. 3. 4. 5. <b>E-Resourc</b>	<ul> <li>Robert L.Boylestad,Louis Nashelssky, "Electronic Devices and Circ 2015.</li> <li>Donald .A. Neamen, "Electronic Circuit Analysis and Design", 3rd I</li> <li>s</li> <li>David A. Bell, "Electronic Devices and Circuits", Oxford Higher Ed</li> <li>BehzadRazavi, "Design of Analog CMOS Integrated Circuits", Tata</li> <li>Paul Gray, Hurst, Lewis, Meyer, "Analysis and Design of Analog Willey &amp; Sons, 4th Edition, 2005.</li> <li>Millman .J. and Halkias C.C, "Integrated Electronics", McGraw II</li> <li>D.Schilling and C.Belove, "Electronic Circuits", McGraw Hill, 3</li> </ul>	Edition, Tata M Edition, Tata M lucation press, 5 Mc Graw Hill, g Integrated Cir Hill, 2001. B <sup>rd</sup> Edition, 198	<ul> <li><sup>h</sup> Edition, Pearson</li> <li>cGraw Hill, 2010.</li> <li>5th Edition,2010.</li> <li>2007.</li> <li>rcuits", John</li> <li>9.</li> </ul>

Former Signature of BOS Chairman ECE

		NDHA COLLEGE OF nous Institution, Affiliate Elayampalayam, Tir	d to An	na Un	iversit	y, Chennai)		TÜVReinland CERTIFED	001.2015 0.000 0.000 0.000 0.000 0.000 0.000 0.000			
Programme	B.E.	Programme	e code	10	3	Regula	ation	20	19			
Department	ELECTRON ENGINEERI	ICS AND COMMUNIC NG	CATIO	N		Sem	ester	IJ	I			
Course code	C	ourse Neme	Perio	ods /W	'eek	Credit	ximum I	Marks				
Course code												
U19EC304	Digital Syster	60	100									
Course Objective	<ul> <li>Cram a express</li> <li>Gain th design</li> <li>Implat</li> <li>Evaluation</li> </ul>	bould be made to, bout basic postulates of I sions to deduce optimal d he knowledge of Karnaug of combinational circuits at the functions and extre- te the general notion of a ate the concept of memor	igital C h Map and se mity of asynchr	ircuits Minim quentia Seque onous	aization al circu ential C sequer	n procedures uits Circuits in di ntial circuits	s for the	20 20 11 cimum I ESE 60 00lean analysi sign. Kn Le Ka Ka Ka Ka	s and			
		he course, the student sho the Boolean Functions ar				ions			iowledge vel 4			
Course Outcome	0	he Combinational Circuit	0	0				K.	_			
	CO3: Design the	ne Synchronous Sequenti	al Circu	iits usi	ing Fli	p Flops		K	3			
		the Asynchronous Seque ombination and Sequenti				ERILOG		K	4			
		nd the Characteristics an and Programmable Logic			differ	ent memory		K.	3			
Pre-requisites	-											

	CO / PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak																
COs		Programme Outcomes (POs)													PSOs		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	P 0 11	PO 12	PS O1	PSO 2	PS O 3		
CO 1	3	2	2	2	2	-	-	-	-	-	-	3	3	-	2		
CO 2	3	3	3	2	2	-	-	-	-	-	-	3	3	-	2		
CO 3	3	3	3	2	2	-	-	-	-	-	-	3	3	-	2		
CO 4	3	3	3	2	2	-	-	-	-	-	-	3	3	-	2		
CO 5	3	2	3	2	-	2											

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Direct			
1.Contin	uous Assessment Test I, II & III		
	ment: Case Studies, Real Time Applications		
	emester examinations		
Indirect			
1.Course	e - end survey		
Content of the sy	llabus		
Unit – I	MINIMIZATION TECHNIQUES AND LOGIC GATES	Periods	9
Number Systems	- Boolean Postulates and Laws – De-Morgan's Theorem – Principle	of Duality	– Boolea
Expression – Mir	imization of Boolean Expression - Sum of Products(SOP) - Product of s	ums(POS)	– Karnaug
Aap Minimizatio	n – Don't Care Conditions – Quine McClusky Method of Minimization.		
Logic Gates (AN	D, OR, NOT, NAND, NOR, Exclusive – OR and Exclusive – NOR)	– Impleme	entation of
Logic Function U	sing Gates, NAND – NOR Implementations.		
Unit – II	<b>DESIGN OF COMBINATIONAL CIRCUITS</b>	Periods	9
•	-Design of Adder, Subtractor, Binary Multiplier, Muliplexer /Demultiple arity Generators, Code Converters, Magnitude Comparator.	xer, Decod	er, Encode
Unit – III	SYNCHRONOUS SEQUENTIAL CIRCUITS	Periods	9
	E Elements-Latches, Flip-Flops, Registers, Counters, State Diagram tate Assignment – Excitation Table and Maps – Design and Analysis of S		
Unit – IV	ASYNCHRONOUS SEQUENTIAL CIRCUITS	Periods	9
Design of Fundar Asynchronous Ci	mental Mode and Pulse Mode Circuits – Incompletely Specified State M rcuits – Design of Hazard Free Switching Circuits. Design of Combina	achine – P	roblems in
Design of Fundar Asynchronous Ci	mental Mode and Pulse Mode Circuits – Incompletely Specified State M rcuits – Design of Hazard Free Switching Circuits. Design of Combina	achine – P	roblems in
Design of Fundar Asynchronous Ci frcuits using VE Unit – V	mental Mode and Pulse Mode Circuits – Incompletely Specified State M rcuits – Design of Hazard Free Switching Circuits. Design of Combina RILOG. MEMORIES AND PROGRAMMABLE LOGIC DEVICES	achine – P tional and Periods	problems in Sequential 9
Design of Fundar Asynchronous Ci circuits using VE Unit – V Classification of Organization – W Memory Expans Array(PLA) – Pro	mental Mode and Pulse Mode Circuits – Incompletely Specified State M rcuits – Design of Hazard Free Switching Circuits. Design of Combina RILOG.	achine – P tional and Periods ROM , RA – Memory Programm	roblems in Sequential 9 M – RAN Decoding nable Logi
Design of Fundar Asynchronous Ci dircuits using VE Unit – V Classification of Organization – W Memory Expans Array(PLA) – Pro	mental Mode and Pulse Mode Circuits – Incompletely Specified State M         rcuits – Design of Hazard Free Switching Circuits. Design of Combina         RILOG.         MEMORIES AND PROGRAMMABLE LOGIC DEVICES         Memories – ROM – ROM Organization – PROM - EPROM – EEPI         Vrite Operation –Read Operation – Memory Cycle – Timing Wave Forms         ion – Static and Dynamic RAM– Programmable Logic Devices –         Ogrammable Array Logic (PAL) – Field Programmable Gate Arrays(FPGA	achine – P tional and Periods ROM , RA – Memory Programm	roblems in Sequential 9 M – RAN Decoding nable Log
Design of Fundar Asynchronous Ci circuits using VE Unit – V Classification of Organization – W Memory Expans Array(PLA) – Pro	nental Mode and Pulse Mode Circuits – Incompletely Specified State M rcuits – Design of Hazard Free Switching Circuits. Design of Combina RILOG. <b>MEMORIES AND PROGRAMMABLE LOGIC DEVICES</b> Memories – ROM – ROM Organization – PROM - EPROM – EEPI Vite Operation –Read Operation – Memory Cycle – Timing Wave Forms ion – Static and Dynamic RAM– Programmable Logic Devices – ogrammable Array Logic (PAL) – Field Programmable Gate Arrays(FPGA Degic Circuits Using ROM, PLA, PAL. Total Periods	achine – P tional and Periods ROM , RA – Memory Programm	roblems in Sequential 9 M – RAN Decoding hable Logi mentation of
Design of Fundar Asynchronous Ci Dircuits using VE Unit – V Classification of Organization – W Memory Expans Array(PLA) – Pro Combinational Lo TEXT BOOKS 1. N	nental Mode and Pulse Mode Circuits – Incompletely Specified State M rcuits – Design of Hazard Free Switching Circuits. Design of Combina RILOG. MEMORIES AND PROGRAMMABLE LOGIC DEVICES Memories – ROM – ROM Organization – PROM - EPROM – EEPI Vrite Operation –Read Operation – Memory Cycle – Timing Wave Forms ion – Static and Dynamic RAM– Programmable Logic Devices – ogrammable Array Logic (PAL) – Field Programmable Gate Arrays(FPGA Degic Circuits Using ROM, PLA, PAL. Total Periods I.MorrisMano, Digital Design, 3 <sup>rd</sup> Edition, Prentice Hall of India Pvt.Ltd.,2	achine – P tional and Periods ROM , RA – Memory Programm A) – Impler	roblems in Sequential 9 MM – RAN Decoding nable Logi nentation of 45
Design of Fundat Asynchronous Ci ircuits using VE Unit – V Classification of Drganization – W Memory Expans Array(PLA) – Pre Combinational Lo TEXT BOOKS 1. N E	nental Mode and Pulse Mode Circuits – Incompletely Specified State M rcuits – Design of Hazard Free Switching Circuits. Design of Combina RILOG. MEMORIES AND PROGRAMMABLE LOGIC DEVICES Memories – ROM – ROM Organization – PROM - EPROM – EEPI Vrite Operation –Read Operation – Memory Cycle – Timing Wave Forms ion – Static and Dynamic RAM– Programmable Logic Devices – Ogrammable Array Logic (PAL) – Field Programmable Gate Arrays(FPGA Ogic Circuits Using ROM, PLA, PAL. Total Periods	achine – P tional and Periods ROM , RA – Memory Programm A) – Impler	roblems in Sequential 9 MM – RAN Decoding nable Logi nentation of 45
Design of Fundar Asynchronous Ci Eircuits using VE Unit – V Classification of Organization – W Memory Expans Array(PLA) – Pro Combinational Lo TEXT BOOKS 1. M E 2. Jo	nental Mode and Pulse Mode Circuits – Incompletely Specified State M rcuits – Design of Hazard Free Switching Circuits. Design of Combina RILOG. MEMORIES AND PROGRAMMABLE LOGIC DEVICES Memories – ROM – ROM Organization – PROM - EPROM – EEPI /rite Operation –Read Operation – Memory Cycle – Timing Wave Forms ion – Static and Dynamic RAM– Programmable Logic Devices – ogrammable Array Logic (PAL) – Field Programmable Gate Arrays(FPGA ogic Circuits Using ROM, PLA, PAL. Total Periods MorrisMano, Digital Design, 3 <sup>rd</sup> Edition, Prentice Hall of India Pvt.Ltd.,2 ducation (Singapore) Pvt.Ltd., NewDelhi, 2018. DhnF.Wakerly, Digital Design,Fourth Edition,Pearson /PHI,2016	achine – P tional and Periods ROM , RA – Memory Programm A) – Impler	roblems in Sequential 9 MM – RAN Decoding nable Log nentation of 45
Design of Fundar Asynchronous Ci circuits using VE Unit – V Classification of Organization – W Memory Expans Array(PLA) – Pro Combinational Lo TEXT BOOKS 1. M E 2. Jo REFERENCES	nental Mode and Pulse Mode Circuits – Incompletely Specified State M rcuits – Design of Hazard Free Switching Circuits. Design of Combina RILOG. MEMORIES AND PROGRAMMABLE LOGIC DEVICES Memories – ROM – ROM Organization – PROM - EPROM – EEPI /rite Operation –Read Operation – Memory Cycle – Timing Wave Forms ion – Static and Dynamic RAM– Programmable Logic Devices – ogrammable Array Logic (PAL) – Field Programmable Gate Arrays(FPGA ogic Circuits Using ROM, PLA, PAL. Total Periods MorrisMano, Digital Design, 3 <sup>rd</sup> Edition, Prentice Hall of India Pvt.Ltd.,2 ducation (Singapore) Pvt.Ltd., NewDelhi, 2018. DhnF.Wakerly, Digital Design,Fourth Edition,Pearson /PHI,2016	(achine – P tional and Periods ROM , RA – Memory Programm A) – Impler	roblems in Sequentia 9 MM – RAI Decoding nable Log nentation of 45



3.	William H. Gothmann, Digital Electronics, 2nd Edition, PHI, 1982.
4.	Thomas L. Floyd, Digital Fundamentals, 8th Edition, Pearson Education Inc, New Delhi, 2005
5.	Donald D. Givone, Digital Principles and Design, TMH, 2016.
E-Resources	
1.	http://osp.mans.edu.eg/cs212/Seq_circuits_design.htm
2.	https://www.electronics-tutorials.ws/combination/comb_1.html
3.	https://www.geeksforgeeks.org/difference-between-synchronous-and-asynchronous-sequential- circuits/

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		ANANDHA COLI onomous Institution Elayampa	n, Affili	ated to	Anna U	Iniversity, O			TÜVProdukad GERTIFER D 1 Stateman	
Programme	B.E		Pro	gramn	ne Code	103	Regulation		2019	
Department	ELECTR ENGINE	CONICS AND CO ERING	MMUN	ICAT	ION		Semester		III	
			Periods Per Week			Credit	М	aximı	um Marks	
Course Code	Co	ourse Name	L	Т	Р	С	CA	ES E	Total	
U19EC305	Signals a	nd Systems	3	0	0	3	40	60	100	
Course Objective	fu • T ti: • T ti: • T si	<ul> <li>To teach the applications of Laplace and Fourier transforms in the analysis of continuous time signals.</li> </ul>								
	At the end CO1: And periodic s	Knowledge Leve K4								
Course	CO2: Cla LSI system	of	K3							
Outcome		alyze system proper		sed on	impulse	response a	nd Fourier		K4	
	<b>CO4:</b> Apply the Laplace transform and Z- transform for analyze of continuous- time and discrete-time signals and systems.						ous- K4			
	<b>CO5:</b> Understand the process of sampling and the effects of under sampling. K3									
Pre-requisites	-									
COs		(3/2/1 indicates s Program	nme Ou	of corre tcomes					PSO pping Is	

	(3/2/1 indicates strength of correlation)									Map	ping				
COs		Programme Outcomes (POs)									PSOs				
	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	PSO
										10	11	12	1	2	3
CO 1	3	2											3	1	2
CO 2	3	2	3										3	1	2
CO 3	3	2	2	2									3	1	2
CO 4	3	2											3	1	2

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CO 5	3	2	3	2									3	1	2	
													•	•	•	-
Course As	sessme	nt Metho	ods													
Direct																
	Continuo	ous Asses	sment '	Test I, Il	& III											
		ent: Simu			ol											
<b>3.</b> E	nd-Sen	nester exa	iminati	ons											-	
1. C	'ourse -	end surv	ev (stu	dent pa	rticipat	ion, pla	cement	details	can als	so be i	nclud	ed as a	an ind	irect	_	
	ool)		-) (	F	<b>r</b>	, <b>r</b>										
Content of	the syl	llabus														
Unit –	Ι	CLA	SSIFI	CATIO	N OF	SIGNA	LS AN	D SYS	TEMS		Peri	ods			9	
Continuou		•					•	•		-	-		-			
Exponentia														ystems		
and DT Sy Unit -				IS OF (						ins and	Peri		•		9	
Fourier Ser										nsform	-		re Tra			
in Signal A		•	speene		Sintinuo	<b>u</b> 5 1111	e bigila	.5, 1 001	iei iiu	1510111	i unu	Lupiu		115101111		
Unit – ]	Unit - III     LINEAR TIME INVARIANT -CONTINUOUS TIME     Periods     9															
Differentia	l Equa	tion, Blo	ock dia	gram rej	presenta	ation , I	mpulse	Respo	nse , Co	nvolu	tion in	ntegral	l, Free	quency		
Response,		er and La	place T	ransfor	ms in A	nalysis	, State	Variab	le Equa	tions a	and M	latrix l	Repres	sentatio	n	
of Systems			<b>NIAT X</b>			DEVDE	TIME	CLON	TC		Peri	a da			0	
Unit - I Sampling of				SIS OF						d Dron			Transf		9	
				<u> </u>		<u> </u>										
Unit –					SYS	TEMS					Peri				9	
Difference															5	
Analysis U	sing D	off f and	Z-1ra	nstorms	, State	v ariab	le Equa	tions ar	id Matr						45	
Text Book	.0									10	lai P	eriods		4	45	
1 ext Book		V.Oppe	nhoim	S Wilei	zy and (	C H Mar	wah Si	mala	nd Suct	ame D	aaraa	n Edu	cation	2007		
2.		n Haykin						-								
2. Reference		11 HAYKIII	is and I			ii, Siglič	us allu s	ystem	5 JOHH	a ney	x 501	15, IIIC	, 2004	•		
1.		rt A. Gab	el and	Richard	l A.Roł	perts. "S	Signals a	& Line	ar Svste	ems". I	ohn V	Wilev.	3rd Ed	lition. 1	987.	
2.	Rodg	ger E. Zie ation, 20	emer, V				-					•				
		ation, 200 ard W Ka		Bonnie	's Heel	c "Fun	damente	alsofs	ionale a	ind Sv	steme	" Pea	rson F	Iducatio	าท	
3.	2007.								•	•				Juucati	511,	
4.		Lathi, "P	<u> </u>		•								•			
5.		ykin and	B. Va	n Veen,	"Signa	ls and S	Systems	", 2nd l	Edition,	Wiley	, 200	)3.				
E-Resourc	es															
1.	https	://ocw.mi	t.edu/re	esources	/res-6-0	07-sign	als-and-	system	s-spring	-2011/	lectur	e-note	s/			
2.	https:	//ocw.mit	.edu/re	sources/	res-6-00	07-signa	als-and-s	systems	-spring-	-2011/a	assign	ments	/			
3.	3. <u>http://www.eng.ucy.ac.cy/cpitris/courses/ece623/notes/SignalsAndSystems.pdf</u>															



		NANDHA COLLE nomous Institution, A Elayampalay	Affiliate	d to Ar	nna Uni	versity, (		TOVPrivateland CENTED		
Programme	B.E.		Pro	gramm	e Code	104	Regulation		2019	
Department	ELECTR ENGINE	CONICS AND COM ERING	MUNIO	CATIC	DN		Semester		III	
Course Code	C	ourse Name	Periods Per Week Cre		Credit	Ma	aximu	m Marks		
Course Code	C		L	Т	Р	С	CA	ESE	Total	
U19CS304	Data Stru	100								
Course Objective	<ul><li>Lear</li><li>Desc</li><li>Exan</li></ul>	<ul> <li>The student should be made to,</li> <li>Impart the basic concept of list ADT.</li> <li>Learn the linear data structures such as stack and queue.</li> <li>Describe the non linear data structures such as Tree and Graphs.</li> <li>Examine various algorithms for finding shortest path and minimum spanning tree.</li> <li>Analyze various searching, sorting algorithms and hashing techniques.</li> </ul>								
	At the	e end of the course, th	e studen	t shoul	d be abl	e to,			Knowledge Level	
	CO1: Imp	plement abstract data	type for	list an	d opera	tions			K3	
Course		ply the stack and que			_				K3	
Outcome		lyze various tree data			-				K4	
0	CO4: Crit minimum	tically analyze and so spanning	olve the	proble	ms in fi	nding sh	ortest path and	1	K4	
	CO5: Den techniques	CO5: Demonstrate the various searching, sorting algorithms and hashing K2								
Pre- requisites	-									

COs	CO / PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak COs Programme Outcomes (POs)									CO/PSO Mapping PSOs				
	PO 1									-	PSO 1	PSO 2	PSO 3	
CO 1	3	3	3								2	2	2	
CO 2	3	3	3								2	2	2	
CO 3	3	3	3								2	2	3	
CO 4	3	3	3								2	2	3	
CO 5	3	3	3								2	2	3	

Direct

- 1. Continuous Assessment Test I, II & III
- 2. Assignment: Simulation using tool
- 3. End-Semester examinations

Indirect

1. Course - end survey

# Content of the syllabus

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Unit – I	LINEAR DATA STRUCTURE – LIST	Periods	9
	ta Types (ADTs) – List ADT – Array Implementation – Linked List Im		
	ked Lists - Doubly Linked Lists - Applications of Lists - Polynomial	operations (Inse	ertion, Deletion, Merge,
Traversal).			-
Unit - II	, e	Periods	9
	- Operations - Application: Evaluating Arithmetic Expressions - Conv		
-	- Operations – Circular Queue – Priority Queue – DeQueue – Applica		
Unit – II		Periods	<b>9</b>
0	ies – Tree ADT – Binary Tree – Tree Traversals – Expression Trees – AVL Trees – B- Trees – Heap – Applications of Heap.	Applications of	Trees – Binary Search
Unit - IV		Periods	9
	- Representation of Graph – Types of graph – Breadth-First Traversal		
	est Path Algorithms - Minimum Spanning Tree - Applications of graph		Taversai – Topologicai
Unit – V	SEARCHING, SORTING & HASHING TECHNIQUES	Periods	9
	Linear Search – Binary Search, Sorting: Bubble sort – Selection sort – I ash Functions – Collision Resolution Techniques – Separate Chainir Hashing.		
		tal Periods	45
Text Book			
1			
1.	Mark Allen Weiss — Data Structures and Algorithm Analysis in C 2011	, Second Edition	on, Pearson Education,
1. 2.	Mark Allen Weiss — Data Structures and Algorithm Analysis in C	· · · · · · · · · · · · · · · · · · ·	
-	Mark Allen Weiss — Data Structures and Algorithm Analysis in C 2011 Reema Thareja — Data Structures Using C, Second Edition , Oxford U	· · · · · · · · · · · · · · · · · · ·	
2.	Mark Allen Weiss — Data Structures and Algorithm Analysis in C 2011 Reema Thareja — Data Structures Using C, Second Edition , Oxford U	University Press	, 2011
2. References	Mark Allen Weiss — Data Structures and Algorithm Analysis in C 2011 Reema Thareja — Data Structures Using C, Second Edition, Oxford U Thomas H. Cormen, Charles E. Leiserson, Ronald L.Rivest, Clifford	University Press Stein — "Introd	duction to Algorithms",
2. References	Mark Allen Weiss — Data Structures and Algorithm Analysis in C 2011 Reema Thareja — Data Structures Using C, Second Edition , Oxford U Thomas H. Cormen, Charles E. Leiserson, Ronald L.Rivest, Clifford Second Edition, Mcgraw Hill, 2002. Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, — "Fundamen	University Press Stein — "Introc tals of Data St	duction to Algorithms",
2. <b>References</b> 1. 2.	Mark Allen Weiss — Data Structures and Algorithm Analysis in C 2011 Reema Thareja — Data Structures Using C, Second Edition , Oxford U Thomas H. Cormen, Charles E. Leiserson, Ronald L.Rivest, Clifford Second Edition, Mcgraw Hill, 2002. Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, — "Fundamen Edition, University Press, 2008	University Press Stein — "Introc tals of Data St ducation.	duction to Algorithms",
2. References 1. 2. 3.	Mark Allen Weiss — Data Structures and Algorithm Analysis in C 2011 Reema Thareja — Data Structures Using C, Second Edition , Oxford U Thomas H. Cormen, Charles E. Leiserson, Ronald L.Rivest, Clifford Second Edition, Mcgraw Hill, 2002. Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, — "Fundamen Edition, University Press, 2008 Stephen G. Kochan, — "Programming in C", Third edition, Pearson E	University Press Stein — "Introc tals of Data St ducation. tion, 2006.	duction to Algorithms", ructures in C", Second
2. References 1. 2. 3. 4.	Mark Allen Weiss — Data Structures and Algorithm Analysis in C 2011 Reema Thareja — Data Structures Using C, Second Edition , Oxford U Thomas H. Cormen, Charles E. Leiserson, Ronald L.Rivest, Clifford Second Edition, Mcgraw Hill, 2002. Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, — "Fundamen Edition, University Press, 2008 Stephen G. Kochan, — "Programming in C", Third edition, Pearson E Joe Bentley — "Programming Pearls", Second Edition, Pearson Educa Steven S. Skiena — "The Algorithm Design Manual", Second Edition	University Press Stein — "Introc tals of Data St ducation. tion, 2006.	duction to Algorithms", ructures in C", Second
2. <b>References</b> 1. 2. 3. 4. 5.	Mark Allen Weiss — Data Structures and Algorithm Analysis in C 2011 Reema Thareja — Data Structures Using C, Second Edition , Oxford U Thomas H. Cormen, Charles E. Leiserson, Ronald L.Rivest, Clifford Second Edition, Mcgraw Hill, 2002. Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, — "Fundamen Edition, University Press, 2008 Stephen G. Kochan, — "Programming in C", Third edition, Pearson E Joe Bentley — "Programming Pearls", Second Edition, Pearson Educa Steven S. Skiena — "The Algorithm Design Manual", Second Edition	University Press Stein — "Introc tals of Data St ducation. tion, 2006.	duction to Algorithms", ructures in C", Second
2. <b>References</b> 1. 2. 3. 4. 5. <b>E-Resource</b>	Mark Allen Weiss — Data Structures and Algorithm Analysis in C 2011 Reema Thareja — Data Structures Using C, Second Edition , Oxford U Thomas H. Cormen, Charles E. Leiserson, Ronald L.Rivest, Clifford Second Edition, Mcgraw Hill, 2002. Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, — "Fundamen Edition, University Press, 2008 Stephen G. Kochan, — "Programming in C", Third edition, Pearson E Joe Bentley — "Programming Pearls", Second Edition, Pearson Educa Steven S. Skiena — "The Algorithm Design Manual", Second Edition	University Press Stein — "Introc tals of Data St ducation. tion, 2006.	duction to Algorithms", ructures in C", Second
2. <b>References</b> 1. 2. 3. 4. 5. <b>E-Resource</b> 1.	Mark Allen Weiss — Data Structures and Algorithm Analysis in C 2011 Reema Thareja — Data Structures Using C, Second Edition , Oxford U Thomas H. Cormen, Charles E. Leiserson, Ronald L.Rivest, Clifford Second Edition, Mcgraw Hill, 2002. Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, — "Fundamen Edition, University Press, 2008 Stephen G. Kochan, — "Programming in C", Third edition, Pearson Educa Joe Bentley — "Programming Pearls", Second Edition, Pearson Educa Steven S. Skiena — "The Algorithm Design Manual", Second Edition https://www.edx.org/course/algorithms-and-data-structures	University Press Stein — "Introc tals of Data St ducation. tion, 2006.	duction to Algorithms", ructures in C", Second

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	(Autonomo	VIVEKANA LEGE OF ENGINEE us Institution Affiliated Elayampalayam, Tirucl	C <b>RINC</b> l to Ai	<b>FOF</b> nna Ur	niversity C		TÜVRhein CERTIFI			
Programme	B.E/B.TECH	Programme cod	le			Regulation	n	20	)19	
Department	CSE,EEE,E	CE,IT,BT,BME & C	ST		Se	mester				
Course code	Cou	irse name	Per	iods p	er week	Credit	Max	imum Marks		
			L	Т	Р	C	CA	ESE	Total	
U19TA302		TECHNOLOGY	2	0	0	1	40	60	100	
Content of	f the syllabus									
myF 1						Pe	eriods	,	3	
myF 2						Pe	eriods		3	
myF 3						Pe	eriods		3	
myF 4						Pe	eriods	,	3	

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myF 5	Periods	3
	Total Periods	15

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		VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN (Autonomous Institution Affiliated to Anna University Chennai) Elayampalayam, Tiruchengode – 637 205									
Programme	B.E/B.TECH	Program	me code			Regula	tion		2019		
Department	CSE,EEE,ECE,	IT,BT,BMF	E & CST		Semest	ter					
Course code	Course name		Periods	per week		Credit Maxim		ım Mark	s		
	000000		L	Т	Р	C	CA	ESE	Total		
U19TA302		.ND	2	0	0	1	40	60	100		
Content of the	TECHNOLOGY       Content of the syllabus										
UNIT I	WEAVING	AND CER	RAMIC T	ECHNOL	OGY		Periods		3		
Weaving Indust Potteries.	try during Sangam	Age – Cer	amic tech	nology – 1	Black and F	Red Ware	Potteries	(BRW) –	Graffiti on		
UNIT II	DESIGN ANI	<b>D CONSTR</b>	UCTION	TECHNO	OLOGY		Periods		3		
and Hero stone Mamallapuram	Structural construct s of Sangam age - Great Temples akshi Temple)- Th British Period.	– Details o of Cholas a	f Stage C and other	onstruction worship p	ns in Silapp laces - Ten	athikaram	- Sculpti Nayakkar	res and Period -	Temples of Type study		
UNIT III	MANU	FACTURI	NG TECH	INOLOG	Y		Periods		3		
history - Mintin beats - Archeolo	lding - Metallurgic g of Coins – Bead ogical evidences - C	s making-in Jem stone ty	dustries S pes descri	tone beads bed in Sila	- Glass bea ppathikaran	ads - Terra	acotta bead		beads/ bone		
UNIT IV	AGRICULTUR	E AND IR	RIGATIO	N TECH	NOLOGY		Periods		3		
cattle use - Agri	Dam, Tank, ponds, Sluice, Significance of Kumizhi Thoompu of Chola Period, Animal Husbandry - Wells designed for cattle use - Agriculture and Agro Processing - Knowledge of Sea - Fisheries – Pearl - Conche diving - Ancient Knowledge of Ocean - Knowledge Specific Society.										
UNIT V	SCIENTIFI	C TAMIL	& TAMII	COMPL	TING		Periods		3		
-	Scientific Tamil - Academy – Tamil	-	-	-			-	t of Tami	1 Software		

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Tex	t cum-Reference Books
1	jkpof tuyhW – kf;fSk; gz;ghLk; - Nf.Nf. gps;is (ntspaPL: jkpo;ehL ghlE}y; kw;Wk; fy;tpapay; gzpfs; fofk;).
2	fzpdpj; jkpo; - Kidth; ,y. Re;juk;. (tpfld; gpuRuk;).
3	fPob – itif ejpf;fiuapy; rq;ffhy efu ehfhpfk; (njhy;ypay; Jiw ntspaPL)
4	nghUie -Mw;wq;fiu ehfhpfk;.(njhy;ypay; Jiw ntaspaPL)
5	Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL
6	Life of the Tamils – The Classical Period (Dr.S.Singaravelu) (Published by International Institute of Tamil Studies.
7	Historical Heritage of the Tamils (Dr.S.V.Subatamarnan,Dr.K.D.Thirunavukkarasu) Published by International Institute of Tamil Studies.
8	The Contributions of the Tamils to Indian Culture (Dr.M.Valarmath1) Published by International Institute of Tamil Studies. )
9	Keeladi-'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu.
10	Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.P1llay)
11	Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
12	Journey of Civilization Indus to Vaigai (R.Balakrishnan) Published by RMRL.

	8			ous Ins	stitution	, Affilia	ated to	GINEE Anna U ngode –	niversit	y, Ch				TÜVRheinland CERTIFIED	SO 80011-2015			
Program	nme	B.E.				Pro	ogramn	ne Code	103	]	Regu	lation		2	019			
Departi	пен	ELEC' ENGIN			ND CO						Sen	nester			III			
Course Co	ode	Course Nar			Course Nat				Perio L	ds Per	Week P	Credit C		CA		ximum ESE		ks Total
U19EC306		Digital System Design									40		100					
Course Objectiv		<ul> <li>T</li> <li>T</li> <li>T</li> <li>L</li> </ul>	o intro o unde o simi anguag	duce B rstand t alate b ge HDL	oolean a the designation of the design of the d	llgebra gn and f ombinat	and its functio ional		tions in f combi juential	digita natio	al sys nal ai	stems nd seq	uential	ware	Descript			
								ld be abl	e to					]	Knowled Level			
Course	.  -	CO1: Simplify complex Boolean functions													K1			
Outcom	es	CO2: Implement digital circuits using combinational logic ICs and PLDs. CO3: Understand the characteristics of various Flip-Flops													K3 K2			
	F				circuits	nts	K6											
					uild dig							•			K3			
	(3/)	/1 india	atas stra		CO / PC			) Modi	um 1	Wook			CO/P					
COs	(3/2/1 indicates strength of correlation)3-Strong, 2 – Medium, 1 - WeakMappingCOsProgramme Outcomes (POs)PSOs																	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8		PO	РО	PO	PSO	PSO	PSO			
CO 1	3	2	2	1	1				1	10	11 1	12 2	1 3	2 2	3			
CO 2	3	2	2	1	1				1		1	1	3	2	1			
CO 3	3	2	2	1	1				1		1	1	1	3	3			
CO 4	3	2	2	1	1				1		1	1	1	1	1			
CO 5	3	2	2	1	1				1		1	1	2	1	1			
Course Ass Direct		t Metho																
2.4	Assignr			ations														
Indirect																		
1. Co	ourse - e	end surv	vey															
Suggested Design and		-			using d	ligital I	C's											
															Course Outcome			
<b>1.</b> Uni	versal	gates.													CO1			
<b>1.</b> Uni	versal	gates.													CO1 102			

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<b>2.</b> Ar	ithmetic circuits using logic gates	CO1
3. Co	ombinational Circuits (Adder, Subtractor).	CO2
4. Co	ode Converters (Gray to Binary & Binary to Gray).	CO2
5. 2b	it magnitude comparator using logic gates.	CO4
6. Oc	ld/Even parity checker and generator using IC74180.	CO4
7. M	ultiplexer and De-multiplexer.	CO4
8. En	coder and Decoder using logic gates.	CO4
9. Da	ata transfer using Shift register.	CO3,CO4
10. Sy	nchronous and ripple counter using logic gates.	CO4
	Total Periods	45
Text Book	is in the second s	
1.	M. Morris Mano and Michael D. Ciletti, -Digital Design , 5th Edition, Pearson, 2013	
2.	Charles H. Roth, Jr, -Fundamentals of Logic Design, Fourth edition, Jaico Books, 20	002.
Reference	S	
1.	William I. Fletcher, —An Engineering Approach to Digital Designl, Prentice-Hall of	India, 1980.
2.	Floyd T.L., —Digital Fundamentals, Charles E. Merril publishing company, 1982.	
3.	John. F. Wakerly, -Digital Design principles and practices, Pearson Education, Four	th Edition, 2007.
4.	Donald D. Givone, "Digital Principles and Design", Tata McGraw Hill, 2003	
5.	G. K. Kharate, "Digital Electronics", Oxford University Press, 2010.	
E-Resourc	es	
1.	https://www.scribd.com/document/290062622/Digital-Electronics-Lab-Viva-Question	s
2.	https://www.javatpoint.com/digital-electronics-interview-questions	
3.	https://www.electronicshub.org/electronics-mini-projects-ideas/	
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Programme	e		B.E.				Prog	gramm	e code	e 1	103		Regul	ation	20	)19		
Departmen	t			ONIC: ERINC		O CON	MMU	NICA'	ΓΙΟΝ				Sem	nester	I	III		
				C	N				Per	Periods /Week			Credit	Maximum		n Marks		
Course code		Course Name							L	Т	P		С	CA	ESE	Total		
U19FA.JU/			ron De ratory		and C	Circuit	S		0	0	2		1 60 40 10					
			To s	simula of the	te vari	ous el	ectron	to mee ic circ shoul cs of P	uits us d be al	ing P.	-SPIC	E softv	vare			nowledg evel K2		
Course Outco	me	CO2:Illustrate the operation of BJT and its Characteristics													K2			
		CO3: Design, build and test any analog circuits for handling real life projects														K3		
		<b>CO4:</b> Exposed to circuit simulations using present meter technology MOSFETs														K4		
		CO5:	Apply	/ P-spi	ce & l	Develo	op a w	orking	mode	l of ar	n elect	ronic c	circuit			K3		
Pre-requisites		U19E	E201 ]	Basic I	Electric	cal and	l Elect	ronics	Engine	ering								
		(0.10.11.1	<b>.</b>					& PSC										
SUB.CODE		(3/2/1 i	ndicat					) <u>3-Str</u> AND (										
& NAME COURSE	PO	PO	РО	PO	PO	N DE V	PO	PO	PO	PO1	PO1	PO1	1	PSO				
OUTCOME	1	2	3	4	5	6	7	8	9	0	1	2	PSO1	2	PSO3			
CO1 CO2	2	1	2										2					
CO3	2	1	2										2					
	2	1	2										2					
CO4	2	1	2										2					

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CO5

Course	Assessment Methods	
	Direct	
	1.Pre lab and Post lab	
	2.Assignment	
	3.End-Semester examinations	
	Indirect         1. Course - end survey	
	List of Experiments	Course Outcome
1.	Characteristics of PN Junction Diode	CO1
2.	Zener diode Characteristics & Regulator using Zener diode	CO1
3.	Common Emitter input-output Characteristics	CO2
4.	FET Characteristics	CO4
5.	SCR Characteristics	CO3
6.	Frequency Response of CE amplifier and its Spice simulation	CO5
7.	Design of CC Amplifier for a specific output impedance and its Spice Simulation	CO5
8.	Spice simulation of CS, CG, and CD configuration of MOSFET amplifiers with various	CO4
9.	Design of Differential Amplifiers and its CMRR measurement	CO3
10.	Design and analysis class A power amplifier	CO3
	Total Periods	45
Sugg	gested Lab Manuals:	
1. Da	avid A. Bell, "Laboratory manual for Electronic Devices and Circuits", PHI, 4 <sup>th</sup> Edition,2001	
E-Reso	urces	
	1. https://www.electronics-tutorials.ws/diode/diode_2.html	
	2. https://nptel.ac.in/courses/117102061/	
	3. https://www.sciencedirect.com/topics/physics-and-astronomy/optical-device	

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Program	me	B.E.				•		nme Co		103	Re	gulati	on <b>2019</b>				
Departm	ent ]	ELECT ENGIN			D CON		v					lemest		]	II		
Course Co	da		Cour	se Nam	Periods Per Week					Credit		Μ	Iaximu	ximum Marks			
Course Co	ue		Cours	Ι	T	P		С	0	CA	ESE	E Total					
U19CS30	8 1	Data St	ructur	es Lab	oratory	y (	0 0	4		2	6	50	40		100		
Course Objective		<ul> <li>De</li> <li>De</li> <li>Wr</li> </ul>	velop p sign sh rite prog	orogram ortest p grams t	a structurs to im bath alg so imple rse, the	plemen orithm : ement fo	t non 1 for var or sorti	inear da ious rea ng and	ita stru il life a hashin	ctures.			Kı	nowled	lge Leve		
		At the end of the course, the student should be able to, CO1: Design and implement program for Linked List															
Course	(	CO2: Implementing the program for manipulating Stack													K2		
Outcome	(	CO3: Design and Implement programs for Binary Search tree and AVL tree												K6			
	(	CO4: Implement the shortest path algorithms available in graph													K2		
		CO5: Apply appropriate sorting algorithm and hash functions that result in a collision free scenario for data storage and retrieval												К3			
Pre- requisites	-	-											·				
<u> </u>	(3/	/2/1 indic	cates str	ength of		tion) $\overline{3}$ -S	Strong,		lium, 1	- Weak	5		CO/I Map	ping			
COs		PO 2	PO 3	PO 4	Program	PO 6	comes ( PO 7	POs)	PO 9	PO	PO	PO	PSOs PSO	PSO	PSO		
	PO 1			104	105	100	107	100	107	10	11	12	1	2	3		
CO 1	3	3	3									2	2		<u> </u>		
	3	3	3					-				$\frac{2}{2}$	2		+		
CO 2	2		i 7	1	1	1	1	1	1	1	1	L 2		1	1		
CO 2 CO 3 CO 4	3	3	3									2	2				

Direct

- 1. Prelab and post lab test
- 2. End-Semester examinations

Indirect

1. Course - end survey

# Content of the syllabus

SUGGESTED LIST OF EXPERIMENTS:

LIST OF EXPERIMENTS	Course Outcome
1. Represent a polynomial as a linked list and write functions for polynomial addition.	CO1
2. Implementation of stack and use it to convert infix to postfix expression.	CO2
3. Implementation of Binary Tree and Traversal Techniques	CO2
4. Implementation of binary search tree	CO3
5. Implementation of insertion in AVL trees.	CO3
6. Implementation of graphs using BFS and DFS.	CO4
7. Implementation of Djikstra's algorithm.	CO4
8. Implementation of Prim's algorithm using priority queue to find MST of an undirected graph.	CO4
9. Implementation of Merge sort using Divide and Conquer method.	CO5
10. Implementation of Hashing with open addressing	CO5
Total Periods	45

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		VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN (Autonomous Institution, Affiliated to Anna University, Chennai)												
HOMEN ENPOWERNEN		Elayampalaya	ım, Tiru	cheng	ode – 6	37 205		CE	RTIFIED www.txv.com ID 910546055					
Programme	B.E.		Prog	gramm	e Code	103	Regulatio	n	2019					
Department	ELECTR ENGINE	ONICS AND COMN ERING	MUNIC	CATIO	N		Semeste	r	IV					
Course Code	C	ourse Name	Period	ls Per	Week	Credit	Μ	aximum	Marks					
Course Coue	C	Course Ivanie			Р	С	CA	ESE	Total					
U19MA407		lity and Random Processes	3	1	0	4	40	60	100					
Course Objective	<ul> <li>The main objective of the course is to</li> <li>Know and differentiate between discrete and continuous random variables.</li> <li>Proficiently understand the expected value, variance, and higher-order moments of random variables (for both discrete and continuous types).</li> <li>Understand means, correlations/ covariances of random processes.</li> <li>Identify relationship between wiener-Khintchine relation and spectral densities.</li> <li>Evaluate the response of a linear system to stationary processes.</li> </ul>													
	At the end	of the course, the stude	Kı	Knowledge level										
		slate the density and uous variables.	crete	K1,K3										
Course		e the central limit the		K2,K3										
Outcome		ognize the Random processes are joint	the	K1,K5										
		pute the autocorrelation of a wide-sens	ectral	K2,K5										
		lyze the response of r		K2,K4										
Pre- requisites		~												

	(3/2	2/1 indi	cates str	ength of	CO / PO	tion) $\overline{3}$ -	Strong,		lium, 1 -	- Weak			CO/I Map PSOs	ping	
COs		Programme Outcomes (POs)													
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	3	3											2		
CO 2	3	3											2		
CO 3	3	3											2		
CO 4	3	3											2	Ī	
CO 5	3	3											2		

Direct

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- Continuous Assessment Test I, II & III 1.
- Assignment: Simulation using tool
   End-Semester examinations

### Indirect

Course - end survey 1.

Unit – I		Periods	12
Discrete a	nd continuous random variables - Moments - Moment genera	ting functions	and their properties.
Binomial,	Poisson, Geometric, Uniform, Exponential, Normal distributions		
Unit - I	TWO DIMENSIONAL RANDOM VARIBLES	Periods	12
Joint distri	butions - Marginal and conditional distributions – Covariance - Co	orrelation and R	Regression(for two
dimensiona	al random variables) - Central limit theorem		
Unit – II	I CLASSIFICATION OF RANDOM PROCESSES	Periods	12
Definition	and examples - first order, second order, strictly stationary, auto co	orrelation and i	ts properties, wide-
sense statio	onary and ergodic processes - Markov process - Poisson and Norm	al processes.	
Unit - IV	CORRELATION AND SPECTRAL DENSITIES	Periods	12
Cross cor	relation - Properties - Power spectral density - Cross spectr	ral density - I	Properties – Wiener-
Khintchine	relation - Relationship between cross power spectrum and cross of	correlation func	ction
Unit – V	LINEAR SYSTEMS WITH RANDOM INPUTS	Periods	12
Linear	time invariant system - System transfer function - Linear sy	stems with rai	ndom inputs – Auto
correlation	and cross correlation functions of input and output – white noise.		
	,	Total Periods	60
Text Book	s		·
1.	Ibe, O.C., Fundamentals of Applied probability and Random pro	ocesses, Elsevie	er, 2007
2.	Peebles Jr. P.Z., Probability Random Variables and Random Sign Publishers, Fourth Edition, New Delhi, 2015.	nal Principles,	Tata McGraw-Hill
Reference	S		
1.	Miller, S.L and Childers, S.L, Probability and Random Processes Processing and Communications, Elsevier Inc., First Indian Repr		ons to Signal
2.	Stark, H. and Woods, J.W., Probability and Random Processes w Processing, Pearson Education (Asia), 3 <sup>rd</sup> Edition, 2009.	vith Applicat	ions to Signal
3.	Papoulis, A. and Pillai, S.U., Probability, Random Variables and McGraw Hill, 2002.	Stochastic Pro	cesses, 4 <sup>th</sup> Edition,
4.	Hwei Hsu, H. "Schaum's Outline of Theory and Problems of Random Processes", Tata McGraw-Hill edition, New Delhi, 201		andom Variables and
5.	Leon-Garcia, A, "Probability and Random Processes for Electric Asia, Second Edition, 2011.	cal Engineering	;", Pearson Education
E-Resourc	es		
1.	https://www.maths.ed.ac.uk		
2.	www.learnerstv.com/Free-engineering-Video-lectures		
3.	www.nptel.ac.in		
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HONEN ENDOWER				nous Ir	A COLI Istitutio ayampa	n, Affi	liated	o Anr	na Univ	ersity,				TÜVRheinland CERTIFIED	12015	
Progra	mme	B.E.					Progr	amme	Code	103	Reg	ulation	n	201	19	
Depart	ment	ELEC ENGI			ND CC	OMMU	INICA	TION	N		Se	emeste	er	I	7	
Cauraa	To do		Cour	a Nam		P	eriods	Per V	Veek	Credit		Max	ximun	n Mark	s	
Course (	Lode		Cour	se Nan	ie		L	Т	Р	С	(	CA	ES	E	Total	
U19E0	C <b>410</b>	Electr	onic C	ircuits	-II		3	0	0	3		40	6	0	100	
Course Objectiv	7e	<ul> <li>To a</li> <li>To a</li> <li>To a</li> </ul>	<ul> <li>To study about feedback amplifiers and oscillator principles</li> <li>To design oscillators</li> <li>To study about tuned amplifiers</li> <li>To design shaping and Multivibrator circuits</li> <li>To know about blocking Oscillator &amp; Time base Circuits.</li> </ul>													
					U					rcuits.			T			
		At the end of the course, the student should be able to,										Knov	wledge	Level		
		<b>CO1</b> : Acquire knowledge about feedback amplifiers											K1			
Course		CO2: Design the oscillator circuits												K6		
Outcom	e	<b>CO3</b> :	Acquir	e know	ledge at	out tur	ed am	plifiers	5					K1		
		<b>CO4</b> : Design and construct Wave shaping and Multivibrator circuits												K6		
		CO5: 1	Design	and cor	struct E	Blockin	g Oscil	lators	and Tir	ne base	Circui	ts.		K6		
Pre- requisite	es	Electr	onic C	ircuits	-I											
COs	(3/2	/1 indica	ates stre	ngth of	CO / PC correlati Program	ion) 3-8	trong,		edium,	1 - Wea	ık		CO/I Map PSOs	ping		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO	B PO 9		РО	РО	PSO	PSO	PSO	
CO 1	2	3	3	3		2				10	11	12	1 3	2	3	
CO 2	2	3	3	3		2		1					3		2	
CO 3	2	3	3	3		2							3		2	
CO 4	2	3	3	3		2							3		2	
CO 5	2	3	3	3		2							3		2	
Course A	Assessr	nent M	ethods													
	Assig End-S	nuous A nment emester			t I, II &	III										
1.		e - end	survey													

Content of t	he syllabus		
Unit – I	FEEDBACK AMPLIFIERS AND STABILITY	Periods	9
	ack concepts -The Transfer gain with feedback-General c		
	utput resistance – Four feedback topologies– Analysis of series	-shunt, series-	series, shunt-shunt
	ries feedback amplifiers – Stability of Feedback amplifiers.		0
Unit - II	OSCILLATORS	Periods	9
	criteria for oscillator – Analysis of RC oscillators – Phase shift a	and Wein bridg	ge oscillators – LC
Unit – III	Colpitts, Hartley, Clapp, and Ring Oscillators. TUNED AMPLIFIERS	Periods	9
	ples – Inductor losses – Use of transformers – Single tuned		
<b>•</b>	ed circuits – Stagger tuning– Stability of tuned amplifiers using I	·	
	WAVE SHAPING AND MULTIVIBRATOR		
Unit - IV	CIRCUITS	Periods	9
	shaping circuits- diode Clippers- diode Clampers-Multiv Multivibrator- Bistable Multivibrator-Schmitt Trigger- UJT Osci		le Multivibrator-
Unit – V	BLOCKING OSCILLATORS AND TIME BASE GENERATORS	Periods	9
	ation Oscillator, Pulse transformers, Free running blocking Time base circuits, Linearization through adjustment of driving w	vaveform.	
	r	<b>Fotal Periods</b>	45
Text Books			
	S.Salivahanan,N.Suresh Kumar,A.Vallavaraj,'Electroni Devices a Edition, Reprinted, 2017.	and Circuits', N	McGraw Hill, 14 <sup>th</sup>
2.	Jacob Millman, 'Microelectronics', McGraw Hill, 2nd Edition, Repu	rinted, 2009.	
References			
1.	Donald .A. Neamen, "Electronic Circuit Analysis and Design", 3rd I	Edition, Tata M	cGraw Hill, 2010.
	Adel .S. Sedra, Kenneth C. Smith, "Micro Electronic Circuits", 7 <sup>th</sup> 2014.	Edition, Oxfor	d University Press,
3.	David A. Bell, "Electronic Devices and Circuits", Oxford Higher Ed	lucation press, 5	oth Edition,2010.
	David A. Bell, "Electronic Devices and Circuits", Oxford Higher Ed BehzadRazavi, "Design of Analog CMOS Integrated Circuits", Tata	-	
4.	David A. Bell, "Electronic Devices and Circuits", Oxford Higher Ed BehzadRazavi, "Design of Analog CMOS Integrated Circuits", Tata D.Schilling and C.Belove, "Electronic Circuits", McGraw Hill, 3	Mc Graw Hill,	2007.
4.	BehzadRazavi, "Design of Analog CMOS Integrated Circuits", Tata D.Schilling and C.Belove, "Electronic Circuits", McGraw Hill, 3	Mc Graw Hill,	2007.
4. 1 5. 1 <b>E-Resources</b> 1.	BehzadRazavi, "Design of Analog CMOS Integrated Circuits", Tata D.Schilling and C.Belove, "Electronic Circuits", McGraw Hill, 3	Mc Graw Hill, 3 <sup>rd</sup> Edition, 198	2007. 9.
4. 5. 5. 5. 5. 5. 5. 5. 5. 5. 5. 5. 5. 5.	BehzadRazavi, "Design of Analog CMOS Integrated Circuits", Tata D.Schilling and C.Belove, "Electronic Circuits", McGraw Hill, 3 https://www.it.iitb.ac.in/nmeict/videoDownloads.html?workshop	Mc Graw Hill, 3 <sup>rd</sup> Edition, 198	2007. 9.

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CO3: D CO4: A CO5: U	<ul> <li>The student should be made to,</li> <li>To learn Discrete Fourier transform and Fast Fourier Transform.</li> <li>To know the characteristics of IIR filters and learn methods to desi</li> </ul>											IR filte	ers. /ledge								
	-	ngth of	correlati	on) <b>3-S</b>	strong, 2		dium,	1 - Weal	k			Aappin									
		1			1			PO	PO	PO	PSO		PSO								
			PO 5	PO 6	PO 7	PO 8	PO	9 10	11	12	1	2	3								
									+				2								
3	3	3									3	3	2								
3	3	3							$\downarrow \downarrow \downarrow$		3	3	2								
nent Me nuous As nment: S emester	ethods ssessme simulati examir	ent Test ion usir nations	ng tool (	Not on	•	-					-	,)									
	CO4: A CO5: U analyze Signal a /1 indica PO 2 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 4 5 6 6 7 8 7 8 7 8 7 8 7 8 7 8 7 8 7 8 7 8	CO4: Analyze CO5: Underst analyze Multin Signal and Sys (1 indicates stree PO 2 PO 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	CO4: Analyze the eff CO5: Understand the analyze Multirate sign Signal and Systems (1 indicates strength of PO 2 PO 3 PO 4 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 Control Control Co	CO4: Analyze the effects of the cost of the archited analyze Multirate signal processing of the archited analyze Multirate signal process of the archited analyze Multirate signal proce	CO4: Analyze the effects of finite w CO5: Understand the architecture and analyze Multirate signal processing. Signal and Systems CO / PO Mapp (1 indicates strength of correlation) 3-S Programme Out PO 2 PO 3 PO 4 PO 5 PO 6 3 Control of the strength o	CO4: Analyze the effects of finite word len         CO5: Understand the architecture and programalyze Multirate signal processing.         Signal and Systems         Signal and Systems         CO / PO Mapping         /1 indicates strength of correlation) 3-Strong, 2         Programme Outcomes (         PO 2       PO 3       PO 4       PO 5       PO 6       PO 7         3       3       3       4       5       4       4       4       5       4       4       4       5       4       4       4       5       5       4       4       4       5       5       5       5       7       6       7       7       3	CO4: Analyze the effects of finite word length effects         CO5: Understand the architecture and programmina analyze Multirate signal processing.         Signal and Systems         CO / PO Mapping         /1 indicates strength of correlation) 3-Strong, 2 – Mee         Programme Outcomes (POs)         PO 2       PO 3       PO 4       PO 5       PO 6       PO 7       PO 8         3       3       3       4	CO4: Analyze the effects of finite word length effects         CO5: Understand the architecture and programming of I analyze Multirate signal processing.         Signal and Systems         Signal and Systems         CO / PO Mapping         (1 indicates strength of correlation) 3-Strong, 2 – Medium, Programme Outcomes (POs)         PO 2       PO 3       PO 4       PO 5       PO 6       PO 7       PO 8       PO 9         3       3       3       4	CO4: Analyze the effects of finite word length effects         CO5: Understand the architecture and programming of DSP proceanalyze Multirate signal processing.         Signal and Systems         Signal and Systems         CO / PO Mapping         '1 indicates strength of correlation) <b>3-Strong, 2 – Medium, 1 - Weal</b> Programme Outcomes (POs)         PO 2       PO 4       PO 5       PO 6       PO 7       PO 8       PO 9       PO 10         3       3       3       4 <t< th=""><th>CO4: Analyze the effects of finite word length effects         CO5: Understand the architecture and programming of DSP processors analyze Multirate signal processing.         Signal and Systems         Signal and Systems         CO / PO Mapping         (1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak         Programme Outcomes (POs)         PO 2       PO 3       PO 4       PO 5       PO 6       PO 7       PO 8       PO 9       PO 10       11         3       3       3       4</th><th>CO4: Analyze the effects of finite word length effects         CO5: Understand the architecture and programming of DSP processors and analyze Multirate signal processing.         Signal and Systems         Signal and Systems         You PO / PO Mapping         1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak         Programme Outcomes (POs)         P0 2       P0 3       P0 4       P0 5       P0 6       P0 7       P0 8       P0 9       P0       P0       P0         3       3       3       4&lt;</th><th>CO4: Analyze the effects of finite word length effects         CO5: Understand the architecture and programming of DSP processors and analyze Multirate signal processing.         Signal and Systems         CO / PO Mapping         Of the constraint of correlation of the corr</th><th>CO4: Analyze the effects of finite word length effects       K4         CO5: Understand the architecture and programming of DSP processors and analyze Multirate signal processing.       K4         Signal and Systems         CO / PO Mapping       CO/PSG         '1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak       Mappin         Programme Outcomes (POS)       PSOs         P0 2       P0 3       P0 4       P0 5       P0 6       P0 7       P0 8       P0 9       P0       P10       P1       1       2       2       3</th></t<>	CO4: Analyze the effects of finite word length effects         CO5: Understand the architecture and programming of DSP processors analyze Multirate signal processing.         Signal and Systems         Signal and Systems         CO / PO Mapping         (1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak         Programme Outcomes (POs)         PO 2       PO 3       PO 4       PO 5       PO 6       PO 7       PO 8       PO 9       PO 10       11         3       3       3       4	CO4: Analyze the effects of finite word length effects         CO5: Understand the architecture and programming of DSP processors and analyze Multirate signal processing.         Signal and Systems         Signal and Systems         You PO / PO Mapping         1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak         Programme Outcomes (POs)         P0 2       P0 3       P0 4       P0 5       P0 6       P0 7       P0 8       P0 9       P0       P0       P0         3       3       3       4<	CO4: Analyze the effects of finite word length effects         CO5: Understand the architecture and programming of DSP processors and analyze Multirate signal processing.         Signal and Systems         CO / PO Mapping         Of the constraint of correlation of the corr	CO4: Analyze the effects of finite word length effects       K4         CO5: Understand the architecture and programming of DSP processors and analyze Multirate signal processing.       K4         Signal and Systems         CO / PO Mapping       CO/PSG         '1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak       Mappin         Programme Outcomes (POS)       PSOs         P0 2       P0 3       P0 4       P0 5       P0 6       P0 7       P0 8       P0 9       P0       P10       P1       1       2       2       3								

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Unit – I	DISCRETE FOURIER TRANSFORM	Periods	9+3
	discrete-time signals & systems, Discrete Fourier Transform : Pr n, Fast Fourier Transform: Radix-2 FFT, Decimation-in-tim		
	& its applications ,Overlap-add & overlap-save methods.		lation-m-mequency
Unit - II	INFINITE IMPULSE RESPONSE FILTERS	Periods	9+3
	tics of practical frequency selective filters. characteristics of		
	i filters, Chebyshev filters. Design of IIR filters from analog		
	tion of derivatives, Impulse invariance method, Bilinear transform		
<b>I I</b>	g domain. Structure of IIR filter - direct form I, direct form II, Ca	-	•
Unit – II		Periods	9+3
Design of 1	FIR filters - symmetric and Anti-symmetric FIR filters - design	of linear phas	e FIR filters using
	ies method - FIR filter design using windows (Rectangular, H		
	sampling method. FIR filter structures - linear phase structure, dir		
Unit - IV		Periods	9+3
Representat	ion of numbers-ADC Quantization noise, derivation for quantization	tion noise pow	er. over flow error.
	quantization error, Product Quantization error-truncation &		
oscillation.		C	ý J
TI:4 T7	DIGITAL SIGNAL PROCESSORS & MULTIRATE	Deviale	0.2
Unit – V	SIGNAL PROCCESSING	Periods	9+3
DSP functi	onalities - Circular buffering - Pipelining - DSP architect	ure – Fixed (	(C5X)and Floating
	) architecture principles – addressing modes - Simple progra		-
	al description of change of sampling rate, Interpolation and Deci		
	polation by an integer factor, - Sampling rate conversion by a rati		, ,
		<b>Total Periods</b>	60
Text Books	3		1
1	John G. Proakis & Dimitris G.Manolakis, -Digital Signal Proce	essing – Princi	ples. Algorithms &
1.	Applications, Fourth Edition, Pearson Education / Prentice Hall,	•	
2	B.Venkataramani & M. Bhaskar, "Digital Signal Processor		
2.	Application", TMH 2002.(Unit V)	,	6 6
References			
1.	Emmanuel C. Ifeachor & Barrie. W. Jervis, -Digital Sign	al Processing	, Second Edition,
1.	Pearson Education / Prentice Hall, 2002.		
	Alan V Oppenheim, Ronald W Schafer, John R Bu	uck, "Discre	te Time Signal
2.	Processing", Pearson, 2009.		te Thile Signal
		1.4 1.1.7	
3.	Sanjit K. Mitra, -Digital Signal Processing - A Computer Base	d Approach <sup>I</sup> , J	ata Mc Graw Hill,
4	2007.	U:11 2006	
4.	2007. Andreas Antoniou, —Digital Signal Processingl, Tata Mc Graw	Hill, 2006.	
4. E-Resource	2007. Andreas Antoniou, —Digital Signal Processing∥, Tata Mc Graw s	Hill, 2006.	
E-Resource	2007. Andreas Antoniou, —Digital Signal Processingl, Tata Mc Graw	Hill, 2006.	
	2007. Andreas Antoniou, —Digital Signal Processing  , Tata Mc Graw s https://nptel.ac.in/courses/117102060/	Hill, 2006.	
E-Resource	2007. Andreas Antoniou, —Digital Signal Processing∥, Tata Mc Graw s	Hill, 2006.	

Former Signature of BOS Chairman ECE

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Progra	mme	<b>B.</b> ]	E				Prog	ramme	e Code	103	Reg	gulation	n	201	.9	
Depart	ment		CTRON NEER		ND CO	OMMU	JNICA	ATIO	N		Se	emeste	r	IV	7	
Course (	Code		Cour	se Nan	ne	I	Periods	s Per V T	Veek P	Credit C		Max CA	kimum ES	Mark	s Total	
U19EC	/12	Floctr	omogr	netic Fi	olde		L 3	0	0	3		$\frac{CA}{40}$	60		100	
Course Objectiv	7e	The ma	<ul> <li>To learn about the static electric charges ,laws and field concepts</li> <li>To learn about the material mediums and its properties along with fileds</li> <li>To learn about the static magnetic fields concepts and laws .</li> <li>To learn the Maxwell's equations, electromagnetic waves and propagation</li> </ul>													
			At the end of the course, the student should be able to, Knowledge Level													
	electro	CO1: understand and solve basicmathematical problems relavent to electromagnetics.K2CO2: Interpret knowledge on the basics of static electric and magnetic fieldK3														
Course Outcom	e	and the associated laws.														
		CO3: Explain the behavior of electric and magnetic fields in the presence of dielectrics and magnetic materials.														
		CO4: Apply the propagation of EM waves and also get introduced to the methods in computational electromagnetic.														
		CO5:	Analyz	e Elect	romagr	etic wa	ave pro	opagat	tion.					K4		
Pre- requisite	es	Vector	algebr	a,Diffe	rential a	nd Inte	gral ca	lculus								
			(3	/2/1 ind	CO / Po	rength o	of corre						CO/F Map	ping		
COs	DO 1	DC 2	DO 2		Progran			. ,		0 00	- DO	- DC	PSOs		<b>D</b> CO	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	РО	8 PO	9 PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	
CO 1	3	3	3	3									3	1	2	
CO 2 CO 3	3	3	2	3									3	1	2	
CO 3	3	3	2 2	3	2								3 3	1 1	2	
CO 4 CO 5	3	2	2	2	2								3	1	2	
Course A Direct		<b>nent M</b> nuous A							•							

- 1. Continuous Assessment Test I, II & III
- 2. Assignment: Simulation using tool
- **3.** End-Semester examinations

# Indirect



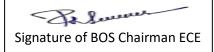
1. C	ourse - end survey		
Content of	the syllabus		
Unit – I	INTRODUCTION	Periods	9
volume int	vector algebra, Rectangular, cylindrical and spherical coordinate sy egrals- Divergence theorem, Stoke's theorem- Gradient, Divergencon, Null identities, Helmholtz's theorem.		
Unit - Il		Periods	9
Density, C	Law and Field Intensity, Electric Fields due to Continuous Charg auss's Law – Maxwell's Equation – Applications of Gauss's Law Electrostatic Fields.		
Unit – II	ELECTRIC FIELDS IN MATERIAL SPACE	Periods	9
Relaxation Laplace's I		y Conditions –	Poisson's and
Unit - IV		Periods	9
Flux Densi Potentials.	's Law, Ampere's Circuit Law – Maxwell's Equation, Application ty – Maxwell's Equation, Maxwell's Equations for Static Fields, N		
Unit – V		Periods	9
Dielectrics	Equation in Final Form – Wave Propagation in Lossy Dielectrics, , Free Space and Good Conductors, Power and the Poynting Vector Iormal Incidence and Oblique Incidence.		
Text Book			
1.	Sadiku, M.N.O., "Elements of Electromagnetics", 3rd Edition, Ox	ford University	v Press. 2001.
2.	Jordan, E.C. and Balmain, K.G., "Electromagnetic Waves and Ra Prentice-Hall of India. 1993.		
Reference			
1.	Narayana Rao, N., "Elements of Engineering Electromagnetic India.2002.	c", 6th Edition	, Prentice-Hall of
2.	Hayt, W.H. and Buck, J.A., "Engineering Electromagnetics", 2012.	7th Edition, T	ata McGraw-Hill.
3.	Kraus, J.D. and Fleisch, D.A., "Electromagnetics with Application	ns", McGraw-	Hill. 2010.
3. 4.	Kraus, J.D. and Fleisch, D.A., "Electromagnetics with Applicatio Ramo, S.A., Whinnery, J.R. and Van Duzer, T., "Fields and Wave Electronics", 3rd Edition, John Wiley & Sons. 1994.		
	Ramo, S.A., Whinnery, J.R. and Van Duzer, T., "Fields and Wave	es in Commun	ication
4.	Ramo, S.A., Whinnery, J.R. and Van Duzer, T., "Fields and Wave Electronics", 3rd Edition, John Wiley & Sons. 1994. D.K. Cheng, "Field and Wave Electro Magnetics", Pearson (India	es in Commun	ication
4. 5.	Ramo, S.A., Whinnery, J.R. and Van Duzer, T., "Fields and Wave Electronics", 3rd Edition, John Wiley & Sons. 1994. D.K. Cheng, "Field and Wave Electro Magnetics", Pearson (India	es in Commun	ication
4. 5. <b>E-Resourc</b>	Ramo, S.A., Whinnery, J.R. and Van Duzer, T., "Fields and Wave Electronics", 3rd Edition, John Wiley & Sons. 1994. D.K. Cheng, "Field and Wave Electro Magnetics", Pearson (India	es in Commun	ication

Former Signature of BOS Chairman ECE

HONEY ENOURS	IN FOR			nous Ir	A COLI Istitution ayampa	n, Affi	liated	to An	na Uni	vers	ity, C			1	TÜVRheinland CERTIFIED	101.2015
Program	nme	B.I	Ξ				Progr	amm	e Code	1	.03	Reg	ulatio	n	20	19
Departm	nent	ELEC ENGI			ND CC	OMMU	INICA	TIO	N		I	Se	emeste	er	Г	V
Course Co	ode		Cour	se Nan	10	P	eriods	Per	Week	Cr	edit		Ma	ximur	n Mark	s
Course Co	Jue		Cour	se i van	IC .		L	Т	Р		С	(	CA	ES	SE	Total
U19EC41	13	Linear	r Integ	rated (	Circuits	5	3	0	0		3		40	6	0	100
Course Objective	,	<ul> <li>Illustrate the concept of Monolithic IC fabrication technique and cha amp.</li> <li>Interpret the various applications of Op-amp.</li> <li>Understand the function of Analog Multiplier and the applications of F</li> <li>Categorize the ADCs and DACs with the applications.</li> <li>Elaborate the concept of various waveform generation and regulator ci</li> <li>At the end of the course, the student should be able to,</li> </ul>										s of P tor cir	LL circ ccuits. Knov Level	cuits.		
Course		charac	characteristics various Op-amp based ICs.         CO2: Demonstrate the various applications of Op-amp.         K2													
Outcome		<ul><li>CO3: Analyze the functional blocks and the applications of PLL circuits.</li><li>CO4: Examine the operation of ADCs and DACs.</li></ul>											K4 K3			
		<b>CO5:</b> Define the internal circuits of waveform generation and regulator circuits.												K3		
Pre- requisites	;	-														
COs	(3/2	/1 indica	ites stre	ngth of	<b>CO / PC</b> correlati Program	on) <b>3-S</b>	trong,			, 1 –	Weal	ζ			PSO oping	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	(1 O3) PO		9	РО	PO	РО	PSO	PSO	PSO
CO 1				2							10	11	12	1	2	3
CO 1 CO 2	3 2		2	2	2	$\frac{2}{2}$	22		2	,	$\frac{2}{2}$		$\frac{2}{2}$	3	2	
CO 2 CO 3	<u>2</u> 3		3			3	2	+	2		$\frac{2}{2}$		2	3	2	2
CO 4	2		5	2		2	2		2		2		2	3		2
CO 5	2		2			2	2		2		2		2	2	2	
2. A	Contii Assigi	nuous A	ssessm Simulat	ion usir	t I, II & 1g tool, (		nd Serr	inar.								
Indirect	Cours	e - end s	survey.													



	syllabus		
Unit – I	INTRODUCTION TO LINEAR IC	Periods	9
0	f ICs over discrete components-Manufacturing process of mono		
	Operational amplifier - Parameters of Operational amplifier- Inve	-	
-	General operational amplifier stages and Internal circuit dia	agrams of IC	741, DC and A
performance cl	aracteristics-Slew rate-Open and Closed Loop configurations.		
Unit – II	APPLICATIONS OF OPERATIONAL AMPLIFIER	Periods	9
	ce Amplifier-Differentiator-Integrator-Voltage Follower-Voltag		-
	rumentation amplifier-Logarithmic amplifier-Phase Shift Circ	-	or-Schmitt trigge
Precision rectif	ier- Clipper and Clamper- Low Pass and High Pass Butterworth fi	ilters.	
Unit – III	ANALOG MULTIPLIER AND PLL	Periods	9
Analog Multip	lier using Emitter Coupled Transistor Pair - Gilbert Multiplier cel	l - Analog mul	tiplier ICs and the
applications, C	peration of the basic PLL, Closed loop analysis, Voltage Control	lled Oscillator,	Monolithic PLL I
565, Applicatio	on of PLL.		
Unit – IV	A-D AND D-A CONVERTER	Periods	9
Analog and Di	gital Data Conversions, D/A converter – Specifications - Weighte	ed resistor type	, R-2R Ladder type
Voltage Mode	and Current Mode, R-2R Ladder types - Switches for D/A conve	rters, IC DAC-	08, A/D Converter
-Specification	- Flash type - Successive Approximation type - Single Slope type	be – Dual Slop	e type - Conversio
Fimes of typic	al IC ADC.	-	
TT 14 T7	WAVEFORM GENERATORS AND SPECIAL		0
Unit – V	FUNCTION ICs	Periods	9
ine wave gen	erators, Multivibrators and Triangular wave generator, Saw tooth	wave generat	or-Timer IC 555-I
	tors – Three terminal fixed and adjustable voltage regulators - I		
	Voltage and Voltage to Frequency Converters - Audio Power amp	-	
	to couplers and Fibre optic IC.		
Ampinici - Op		Fotal Periods	45
<b>Fext Books</b>		I Utal I CITUUS	<b>T</b> ./
LEXT DOORS			
C.	rings France "Design with grantingal smalifiers and analog I	eta anata d. Cinar	
	ringo Franco, "Design with operational amplifiers and analog In	ntegrated Circu	
1. M	cGraw-Hill Education - Europe, 2014.	-	its", Fourth Editio
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4.	Analog-to-Digital-(ADC)-And-Digital-to-Analog-(DAC)-Converters_36043/

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Standards	of Measurement & Errors- theory of errors, electrica	al measuring inst	uments and their
	ion. Static and dynamic characteristics – AC Bridge measure	6	
	and Wien bridge.		·,,, » •
Unit – I	~		
	ion of transducers-Selecting a transducer- strain gauges	- Temperature Tra	ansducers - Linear
	Differential Transformer (LVDT)-RVDT – Capacitive Trans		
	Effect sensors and Optoelectronic Transducers - Smart/intell		
Unit – I	II INSTRUMENTS FOR SIGNAL GENERATION A ANALYSIS	ND Periods	9
Introducti	on- Sine wave generator- frequency synthesized signal gen	erator- Sweep gen	erators - pulse and
	ve generator-Wave analyzers-Harmonic distortion analyzer-		
Analyzer-	Block diagram of General Purpose Oscilloscope-Measure	ment of voltage, of	current, phase and
frequency	using CRO - MSO - DSO.		
Unit – I	V INDICATING AND DISPLAYING INSTRUMENTATION SYSTEMS	Periods	9
D'ARSON	JAL Galvanometer- PMMC Mechanism- DC Ammeters and	l voltmeters- Q me	ters-RF power and
voltage m	easurement-high frequency measurement - frequency meter	, True RMS meter	s – Dual trace and
beam osc	lloscope-Analog and digital storage oscilloscope.		
Unit – `	<b>DIGITAL DATA ACQUISITION &amp;</b> INSTRUMENTATION SYSTEMS	Periods	9
	oltmeters – Millimeters – automation in Voltmeter – Accurac s – Digital Frequency counter- Data Loggers.	y and Resolution ir	DVM - Guarding
•		<b>Total Periods</b>	45
Text Bool	ΧS		
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Course		At the	end of	the cou	urse, the	e studer	nt shou								Level	rledge K6	
Outcome		CO1: Design and construct the amplifiers and oscillators CO2: Evaluate the output of analog circuits														K0 K5	
outcome		<b>CO3:</b> Demonstrate the mathematical operation using OP-Amp														K2	
		<b>CO4:</b> Understand performance of filter and oscillator circuits														K1	
		<b>CO5:</b> Examine the operation of PLL													K4		
Pre- requisites		-															
( COs	3/2/	1 indica	ates stre	ngth of	<b>CO / PC</b> correlati Program	on) <b>3-S</b>	trong,			m, 1 -	- Weal	X		CO/I Map	ping		
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Course Asse	ssm	ent M	ethods														
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	List of Experiments	Course Outcome
1.	Series and Shunt feedback amplifiers: Frequency response, input and output impedance calculation	CO1
2.	Design of R-C Oscillators (Phase Shift and Wien Bridge)	CO1
3.	Design of L-C Oscillators (Colpitts and Hartley )	CO2
4.	Design of Class – C tuned Amplifier	CO2
5.	Design of Astable and Bistable multivibrators.	CO3
6.	Inverting and Non inverting amplifiers using Op-Amp.	CO3
7.	Integrator, Differentiator and Instrumentation Amplifier using Op-Amp.	CO4
8.	Active Low pass filters, A/D and D/A convertor using OP-Amp.	CO4
9.	PLL characteristics and its use as Frequency Multiplier.	CO5
10.	Voltage Regulator using IC723.	CO5
	Total Periods	45
Text Bo		
1.	David A.Bell, "Electronic devices and Circuits", Prentice Hall of India, 2004.	
2.	D. Roy Choudhry, Shail Jain, "Linear Integrated Circuits", 4 <sup>th</sup> Edition, New A	ge International
2.	Pvt. Ltd., 2011.	
E-Resou	irces	
1.	https://www.electronics-tutorials.ws/amplifier/	
2.	https://www.multisim.com/help	
3.	https://www.it.iitb.ac.in/nmeict/videoDownloads.html?workshopid=OFQvSNjTnV YPpEA	ULIt65H-
4.	https://swayam.gov.in/	
5.	https://en.wikipedia.org/	

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		NDHA COLLEGE OF D ous Institution, Affiliated Elayampalayam, Tiru	l to Anr	na Uni	versity	, Chennai)	EN	TÜVRheinland CERTIFIED	SO 50112015				
Programme	B.E.	Programm	e code	10	3	Regul	ation	20	2019				
Department	ELECTRONICS AND COMMUNICATION     Semester       ENGINEERING     Semester												
Course code	Course Name Periods /Week Credit Maximu												
Course code	Cour	se mame	L	Т	Р	C	CA	ESE	Total				
U19EC416	Digital Signal Processing Laboratory     0     0     2     1     60     4												
Course Objective	<ul><li>To implet</li><li>To study</li><li>To implet</li></ul>	ion, DFT using MATL ment FIR and IIR filter the architecture of DSF ment the Multi-rate sig course, the student should	rs in M P proce nal pro	ATLA ssor. cessir	AB and	d DSP Proc		Kı	essor nowledge evel				
	CO1: Carryout to	o generate different sig	nals us	ing M	IATL	AB and DS	P		K2				
Course	CO2: Analyze th	e basic operations usin	ng MA'	ГLAB	and l	DSP Proces	ssor.		K2				
Outcome	CO3: Design and	d Implement the FIR an	nd IIR	Filters	s using	g MATLAI	B and D	SP	K2				
	CO4: Analyze th	e architecture of a DSI	P Proce	essor.					K2				
	CO5: Design a N	Aulti-rate system using	MATI	LAB a	and D	SP Process	or.		K2				
Pre-requisites	Signals and System	ns & Digital Signal Proce	ssing										

		(3/2/1	indicat	tes stre		COs V f correl			-	Mediu	ım, 1 -	Weak	Σ.		
SUB.CODE & NAME		DSP Laboratory													
COURSE OUTCOME	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO1	PSO 2	PSO3
CO1	3	3	2	2	2	2					2	2	3		2
CO2	3	3	2	2	2	2					2	2	3		2
CO3	3	3	2	2	2	2					2	2	3		2
CO4	3	2	2	2	2	2					2	2	3		2
CO5	3	2	2	2	2	2					2	2	3		2

Course Assessment Methods Direct

- 1. Pre lab and Post lab Test.
- 2. Assignment
- 3. End-Semester examinations

Indirect

1. Course - end survey.

S.No	List of Experiments	Course Outcome
1.	Generation of different types of Signals.	CO1
2.	Computation of DFT of signal input sequence	CO1
3.	Design and Implementation of Linear and Circular Convolution.	CO2
4.	Design and Simulation of FIR (LPF, HPF, BPF& BSF) filters.	CO4
5.	Design and Simulation of IIR (LPF, HPF, BPF& BSF) filters.	CO4
6.	Design and Simulation of sampling and sampling rate conversion.	CO2
	DSP PROCESSOR Experiments:	
7.	Study of architecture of Digital Signal Processor	CO3
8.	Generation of Signals.	CO1
9.	Computation of a DFT of a signal.	CO1
10.	Design and Implementation of Linear and Circular Convolution.	CO2
11.	Design and Implementation of FIR filters.	CO4
12.	Design and Implementation of IIR filters.	CO4
13.	Implement an Up-sampling and Down-sampling operation in DSP Processor	CO5
	Total Periods	45
1. V	ested Lab Manuals: inay K.Ingle , John G Proakis, "Digital Signal Processing using MATLAB", 3 <sup>rd</sup> Edition earning	,CENGAGE
2. So	ophocles J. Orfanidis, "DSP Lab Manual", RUTGERS UNIVERSITY, The State University	ty of New Jersey
E-Reso	urces	
	1.         http://research.iaun.ac.ir/pd/naghsh/pdfs/UploadFile_6417.pdf	
	2. https://en.wikipedia.org/wiki/Digital_signal_processor	

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		DHA COLLEGE OF ENGINEER ion, Affiliated to Anna University, Tiruchengode – 637 205			TOVINAME Correcto Correcto
Programme         B.E/B.TECH         Programme code				Regulation	2019
Department	ELECTRONICS AN ENGINEERING	<b>D</b> COMMUNICATION		Semester	IV

Course	code Course Name		riods j week	per	Credit	Maximum Marks			
coue		L	Т	Р	С	CA	ESE	Total	
U19EN401	Communication Skills laboratory	0	0	3	1	100	-	100	

Objective	• E	Enhar	with the the with	nem v	with	intra	perso	onal	skills	5.						
	The stu	dent	s wh	no co	mpl	ete 1	this	cour	se s	ucce	essfu	lly a	re ex	pected	to:	Knowledge Level
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Outcomes	<b>CO2:</b> E atmospi		-	for a	n ea	asy t	rans	itior	n fro	m st	udyi	ng t	o woi	king		K1
	<b>CO3:</b> A	ccon	nplis	hed	with	l pla	nnin	ig ar	nd co	orpo	rate	Man	lageri	al skill	s.	K2
	CO4: To professi					nal	corre	espo	nder	nce a	and e	exec	ute tl	ne sam	e in	K4
	<b>CO5:</b> To standar		ploy	the	prof	essi	onal	nee	ds a	nd a	lccon	nplis	shme	nts at g	global	K4
Pre- requisites	Nil															
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	CO 2 CO 3	-	-	-	-	-	2	-	-	2	3	-	3	-	2	
	CO 3 CO 4	-	-	-	-	-	2	-	-	2	2	-	3	-	1 2	
	CO 4	-	-	-	-	-	2	-	-	3	3	-	3	-	3	

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**English Language Proficiency:** Listening Comprehension, Reading Comprehension, Common Errors in English, Diction and its usage, Framing sentences – Idiomatic Expressions.

**Resume –** Structuring and Drafting the resume – Cover letter- Writing Professional Letters

Group Discussion: Introduction – Topic Analysis – Thematic Expressions-Objective and content of

discussion – Persuasion – Discussion – Controlling Emotions - Presentation of the group – Offering support – Use of functional Language - Summary and conclusion

**Presentation skills:** Making Self Introduction effectively-Elements of effective presentation – Structure of presentation - Presentation tools – Voice Modulation – Audience analysis - Body language – Accents analysis – Stylistics.

Soft Skills: Introduction - Change in Today's Workplace: Soft Skills as a Competitive Weapon -

Antiquity of Soft Skills - Classification of Soft skills - Ability to work as a team - Innovation,

Creativity and Lateral thinking – Flexibility - Personality Traits and Soft Skills for future Career

Advancement-Personality and Soft Skills for career growth- Time management.

Total Periods

45

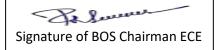
Lab	Manuals suggested:
1.	Anderson, P.V, <b>Technical Communication</b> , Thomson Wadsworth, Sixth Edition, New Delhi, 2007.
2.	John Seely, <b>The Oxford Guide to Writing and Speaking</b> , Oxford University Press, New Delhi, 2004.

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**3.** End-Semester examinations

## Indirect



1. Cc	urse - end survey		
Content of	the syllabus		
Unit – I	MODELING OF PHYSICAL SYSTEMS	Periods	9
Elements	of Control System - Open loop and closed loop systems - D	Differential equ	ation - Transfer
function,	Modeling of Electric systems - Block diagram reduction Techni	ques - Signal	flow graph. State
	resentation of Continuous Time systems - State equations - Trans	fer function fro	om State Variable
-	tation – Solutions of the state equations.		
Unit – I		Periods	9
	nain Specifications- Standard Test Signals- Impulse response - Tir		
	or unit step and unit ramp input - Time Response of Second order	Systems for un	ut step – Steady
	rs and static error constants-error coefficients.	D 1	0
Unit – II		Periods	9
	y Response Specifications of second order system - Correlation bet		d Frequency
Response	-Frequency response plot: Polar plot - Bode plot - M and N Circl	les.	
Unit – IV	SYSTEM DESIGN	Periods	9
	epts of Stability - Necessary Conditions for Stability - Routh Hurv		
	- Root Locus Construction. Introduction- Compensators and Contr	ollers-Design o	of Feedback
Compens	ation Scheme using Bode plot.	I	
Unit – V	, STATE VARIABLE ANALYSIS AND DIGITAL CONTROL SYSTEM	Periods	9
Concepts	of Controllability and Observability - State space representation f	or Discrete tim	e systems.
Sampled	Data control systems – Sample & Hold – Open loop & Closed loop	p sampled data	systems.
		<b>Fotal Periods</b>	45
Text Book	s		
1.	J.Nagrath & M.Gopal, "Control System Engineering", New Age	e International	Publishers, 5 <sup>th</sup>
1.	Edition, 2017.		
2.	Benjamin.C.Kuo, "Automatic Control System", Prentice Hall or	f India, 8 <sup>th</sup> Edit	ion, 2003.
3.	A. Nagoor Kani, "Control Systems" REA Publications, 3 <sup>rd</sup> Edi	ition. 2017	
Reference			
1.	Richard C. Dorf & Robert H. Bishop, "Modern Control System",	Prentice Hall.	2010.
2.	M.Gopal, "Control System – Principles and Design", Tata McGr		
3.	K. Ogata, 'Modern Control Engineering', 5th edition, PHI, 2012.		,
4.	S.K.Bhattacharya, Control System Engineering, 3rd Edition, Pear		
5.	Benjamin.C.Kuo, "Automatic control systems", Prentice Hall of	India, 7th Editi	on,1995.
E-Resourc	es		
1.	https://www.cgaspirants.com/2018/01/download-control-system- book-pdf.html	engineering-by	-i-j-nagrath-
2.	http://gppuri.in/pdf/lecturenotes/Control%20system%20note%20 .pdf	)for%206th%20	0sem%20electrical
3.	https://www.sanfoundry.com/1000-control-systems-questions-an	swers/	

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requisit	tes													
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1.	Course	- enu s	urvey											
Conten	t of the	syllabu	15											
Unit	– I		8- BI7	F and 1	6 - BIT MI	CROP	ROCE	SSOR		Per	iods		9	
Unit	– I		8- BI	F and 1	6 - BIT MI	CROP	ROCE	SSOR		Per	iods		9	12

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	hitecture, Instruction set, Addressing modes, Interrupts, Timing di	0	•
	ag. 8086 Architecture, Instruction set and programming, M	linimum and	Maximum mode
configura		Devie 1	0
Unit – I		Periods	<u>9</u>
	nals – Basic configurations – System bus timing –System design us on to Multiprogramming – System Bus Structure – Multiprocesso		
	bupled and loosely Coupled configurations – Introduction to advar	÷	
Unit – II		Periods	9
interface- controller	Interfacing and I/O interfacing – Parallel communication inter D/A and A/D Interface – Timer – Keyboard /display controller – Programming and applications Case studies: Traffic Light contro display interface and Alarm Controller.	r – Interrupt c	ontroller – DMA
Unit – IV	MICROCONTROLLER	Periods	9
	ture of 8051 – Special Function Registers(SFRs) – I/O Pins Ports and modes – Assembly language programming.	and Circuits –	Instruction set –
Unit – V		Periods	9
Programm	ning 8051 Timers – Serial Port Programming – Interrupts Prog		CD & Keyboard
U U	g – ADC, DAC & Sensor Interfacing – External Memory		•
Waveform	n generation.		
	r	<b>Total Periods</b>	45
Text Book	s		
1.	Doughlas V.Hall, "Microprocessors and Interfacing, Programm	ing and Hardw	are", TMH, 2012.
2.	A.K.Ray,K.M.Bhurchandi, "Advanced Microprocessors and Per	ripherals" 3rd e	edition, Tata
	McGrawHill, 2012		
Reference			
1.	Yu-Cheng Liu, Glenn A. Gibson, "Microcomputer Systems: The Architecture, Programming and Design", 2nd Edition, Prentice H		•
	Mohamed Ali Mazidi, Janice Gillispie Mazidi, Rolin McKinlay,		
2.	Embedded Systems: Using Assembly and C", 2nd Edition, Pears		
2	Krishna Kant, "Microprocessor and Microcontroller Architecture		
3.	design using 8085, 8086, 8051 and 8096", PHI, 2007, 7th Reprin		2 J
4.	Kenneth J. Ayala., "The 8051 Microcontroller, 3rd Edition, Thom		Learning", 2012.
5.	A.K. Ray, K.M. Bhurchandi, "Advanced Microprocessor and Per	<b>1</b>	U ,
5.	McGraw-Hill, 2nd Edition, 2010.	-	
E-Resourc	es		
1.	https://www.worldcat.org/title/microprocessors-and-interfacing-phardware/oclc/611374608	programming-a	nd-
2.	https://pdfcoffee.com/ak-ray-and-km-bhurchandi-advanced-microtata-mcgraw-hill-2012pdf-pdf-free.html	oprocessors-an	d-peripherals-3e-
3.	https://pdfcoffee.com/1pdfnetmicrocomputer-systems-the-8086-8 pdf-free.html	8088-family-ar	chitecture-pdf-
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concepts. <b>CO2:</b> Design simple matching networks using lumped elements, quarter - wave sections, and the Smith chart & its use for fundamental transmission line calculations.												
<b>CO3:</b> Analyze the electromagnetic fields configuration within the guides and general wave behaviors along uniform guiding structures.												
<ul> <li>CO4: Design the basic principles associated with waveguides (metallic and dielectric): Mode (TM, TE, TEM), cutoff frequency, guided wavelength, velocities.</li> <li>CO5: Describe the various types of planar transmission lines.</li> </ul>												
		<u>K4</u>										
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Content of	the syllabus		
Unit – I	TRANSMISSION LINE THEORY	Periods	9
	ascaded T Sections -Transmission lines - General Solution -Physic		e of the equations -
	e – wavelength, velocity of propagation, Distortion less line, the		
line not ter	minated in Zo, Reflection coefficient - Open and short circuited li	nes – insertion	loss.
Unit – I		Periods	9
	ers of the open wire at RF frequencies - Voltage and currents		
0	waves, nodes, standing wave ratio -input impedance of the dissipa		1 1
	nd short circuited lines – Power and impedance measurement of		
	ave line, half wave line – The Smith chart and its applications $-s$	ingle stub and	double matching
with the S	Guiden Smith chart. Guiden Waves AND		
Unit – II	I RECTANGULAR WAVEGUIDES	Periods	9
Wayes be	tween parallel planes of perfect conductors – Transverse electric	and transverse	magnetic waves
	eristics of TE and TM Waves – Transverse Electromagnetic v		
	es of the waves – Application of Maxwell's equations to the rect		
	Waves in Rectangular Wave guides – Transverse Electric Waves		
	stic of TE and TM Waves - Impossibility of TEM waves in wav		0
Unit – I	CIRCULAR WAVE GUIDES AND	Periods	9
	RESONATORS		
	al wave guides -Bessel function-TE and TM waves in circular w		
	guide terminations - Resonant cavities-Rectangular cavity reson	nator-Field exp	pressions - cutoff
<b>^</b> ·	-Quality factor.		0
Unit – V		Periods	<u>9</u>
	on to Planar transmission lines-Types- Strip line, Microstri Strip Line and Slot LineGeometrical structure ,Field configur		
	(qualitative treatment only)	ations ,Attenu	ation and Design
equations		<b>Total Periods</b>	45
Text Book			
1.	J. D. Ryder, "Networks, Lines and Fields", PHI, New Delhi, 20	03.	
2	E.C. Jordan and K.G. Balmain "Electro Magnetic Waves and R	adiating Syster	n". PHI. New
2.	Delhi, 2003.		,
2	Anand K. Verma, Introduction To Modern Planar Transmission	Lines: Physic	al Analytical and
3.	Circuit Models Approach, Wiley – IEEE press, 2021		ui, i marytical, and
Reference			
1.	Mathew N.O.Sadiku — "Elements of Electro Magnetics", 2nd E	dition, Oxford,	New York, 2005.
2	Ramo, Whineery and Van Duzer, "Fields and Waves in Commun	ication Electro	nics" John
2.	Wiley, 2003		
2	Stephen H. Hall, Howard L. Heck, "Advanced Signal Integrity F	or High-Speed	Digital
3.	Designs", John Wiley & Sons, 2009	0 1	e
4.	Reinmut K Hoffman, "Handbook of Microwave Integrated Circu	its", Artech He	ouse, 1987.
5.	R. K. Shevgaonkar, "Electromagnetic Waves", Tata McGraw Hi	ll Publications,	, 2006
E-Resourc	es		
1.	http://tubebooks.org/Books/martin_1955_electronic-circuits.pdf		
2.	https://www.coursehero.com/file/p1iskj2b/2-Electromagnetic-Wa Jordan-and-KG-Balmain-PHI-2nd/	aves-and-Radia	ating-Systems-EC-
3.	https://easyengineering.net/elements-of-electromagnetics-sadiku/	/	
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		ANDHA COLLEC mous Institution, A Elayampalaya	ffiliated	d to An	na Uni	versity, (		TÜVRheini CERTIFIE		
Programme	B.E.		Pro	gramm	e Code	103	Regulation		2019	
Department	ELECTRON ENGINEER	NICS AND COMM	MUNIC	CATIO	N		Semester		V	
Course Code	Course Name Periods Per Week Credit Maximum N									
Course Code	L T P C CA ESE									
U19EC521	Analog and Digital Communication31044060									
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Course	·	ehend and apprecia emporary world	ate the s	ignific	ance an	d role of	this course in		Level K3	
Outcomes	CO2: Evalua	ate the influence of	noise o	n com	nunica	tions sign	nals.		K6	
Outcomes		the knowledge of s nmunication system	0	•			te the performa	ance	K4	
	CO4: Apply	v line coding and pu	ulse sha	ping te	chniqu	es for da	ta transmissior	ı.	K4	
	CO5: Design	and implement ba	ind pass	signal	ing sch	emes.			K3	
Pre- requisites	-									

	CO / PO Mapping (3/2/1 indicates strength of correlation) <b>3-Strong</b> , <b>2 – Medium</b> , <b>1 - Weak</b>														
COs		(3/2/1 indicates strength of correlation) <b>3-Strong, 2 – Medium, 1 - Weak</b> Programme Outcomes (POs)												;	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	3	3	2							2			3		2
CO 2	3	2	2										3		2
CO 3	3	2	3							2			3		
CO 4	3	2									2			3	
CO 5	3	2												3	

#### Direct

- 1. Continuous Assessment Test I, II & III
- 2. Assignment
  - **3.** End-Semester examinations

## Indirect

1. Course - end survey

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Unit –	I AMPLITUDE AND ANGLE MODULAT SYSTEMS	ION Periods	9
relations	ion and demodulations of AM, DSBSC, SSB and VSB si hip- frequency spectrum for sinusoidal AM -AM transmi lation of FM –FM transmitter. Frequency and Phase Mo	tter and receiver. Gener	ation and
Unit – I	II NOISE THEORY	Periods	9
	n Random Process-Stationary Random Process- Noise - noise and white noise; Narrow band noise, Noise factor,		
Unit – I	DIGITAL COMMUNICATION	Periods	9
Reconst	Communication: Functional Description- Channel Classi truction-Quantization-Uniform and Non Uniform Quantiz nding of Speech signal-PCM-TDM		
Unit – I	IV BASEBAND TRANSMISSION TECHNIQU	ES Periods	9
	ies of Line codes-Power spectral density of Unipolar/Polatic transmission-Pulse Shaping-		
• •	-Equalization.	Correlative coding-Mar	j ~ j -
pattern- Unit – V	-Equalization.           BAND PASS MODULATION           TECHNIQUES	Periods	9
pattern- Unit – V Amplitu Shift Ke	-Equalization.           BAND PASS MODULATION	Periods Amplitude Modulation	9 - Binary Frequency
pattern- Unit – V Amplitu Shift Ke	-Equalization. V BAND PASS MODULATION TECHNIQUES ude Shift Keying, Binary Phase Shift Keying- Quadrature eying-Quadrature Phase Shift Keying-Carrier synchroniz	Periods Amplitude Modulation	9 - Binary Frequency coherent receivers-
pattern- Unit – V Amplitu Shift Ke	-Equalization. V BAND PASS MODULATION TECHNIQUES ude Shift Keying, Binary Phase Shift Keying- Quadrature eying-Quadrature Phase Shift Keying-Carrier synchroniz le of DPSK.	Periods e Amplitude Modulation ation, Structure of Non	9 - Binary Frequency coherent receivers-
pattern- Unit – V Amplitu Shift Ke Principl	-Equalization. V BAND PASS MODULATION TECHNIQUES ude Shift Keying, Binary Phase Shift Keying- Quadrature eying-Quadrature Phase Shift Keying-Carrier synchroniz le of DPSK.	Periods e Amplitude Modulation ation, Structure of Non <b>Total Periods</b>	9 - Binary Frequency coherent receivers- 5 45
pattern- Unit – Amplitu Shift Ke Principl Text Bool	-Equalization.           V         BAND PASS MODULATION TECHNIQUES           ude Shift Keying, Binary Phase Shift Keying- Quadrature eying-Quadrature Phase Shift Keying-Carrier synchroniz le of DPSK.           ks           B.P.Lathi, "Modern Digital and Analog Communication	Periods e Amplitude Modulation ation, Structure of Non <b>Total Periods</b> on Systems", 3rd Edition	9 - Binary Frequency coherent receivers- 5 45
pattern- Unit – V Amplitu Shift Ke Principl Text Bool 1.	Equalization.         V       BAND PASS MODULATION TECHNIQUES         ude Shift Keying, Binary Phase Shift Keying- Quadrature eying-Quadrature Phase Shift Keying-Carrier synchroniz le of DPSK.         ks         B.P.Lathi, "Modern Digital and Analog Communication 2011.         Simon Haykins, "Digital Communications", John Wile	Periods e Amplitude Modulation ation, Structure of Non <b>Total Periods</b> on Systems", 3rd Edition	9 - Binary Frequency coherent receivers- 5 45
pattern- Unit – V Amplitu Shift Ko Principl Text Bool 1. 2.	Equalization.         V       BAND PASS MODULATION TECHNIQUES         ude Shift Keying, Binary Phase Shift Keying- Quadrature eying-Quadrature Phase Shift Keying-Carrier synchroniz le of DPSK.         ks         B.P.Lathi, "Modern Digital and Analog Communication 2011.         Simon Haykins, "Digital Communications", John Wile         es         Simon Haykin, "Communication Systems", John Wile	Periods e Amplitude Modulation ation, Structure of Non <b>Total Periods</b> on Systems", 3rd Edition ey, 2013 y & Sons, Newark, 4th 1	9 - Binary Frequency coherent receivers- 5 45 h, Oxford Press, Edition, 2001.
pattern- Unit – V Amplitu Shift Ke Principl Text Bool 1. 2. Reference	Equalization.         V       BAND PASS MODULATION TECHNIQUES         ude Shift Keying, Binary Phase Shift Keying- Quadrature eying-Quadrature Phase Shift Keying-Carrier synchroniz le of DPSK.         ks         B.P.Lathi, "Modern Digital and Analog Communication 2011.         Simon Haykins, "Digital Communications", John Wile	Periods e Amplitude Modulation ation, Structure of Non <b>Total Periods</b> on Systems", 3rd Edition ey, 2013 y & Sons, Newark, 4th 1	9 - Binary Frequency coherent receivers- 5 45 h, Oxford Press, Edition, 2001.
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pattern- Unit – V Amplitu Shift Ko Principl Text Bool 1. 2. Reference 1. 2.	Equalization.         V       BAND PASS MODULATION TECHNIQUES         ude Shift Keying, Binary Phase Shift Keying- Quadrature eying-Quadrature Phase Shift Keying-Carrier synchroniz le of DPSK.         ks         B.P.Lathi, "Modern Digital and Analog Communication 2011.         Simon Haykins, "Digital Communications", John Wile         es         Simon Haykin, "Communication Systems", John Wile         Dennis Roddy & John Coolen – "Electronic Communi	Periods e Amplitude Modulation ation, Structure of Non <b>Total Periods</b> on Systems", 3rd Edition ey, 2013 y & Sons, Newark, 4th cation"4th Edition, Prer , Pearson Education, 20	9 - Binary Frequency coherent receivers- <b>45</b> - A - A - A - A - A - A - A - A
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Text Bool 1. 2. Reference 1. 2. 3. 4.	Equalization.         V       BAND PASS MODULATION TECHNIQUES         ude Shift Keying, Binary Phase Shift Keying- Quadrature eying-Quadrature Phase Shift Keying-Carrier synchroniz le of DPSK.         ks         B.P.Lathi, "Modern Digital and Analog Communication 2011.         Simon Haykins, "Digital Communications", John Wile         es         Simon Haykin, "Communication Systems", John Wile         Dennis Roddy & John Coolen – "Electronic Communi John.G.Proakis, "Digital Communication", 4th Edition         Amitabha Bhattacharya, "Digital Communications", T         Sam K.Shanmugam —Digital & Analog Communication	Periods e Amplitude Modulation ation, Structure of Non <b>Total Periods</b> on Systems", 3rd Edition ey, 2013 y & Sons, Newark, 4th I cation"4th Edition, Prer , Pearson Education, 20 ata McGraw Hill, 2006	9 - Binary Frequency coherent receivers- - 45 - A5 - A5
pattern- Unit – V Amplitu Shift Ko Principl Text Bool 1. 2. Reference 1. 2. 3. 4. 5.	Equalization.         V       BAND PASS MODULATION TECHNIQUES         ude Shift Keying, Binary Phase Shift Keying- Quadrature eying-Quadrature Phase Shift Keying-Carrier synchroniz le of DPSK.         ks         B.P.Lathi, "Modern Digital and Analog Communication 2011.         Simon Haykins, "Digital Communications", John Wile         es         Simon Haykin, "Communication Systems", John Wile         Dennis Roddy & John Coolen – "Electronic Communi John.G.Proakis, "Digital Communication", 4th Edition         Amitabha Bhattacharya, "Digital Communications", T         Sam K.Shanmugam —Digital & Analog Communication	Periods Periods Periods Periods Periods Periods Total Periods	9         a- Binary Frequency         coherent receivers-         s       45         h, Oxford Press,         Edition, 2001.         ntice Hall of India.         06.         %20P.%20Lathi%2
pattern- Unit – V Amplitu Shift Ke Principl Text Bool 1. 2. Reference 1. 2. 3. 4. 5. E-Resource	Equalization.         V       BAND PASS MODULATION TECHNIQUES         ude Shift Keying, Binary Phase Shift Keying- Quadrature eying-Quadrature Phase Shift Keying-Carrier synchroniz le of DPSK.         ks         B.P.Lathi, "Modern Digital and Analog Communication 2011.         Simon Haykins, "Digital Communications", John Wile         es         Simon Haykin, "Communication Systems", John Wile         Dennis Roddy & John Coolen – "Electronic Communi John.G.Proakis, "Digital Communication", 4th Edition         Amitabha Bhattacharya, "Digital Communications", T         Sam K.Shanmugam —Digital & Analog Communication         https://edisciplinas.usp.br/pluginfile.php/5251120/mod C%20Zhi%20Ding%20%20Modern%20Digital%20an	Periods Periods Amplitude Modulation ation, Structure of Non <b>Total Periods</b> on Systems", 3rd Edition by, 2013 y & Sons, Newark, 4th I cation"4th Edition, Prer , Pearson Education, 20 ata McGraw Hill, 2006 on systems John Wiley _resource/content/1/B.9 d% 20Analog% 20Comm 9.pdf	9 - Binary Frequency coherent receivers- - 45 - A5 - A5

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	V			ous Ins	stitution	, Affili	ated to	Anna U	Jnivers	ity, Cl				ISO 500 TÜVRheinland CERTIFIED	1.2015 <b></b>
CourseWrite ALP for aObjective• Write ALP for a• Differentiate th• Interface difference• Determine the of• Determine the of• At the end of the courseOutcomeCO1: Illustrate the ALDCO2: Develop variousCO3: Analyze the SeriaCO4: Distinguish the in Arduino and PIC.CO5: Evaluate the data with Microprocessors, APre- requisites-CO3CO3CO3CO3CO3CO4CO5: Evaluate the data with Microprocessors, APre- requisites-CO3CO					yampal			U			_			10 910504	16155
Programme		-					U	nme Co	ode 1	03	Regu	lation		Z019         V         num Marks         ESE       Total         40       100         Knowledge         Level         K2         K3         K6         CO/PSO         Image: SOs         SOs       PSO         SO       PSO         2       2         2       2	
Departmen	nt I				ND CO	MMU	NICAT	ION			Sen	nester		V	<del>,</del>
Course Code	e		Cours	e Name	e	Pe		er Wee		edit C	С				
U19EC522		-				(				1	6			,	
		<ul> <li>Introduce ALP concepts, features and Coding methods</li> <li>Write ALP for arithmetic and logical operations in 8086 and 8051.</li> <li>Differentiate the Serial and Parallel Interface.</li> <li>Interface different I/Os with Microprocessors.</li> <li>Determine the operation of Microprocessors, Arduino and PIC.</li> </ul>													owledg
	C C C C	<ul> <li>O1: Illustrate the ALP concepts and features.</li> <li>O2: Develop various arithmetic and logical operations in 8086 and 8051.</li> <li>O3: Analyze the Serial and Parallel Interface.</li> <li>O4: Distinguish the interface between different I/Os with Microprocessors,</li> </ul>										Level K2 K3 K4 K3			
	С							munot	ign ser	iai & j	paralle	el port	8		K6
	С			cessors	s, Ardui	no and	PIC.							250	K6
requisites	C w	ith Mi		ngth of	s, Ardui CO / Pe correlat	no and O Mapp ion) 3-8	PIC. Ding trong, 2	2 – Med					CO/I Map	ping	K6
COs	C W - (3/2/1	ith Mi	icropro ates stre	ngth of	s, Ardui	no and O Mapp ion) 3-8	PIC. Ding trong, 2	2 – Med		– Wea	k PO	PO	CO/F Map PSOs PSO	ping PSO	PSO
COs PC CO 1	C W - (3/2/1 01 3	ith Mi	ates stre	ngth of	correlat Progran	D Mappion 3-S me Out PO 6	PIC. Ding trong, 2 comes (	2 – Med POs)	ium, 1	– Wea	k PO 11		CO/I Map PSOs	PSO 2	PSO 3
COs CO1 CO2	C W - (3/2/1 01 3 3	ith Mi indica PO 2	ates stre PO 3 2	ngth of	CO / Pe correlat Program PO 5 2 2	D Mappion) 3-S me Out PO 6	PIC. bing trong, 2 comes ( PO 7	2 – Med POs)	ium, 1	- Wea PO 10	k PO 11 2	PO	CO/F Map PSOs PSO 1 3 2	PSO 2 2	PSO 3
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COs COs CO 1 CO 2 CO 3 CO 4 CO 5 Course Asses Direct	C W - (3/2/1 01 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	ith Mi indica PO 2 2 2 nt Met nd Pos	etes stre PO 3 2 2	ngth of PO 4	CO / Pe correlat Program PO 5 2 2 2 2	D Mappion) 3-S me Out PO 6	PIC. bing trong, 2 comes ( PO 7	2 – Med POs)	ium, 1	- Wea	k PO 11 2 2	PO	CO/F Map PSOs PSO 1 3 2 2	PSO 2 2	PSO 3 2
COs       CO 1       CO 2       CO 3       CO 4       CO 5	C W W - (3/2/1 01 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	ith Mi indica PO 2 2 2 2 2 nt Met nd Pos ent nester of	ates stre PO 3 2 2 thods st lab To examina	est.	CO / Pe correlat Program PO 5 2 2 2 2 2 2	D Mappion) 3-S me Out PO 6	PIC. bing trong, 2 comes ( PO 7	2 – Med POs)	ium, 1	- Wea	k PO 11 2 2	PO	CO/F Map PSOs PSO 1 3 2 2	PSO 2 2	PSO 3 2
COs COs CO 1 CO 2 CO 3 CO 4 CO 4 CO 5 Course Asses Direct 1. Pre 2. Ass 3. End Indirect	C W W - (3/2/1 01 3 3 3 3 3 3 3 3 3 3 3 5 ssmer ssmer d-Sem urse -	ith Mi indica PO 2 2 2 2 2 nt Met nd Pos ent nester of end su	ates stre PO 3 2 2 thods st lab To examina	est.	CO / Pe correlat Program PO 5 2 2 2 2 2 2	D Mappion) 3-S me Out PO 6	PIC. bing trong, 2 comes ( PO 7	2 – Med POs)	ium, 1	- Wea	k PO 11 2 2	PO	CO/F Map PSOs PSO 1 3 2 2	PSO 2 2	PSO 3 2
COs CO 1 CO 2 CO 3 CO 4 CO 4 CO 5 Course Asses Direct 1. Pre 2. Ass 3. End Indirect	C           W           -           (3/2/1)           01           3           4.5em           urse -           he syl	ith Mi indica PO 2 2 2 2 2 at Met ent Met ent su end su labus	ates stre PO 3 2 2 2 thods st lab To examina irvey.	est.	CO / Pe correlat Program PO 5 2 2 2 2 2 2	D Mappion) 3-S me Out PO 6	PIC. bing trong, 2 comes ( PO 7	2 – Med POs)	ium, 1	- Wea	k PO 11 2 2	PO	CO/F Map PSOs PSO 1 3 2 2	PSO 2 2 2 2 2	PSO 3 2

1.	Programs for 16 bit Arithmetic operations.	CO1
2.	Programs for Sorting and Searching using MASM	CO3
3.	Interfacing ADC and DAC.	CO3
4.	Parallel Communication between two MP Kits using Mode 1 and Mode 2 of 8255.	CO4
5.	Interfacing and Programming 8279, 8259, and 8253.	CO3
6.	Serial Communication between two MP Kits using 8251.	CO4
7.	Interfacing and Programming of Stepper Motor and DC Motor Speed control.	CO1
8051 Ex	periments using kits	
1.	Programming using Arithmetic, Logical and Bit Manipulation instructions of 8051 microcontroller.	C01,C02
2.	Communication between 8051 Microcontroller kit and PC.	CO5
Arduino		
1.	Interfacing switch and LED with Arduino.	CO5
PIC		
1.	Interrupt programming using PIC.	CO5
2.	USART programming using PIC.	CO5
Minipro		
	Total Periods	45
Text Boo	bks	
1.	Yu-Cheng Liu, Glenn A. Gibson, "Microcomputer Systems: The 8086 / 8088 Family Architecture, Programming and Design", 2nd Edition, Prentice Hall of India, 2014.	/ —
2.	Muhammed Ali Mazidi, Rolind D Mckinlay, Danny Causey "PIC Microcontroller an Systems", Pearson Edition 2008.	nd Embedded
3.	Michael-Margolis, Arduino-Cookbook., Revised edition, O'Reilly, 1st edition, 2011.	
4.	D.Dale.Wheat, Arduino.Internals, TIA publication, 5th edition, 2011.	
E-Resou	rces	
1.	https://pdfcoffee.com/1pdfnetmicrocomputer-systems-the-8086-8088-family-architec free.html	cture-pdf-pdf-
2.	http://www.staroceans.org/kernel-and- driver/PIC%20Microcontroller%20and%20Embedded%20Systems%20Using%20As 0C%20for%20PIC18.pdf	
3.	https://www.worldcat.org/title/pic-microcontroller-and-embedded-systems-using-ass for-pic18/oclc/77476437	embly-and-c-

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NORMAL REPORT	A A A A A A A A A A A A A A A A A A A			nous Ir		n, Affi	liated to	o Anna	Univ	NG FO ersity, C 7 205				TÜVRheinland CERTIFIED	12015 03.50 0.55		
Progra	mme	<b>B.</b>	E				Progra	amme (	Code	103	Reg	ulatio	n	201	19		
Depart	ment		CTRON NEER		ND CO	OMMU	JNICA	TION			Se	emeste	r	V	-		
0	7 1		C	N		F	Periods	Per We	eek	Credit		Max	ximun	n Mark	s		
Course (	Jode		Cour	se Nan	ne		L	Т	Р	С	(	CA	ES	E	Total		
U19EC5	23		g and l nunicat		aborato	ory	0	0	2	1 60 40 10							
Course Objectiv	ve	•	<ul> <li>introduce the relevance of this course to the existing technology through demonstrations, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues</li> <li>Analyze the various types of modulation and demodulation techniques.</li> <li>Demonstrate the sampling theorem, amplitude modulation (AM), binary modulation and power measurements.</li> <li>Analyze the various types of Line Coding techniques</li> </ul>														
Course Outcom	e	CO1: CO2: CO3:	Analyze the various types of Line Coding techniques     At the end of the course, the student should be able to,     CO1: Demonstrate analog modulation techniques     CO2: Interpret various pulse modulation techniques     CO3: Construct various receiver circuits     CO4: Apply line coding techniques for data transmission												Knowledg Level K4 K2 K4 K4 K3		
		<b>CO4:</b> Apply line coding techniques for data transmission <b>CO5:</b> Analyze various digital modulation schemes.												K4			
Pre- requisite	ès	-	·	<u> </u>		<u> </u>								1			
COs	(3/2	2/1 indica	ates stre	ngth of		ion) <b>3-S</b>	trong, 2		lium, 1	1 – Wea	k		CO/I Map PSOs	ping			
COS	PO 1	PO 2	PO 3	PO 4	Program	PO 6	PO 7	PO 8	PO 9	PO	PO	PO	PSO:	PSO	PSO		
			105	104		100	107	100	10,	10	11	12	1	2	3		
CO 1 CO 2	3	2			22	2			-	2			3	3	2		
CO 2 CO 3	3	2			2	2				2	2		3	3			
CO 4	3		2		3	2							3	3	2		
CO 5	3		2		3						2		3				
Course A	ssessi	nent M	ethods														
<b>Direct</b> 1. 2.	Pre la Assig	b and Ponnent	ost lab 7														
Indirec 4.		e - end	survey.														
Content	of the	syllabu	S											0	urse		
															IIIICA		

Design and construction of transistor based Amplitude modulator and Demodulator.	CO1
Design of Frequency Modulator and Demodulator	CO1
Generation and detection of Pulse Modulation – PAM / PWM / PPM.	CO2
Analyze of a PCM system and interpret the modulated and demodulated waveforms.	CO2
Analyze of a Delta Modulator and Adaptive Delta Modulator.	CO4
Design and implementation of Digital Modulation & Demodulation (ASK, PSK, FSK) and its simulation using MATLAB.	CO5
Designing, Assembling and Testing of Pre-Emphasis & De-emphasis Circuits.	CO3
Designing, Assembling and Testing of Phase locked loop.	CO3
Sampling & Time Division Multiplexing using PAM signals.	CO2
Performance of different Line Coding (NRZ, RZ & Manchester).	CO4
Mini Project.	CO5
Total Periods	45
bks	
B.P.Lathi, "Modern Digital and Analog Communication Systems", 3rd Edition 2011.	, Oxford Press,
Sam K.Shanmugam — Digital & Analog Communication systems John Wiley,200	)8.
rces	
C%20Zhi%20Ding%20- %20Modern%20Digital%20and%20Analog%20Communication%20Systems-	P.%20Lathi%2
https://content.kopykitab.com/ebooks/2013/09/1871/sample/sample_1871.pdf	
	Design of Frequency Modulator and Demodulator         Generation and detection of Pulse Modulation – PAM / PWM / PPM.         Analyze of a PCM system and interpret the modulated and demodulated waveforms.         Analyze of a Delta Modulator and Adaptive Delta Modulator.         Design and implementation of Digital Modulation & Demodulation (ASK, PSK, FSK) and its simulation using MATLAB.         Designing, Assembling and Testing of Pre-Emphasis & De-emphasis Circuits.         Designing, Assembling and Testing of Phase locked loop.         Sampling & Time Division Multiplexing using PAM signals.         Performance of different Line Coding (NRZ, RZ & Manchester).         Mini Project.         Total Periods         bks         B.P.Lathi, "Modern Digital and Analog Communication Systems", 3rd Edition 2011.         Sam K.Shanmugam —Digital & Analog Communication systems! John Wiley,200         Crees         https://edisciplinas.usp.br/pluginfile.php/5251120/mod_resource/content/1/B.%201         C% 20Zhi% 20Ding% 20-       % 20Modern% 20Digital% 20and% 20Analog% 20Communication% 20Systems-Oxford% 20University% 20Press% 20% 282009% 29.pdf

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HOMEN EMPOWERNEN		Elayampalaya	ım, Tirt	icheng	ode – 6	37 205		CERTIFI	D 918546055	
Programme	B.E.		Pro	gramm	e Code	103	Regulation		2019	
Department	ELECTRO ENGINEER	NICS AND COM RING	MUNIC	CATIO	N		Semester		VI	
Course Code	Cou	rse Name	Period	ls Per	Week	Credit	Maxin	num N	n Marks	
Course Coue	Cou	ise maine	L	Т	Р	С	CA	ESE	Total	
U19EC625	VLSI Design         3         0         0         3         40         60									
Course	<ul><li>Lea</li><li>An</li><li>Eva</li></ul>	should be made to arn the concepts of alyze the characteri aluate the character	istics of	CMOS	S transi	stor.		MOS	lata path	
Objective	<ul> <li>design.</li> <li>Understand the concept of testing and various testing techniques.</li> <li>Learn the concepts of modeling a digital system using Hardware Desc Language.</li> </ul>									
	At the end of	f the course, the stu	dent she	ould be	e able to	Э,			Knowledg Level	
	CO1: Analy	ze the VLSI design	flow a	nd lear	n about	basic Cl	MOS circuits.		K4	
Course	CO2: Analy	ze the characteristic	cs of CN	MOS tr	ansisto	r.			K4	
Outcomes	CO3: Desig	n combinational and	d seque	ntial ci	rcuits v	vith low	power.		K3	
	<b>CO4:</b> Know techniques.	about need for test	ing and	to con	npare th	ne concep	ot various testin	ng	K2	
		esize the combination	onal and	l seque	ential ci	rcuits us	ing Verilog HI	DL.	K5	
	<b>Digital Sys</b>									

															CO/PSO		
	(3/2/1 indicates strength of correlation) <b>3-Strong, 2 – Medium, 1 - Weak</b>																
COs		Programme Outcomes (POs)													PSOs		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	<b>PO 8</b>	PO 9	РО	PO	PO	PSO	PSO	PSO		
										10	11	12	1	2	3		
CO 1	3	2	2	2					2				3				
CO 2	3	2								2	2		3	2	2		
CO 3	3	2	2	2									3	2			
CO 4	3	2							2	2			2		2		
CO 5	3	2	2										2	2			
	CO 1 CO 2 CO 3 CO 4	COs         PO 1           CO 1         3           CO 2         3           CO 3         3           CO 4         3	COs         PO 1         PO 2           CO 1         3         2           CO 2         3         2           CO 3         3         2           CO 4         3         2	COs         PO 1         PO 2         PO 3           CO 1         3         2         2           CO 2         3         2         2           CO 3         3         2         2           CO 4         3         2         2	(3/2/1 indicates strength of         COs         PO 1       PO 2       PO 3       PO 4         CO 1       3       2       2       2         CO 2       3       2       2       2         CO 3       3       2       2       2         CO 4       3       2       1       1	(3/2/1 indicates strength of correlat         Program         PO1       PO2       PO3       PO4       PO5         CO1       3       2       2       2         CO2       3       2       2       2         CO3       3       2       2       2         CO4       3       2       1       1	(3/2/1 indicates strength of correlation) 3-5         Programme Out         PO 1       PO 2       PO 3       PO 4       PO 5       PO 6         CO 1       3       2       2       2       2       2         CO 2       3       2       2       2       2       2         CO 3       3       2       2       2       2       2         CO 4       3       2       1       1       1       1	(3/2/1 indicates strength of correlation) 3-Strong, 2         COs         PO 1       PO 2       PO 3       PO 4       PO 5       PO 6       PO 7         CO 1       3       2       2       2       2       2       2         CO 2       3       2       2       2       2       2       2         CO 3       3       2       2       2       2       2       2       2         CO 4       3       2       4 <th>(3/2/1 indicates strength of correlation) 3-Strong, 2 – Med         COs         Programme Outcomes (POs)         P01       P02       P03       P04       P05       P06       P07       P08         C01       3       2       3       2       2</th> <th>(3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 -         COs         PO1       PO2       PO3       PO4       PO5       PO6       PO7       PO8       PO9         CO1       3       2       2       2       2       2       2         CO2       3       2       2       2       1       2       2         CO3       3       2       2       2       2       2       2         CO4       3       2       1       1       2       2</th> <th>(3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weal         Programme Outcomes (POs)         PO1       PO2       PO3       PO4       PO5       PO6       PO7       PO8       PO9       PO 10         CO1       3       2       2       2       2       2       2       2         CO2       3       2       2       2       2       2       2       2         CO3       3       2       2       2       2       2       2       2         CO4       3       2       1       1       2       2       2       2       2</th> <th>(3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak         COs         PO 1       PO 2       PO 3       PO 4       PO 5       PO 6       PO 7       PO 8       PO 9       PO 10       PO 111         CO 1       3       2<!--</th--><th>(3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak         COs         Programme Outcomes (POs)         PO1       PO2       PO3       PO4       PO5       PO6       PO7       PO8       PO9       PO       PO       PO         CO1       3       2       2       2       2       2       2       2         CO2       3       2       2       2       2       2       2       2         CO3       3       2       2       2       2       2       2       2         CO4       3       2       2       2       2       2       2       2</th><th>(3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak       Mapy         COs       Programme Outcomes (POs)       PSOs         P01       P02       P03       P04       P05       P06       P07       P08       P09       P0       P0       P0       P30       P30         C01       3       2       2       2       1       2       1       12       1       1       12       1       1       12       1       1       12       1       1       12       1       1       1       12       1       1       1       12       1</th><th>(3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak       Mapping         COs       PO1       PO2       PO3       PO4       PO5       PO7       PO8       PO       PO       PSO         PO1       PO2       PO3       PO4       PO5       PO7       PO8       PO       PO       PSO       PSO         CO1       3       2       2       PO       PO       PSO       PSO         CO1       3       2       2       PO       PO       PSO       PSO         CO1       3       2       2       2       3       3       2         CO2       3       2       2       2       3       2         CO2       3       2       2       2       <th cols<="" th=""></th></th></th>	(3/2/1 indicates strength of correlation) 3-Strong, 2 – Med         COs         Programme Outcomes (POs)         P01       P02       P03       P04       P05       P06       P07       P08         C01       3       2       3       2       2	(3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 -         COs         PO1       PO2       PO3       PO4       PO5       PO6       PO7       PO8       PO9         CO1       3       2       2       2       2       2       2         CO2       3       2       2       2       1       2       2         CO3       3       2       2       2       2       2       2         CO4       3       2       1       1       2       2	(3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weal         Programme Outcomes (POs)         PO1       PO2       PO3       PO4       PO5       PO6       PO7       PO8       PO9       PO 10         CO1       3       2       2       2       2       2       2       2         CO2       3       2       2       2       2       2       2       2         CO3       3       2       2       2       2       2       2       2         CO4       3       2       1       1       2       2       2       2       2	(3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak         COs         PO 1       PO 2       PO 3       PO 4       PO 5       PO 6       PO 7       PO 8       PO 9       PO 10       PO 111         CO 1       3       2 </th <th>(3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak         COs         Programme Outcomes (POs)         PO1       PO2       PO3       PO4       PO5       PO6       PO7       PO8       PO9       PO       PO       PO         CO1       3       2       2       2       2       2       2       2         CO2       3       2       2       2       2       2       2       2         CO3       3       2       2       2       2       2       2       2         CO4       3       2       2       2       2       2       2       2</th> <th>(3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak       Mapy         COs       Programme Outcomes (POs)       PSOs         P01       P02       P03       P04       P05       P06       P07       P08       P09       P0       P0       P0       P30       P30         C01       3       2       2       2       1       2       1       12       1       1       12       1       1       12       1       1       12       1       1       12       1       1       1       12       1       1       1       12       1</th> <th>(3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak       Mapping         COs       PO1       PO2       PO3       PO4       PO5       PO7       PO8       PO       PO       PSO         PO1       PO2       PO3       PO4       PO5       PO7       PO8       PO       PO       PSO       PSO         CO1       3       2       2       PO       PO       PSO       PSO         CO1       3       2       2       PO       PO       PSO       PSO         CO1       3       2       2       2       3       3       2         CO2       3       2       2       2       3       2         CO2       3       2       2       2       <th cols<="" th=""></th></th>	(3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak         COs         Programme Outcomes (POs)         PO1       PO2       PO3       PO4       PO5       PO6       PO7       PO8       PO9       PO       PO       PO         CO1       3       2       2       2       2       2       2       2         CO2       3       2       2       2       2       2       2       2         CO3       3       2       2       2       2       2       2       2         CO4       3       2       2       2       2       2       2       2	(3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak       Mapy         COs       Programme Outcomes (POs)       PSOs         P01       P02       P03       P04       P05       P06       P07       P08       P09       P0       P0       P0       P30       P30         C01       3       2       2       2       1       2       1       12       1       1       12       1       1       12       1       1       12       1       1       12       1       1       1       12       1       1       1       12       1	(3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak       Mapping         COs       PO1       PO2       PO3       PO4       PO5       PO7       PO8       PO       PO       PSO         PO1       PO2       PO3       PO4       PO5       PO7       PO8       PO       PO       PSO       PSO         CO1       3       2       2       PO       PO       PSO       PSO         CO1       3       2       2       PO       PO       PSO       PSO         CO1       3       2       2       2       3       3       2         CO2       3       2       2       2       3       2         CO2       3       2       2       2 <th cols<="" th=""></th>		

### Direct

- 1.Continuous Assessment Test I, II & III
- 2. Assignment
- **3.** End-Semester examinations

### Indirect

# 1. Course - end survey

Former Signature of BOS Chairman ECE

Unit – I	TECHNOLOGY	Periods	9
characteris Fabrication	Circuit Design Techniques, VLSI Design Flow -MOS transisto tics, Non ideal I-V effects, DC transfer characteristics. Switch methods-P-well, N-well, Twin Tub, SOI. CMOS process enha gic. Technology related CAD issues, manufacturing issues.	level RC dela	y models. CMOS
Unit – I		N Periods	9
	imation, Logical effort and Transistor sizing, Power dissipation, In y, Scaling- SPICE tutorial, Device models, Device characterization	nterconnect, De	
Unit – II	CIRCUIT DESIGN	Periods	9
circuit de	milies –Low power logic design – comparison of circuit famili sign of latches and flip flops, Static sequencing element methodolo synchronizers, Data Path Subsystem Design-Addition/Subtraction	ogy- sequencing	g dynamic
Unit – IV		Periods	9
Manufact	testing- Testers, Text fixtures and test programs- Logic verification uring test – FPGA Building Block Architectures, FPGA Intercontaility- Ad hoc Design, Scan Design, IDDQ Testing ,Built in Self Tector VERILOG HDL	nect Routing P	rocedures Design
Design h	nts conditional statements, Data flow and RTL, structural gat ierarchies, Behavioral and RTL modeling, Test benches, Struc equality detector, comparator, priority encoder, half adder, full ad o flop.	ctural gate leve	el description of
			1
Text Book		Total Periods	45
<b>Text Book</b> 1.	s Neil Weste & David Harris , "CMOS VLSI Design-A circuits &		I
	s Neil Weste & David Harris , "CMOS VLSI Design-A circuits & Edition, Pearson education, New Delhi, 2017 Palnitkar Samir, "Verilog HDL: Guide to Digital Design and syn	System Perspe	ctive", 4th
1.	s Neil Weste & David Harris , "CMOS VLSI Design-A circuits & Edition, Pearson education, New Delhi, 2017 Palnitkar Samir, "Verilog HDL: Guide to Digital Design and syn Education , New Delhi, 2017.	System Perspe	ctive", 4th
1. 2.	s Neil Weste & David Harris , "CMOS VLSI Design-A circuits & Edition, Pearson education, New Delhi, 2017 Palnitkar Samir, "Verilog HDL: Guide to Digital Design and syn Education , New Delhi, 2017.	System Perspe thesis", 2nd Ed n, Layout and S	ctive", 4th lition, Pearson imulation", JEEE
1.2.Reference	<ul> <li>s</li> <li>Neil Weste &amp; David Harris, "CMOS VLSI Design-A circuits &amp; Edition, Pearson education, New Delhi, 2017</li> <li>Palnitkar Samir, "Verilog HDL: Guide to Digital Design and syn Education, New Delhi, 2017.</li> <li>s</li> <li>R. Jacob Baker, Harry W. Li, David E. Boyce, "CMOS Circuit Design</li> </ul>	System Perspe thesis", 2nd Ed n, Layout and S eries Edition,2	ctive", 4th lition, Pearson imulation",IEEE 011.
1. 2. <b>Reference</b> 1.	<ul> <li>s</li> <li>Neil Weste &amp; David Harris , "CMOS VLSI Design-A circuits &amp; Edition, Pearson education, New Delhi, 2017</li> <li>Palnitkar Samir, "Verilog HDL: Guide to Digital Design and syn Education , New Delhi, 2017.</li> <li>s</li> <li>R. Jacob Baker, Harry W. Li, David E. Boyce, "CMOS Circuit Desig Press Series on Microelectronics Systems Stuart K. Tewksbuy, S</li> </ul>	System Perspe thesis", 2nd Ed n, Layout and S eries Edition,2 " Prentice Hall,	ctive", 4th lition, Pearson imulation",IEEE 011. Third Edition.
1. 2. <b>Reference</b> 1. 2.	<ul> <li>s</li> <li>Neil Weste &amp; David Harris , "CMOS VLSI Design-A circuits &amp; Edition, Pearson education, New Delhi, 2017</li> <li>Palnitkar Samir, "Verilog HDL: Guide to Digital Design and syn Education , New Delhi, 2017.</li> <li>s</li> <li>R. Jacob Baker, Harry W. Li, David E. Boyce, "CMOS Circuit Design Press Series on Microelectronics Systems Stuart K. Tewksbuy, S Douglas A. Pucknell, Kamran Eshraghian, "Basic VLSI Design"</li> </ul>	System Perspe thesis", 2nd Ed n, Layout and S eries Edition,2 "Prentice Hall, Synthesis", seco	ctive", 4th lition, Pearson imulation",IEEE 011. Third Edition. ond Edition.
1. 2. <b>Reference</b> 1. 2. 3.	<ul> <li>s</li> <li>Neil Weste &amp; David Harris , "CMOS VLSI Design-A circuits &amp; Edition, Pearson education, New Delhi, 2017</li> <li>Palnitkar Samir, "Verilog HDL: Guide to Digital Design and syn Education , New Delhi, 2017.</li> <li>s</li> <li>R. Jacob Baker, Harry W. Li, David E. Boyce, "CMOS Circuit Desig Press Series on Microelectronics Systems Stuart K. Tewksbuy, S Douglas A. Pucknell, Kamran Eshraghian, "Basic VLSI Design" Samir Palnitkar, "Verilog HDL A Guide to Degital Design and S</li> </ul>	System Perspe thesis", 2nd Ed n, Layout and S eries Edition,2 "Prentice Hall, Synthesis", seco a Education, 20	ctive", 4th lition, Pearson imulation",IEEE 011. Third Edition. ond Edition. 07
1. 2. <b>Reference</b> 1. 2. 3. 4.	<ul> <li>s</li> <li>Neil Weste &amp; David Harris , "CMOS VLSI Design-A circuits &amp; Edition, Pearson education, New Delhi, 2017</li> <li>Palnitkar Samir, "Verilog HDL: Guide to Digital Design and syn Education , New Delhi, 2017.</li> <li>s</li> <li>R. Jacob Baker, Harry W. Li, David E. Boyce, "CMOS Circuit Design Press Series on Microelectronics Systems Stuart K. Tewksbuy, S Douglas A. Pucknell, Kamran Eshraghian, "Basic VLSI Design" Samir Palnitkar, "Verilog HDL A Guide to Degital Design and S Wayne Wolf, "Modern VLSI Design: System On Chip", Pearsor Sung-Mo kang, Yusuf leblebici, Chulwoo Kim "CMOS Digital I &amp; Design",4th edition McGraw Hill Education,2013</li> </ul>	System Perspe thesis", 2nd Ed n, Layout and S eries Edition,2 "Prentice Hall, Synthesis", seco a Education, 20	ctive", 4th lition, Pearson imulation",IEEE 011. Third Edition. ond Edition. 07
1. 2. <b>Reference</b> 1. 2. 3. 4. 5.	s Neil Weste & David Harris , "CMOS VLSI Design-A circuits & Edition, Pearson education, New Delhi, 2017 Palnitkar Samir, "Verilog HDL: Guide to Digital Design and syn Education , New Delhi, 2017. s R. Jacob Baker, Harry W. Li, David E. Boyce, "CMOS Circuit Desig Press Series on Microelectronics Systems Stuart K. Tewksbuy, S Douglas A. Pucknell, Kamran Eshraghian, "Basic VLSI Design" Samir Palnitkar, "Verilog HDL A Guide to Degital Design and S Wayne Wolf, "Modern VLSI Design: System On Chip", Pearsor Sung-Mo kang, Yusuf leblebici, Chulwoo Kim "CMOS Digital I & Design",4th edition McGraw Hill Education,2013 es https://www.cin.ufpe.br/~mel/pub/prototipac%E30/referencias/C design.pdf	System Perspe thesis", 2nd Ed m, Layout and S eries Edition,2 "Prentice Hall, Synthesis", seco n Education, 20 Integrated Circu MOS_design/C	ctive", 4th lition, Pearson imulation", IEEE 011. Third Edition. ond Edition. 07 uits:Analysis
1. 2. <b>Reference</b> 1. 2. 3. 4. 5. <b>E-Resourc</b>	<ul> <li>s</li> <li>Neil Weste &amp; David Harris , "CMOS VLSI Design-A circuits &amp; Edition, Pearson education, New Delhi, 2017</li> <li>Palnitkar Samir, "Verilog HDL: Guide to Digital Design and syn Education , New Delhi, 2017.</li> <li>s</li> <li>R. Jacob Baker, Harry W. Li, David E. Boyce, "CMOS Circuit Desig Press Series on Microelectronics Systems Stuart K. Tewksbuy, S Douglas A. Pucknell, Kamran Eshraghian, "Basic VLSI Design" Samir Palnitkar, "Verilog HDL A Guide to Degital Design and S Wayne Wolf, "Modern VLSI Design: System On Chip", Pearsor Sung-Mo kang, Yusuf leblebici, Chulwoo Kim "CMOS Digital I &amp; Design",4th edition McGraw Hill Education,2013</li> <li>es</li> <li>https://www.cin.ufpe.br/~mel/pub/prototipac%E30/referencias/C design.pdf</li> <li>http://www.icisclab.com/userfiles/file/download/Verilog%20HD cal%20Primer.pdf</li> </ul>	System Perspe thesis", 2nd Ed n, Layout and S eries Edition,2 "Prentice Hall, Synthesis", seco a Education, 20 Integrated Circu MOS_design/C L%20Synthesis	ctive", 4th lition, Pearson imulation", IEEE 011. Third Edition. ond Edition. 07 uits:Analysis CMOS-VLSI- s%20A%20Practi
1.         2.         Reference         1.         2.         3.         4.         5.         E-Resourc         1.	<ul> <li>s</li> <li>Neil Weste &amp; David Harris , "CMOS VLSI Design-A circuits &amp; Edition, Pearson education, New Delhi, 2017</li> <li>Palnitkar Samir, "Verilog HDL: Guide to Digital Design and syn Education , New Delhi, 2017.</li> <li>s</li> <li>R. Jacob Baker, Harry W. Li, David E. Boyce, "CMOS Circuit Design Press Series on Microelectronics Systems Stuart K. Tewksbuy, S Douglas A. Pucknell, Kamran Eshraghian, "Basic VLSI Design" Samir Palnitkar, "Verilog HDL A Guide to Degital Design and S Wayne Wolf, "Modern VLSI Design: System On Chip", Pearsor Sung-Mo kang, Yusuf leblebici, Chulwoo Kim "CMOS Digital I &amp; Design",4th edition McGraw Hill Education,2013</li> <li>es</li> <li>https://www.cin.ufpe.br/~mel/pub/prototipac%E30/referencias/C design.pdf</li> <li>http://www.icisclab.com/userfiles/file/download/Verilog%20HD</li> </ul>	System Perspe thesis", 2nd Ed m, Layout and S eries Edition,2 "Prentice Hall, Synthesis", second Education, 20 Integrated Circu CMOS_design/C L%20Synthesis	ctive", 4th lition, Pearson imulation",IEEE 011. Third Edition. ond Edition. 07 uits:Analysis CMOS-VLSI- s%20A%20Practi r/CMOS_Circuit_

		ANDHA COLLEC mous Institution, A Elayampalaya	ffiliated	d to Ar	ına Uni	versity, (		TÜVRheint		
Programme	B.E.			U	e Code		Regulation		2019	
Department	ELECTRO ENGINEER	NICS AND COM	MUNIC	CATIO	N		Semester		VI	
Course Code	Cou	rse Name	Period	ls Per	Week	Credit	Maxii	num M	num Marks	
Course Coue	Cou	iise maine	L	Т	Р	С	CA	ESE	Total	
U19EC626	Computer N	Networks	3	0	0	3	40	60	100	
Course Objective	ap • Fai • rea sta • Be • Ki	nderstand the state-oplications. miliarize the various alize the different landards. aware of IP address now the functions and fight accurate the state of the st	s aspect yers of ssing me nd cong	s of co ISO /C ethods estion	mputer DSI mod and QC <u>control</u>	network del and T OS param mechan	s CP/IP Networ neters.	rk IEEI		
		f the course, the stu						L	nowledge evel K2	
Course Outcomes	Switch CO2: Illustr	ret the basic function ning method ate the error detection layer of different IF	on and	control					K2 K2	
Outcomes	CO3: Appl	y Packet switching, network layer			d routi	ng accor	ding to the	ŀ	K3	
	CO4: Apply	y Techniques for co	ntrol th	e cong	estion i	n the net	work	ŀ	K3	
	CO5: Analy Network Sec	ze Various Networ	k Appli	cation	s Like I	Ftp, Ema	il, Http With	ł	Κ4	
Pre- requisites	-									

CO	(3/2/	'1 indic	ates stre	ength of	CO / PO correlat	ion) <b>3-S</b>	trong, 2		ium, 1	- Weal	K		CO/I Map	ping	
COs					Program	ime Out	comes (	POs)					PSOs	5	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	3	3	2							2			3		
CO 2	3	3	2	2									3	2	2
CO 3	3	3	2	2						2		2	3		
CO 4	3	2	2	2									3	2	
CO 5	3	2	2							2			2	2	2

### Direct

1.Continuous Assessment Test I, II & III

2.Assignment

3.End-Semester examinations



Indirect

1. Co	urse - end survey		
Content of	the syllabus		
Unit – I		Periods	9
	ervice description - Network Edge - Network Core - Circuit S	-	
	itching - Packet Switched Networks - Datagram and Virtual		
•	edia -ISP's and Internet Backbones – Delay and Loss in Packet	Switched Netv	vorks – Protocol
•	d Service Models	1	
Unit – I	DATA LINK LAYER	Periods	9
•	er Services - Error Correction and Detection Techniques -	-	
	er Addressing - Ethernet-Hubs and Switches - Point-to-Point Pr		
	MPLS, Flow control-Ethernet Protocols-Stop & wait -Go-Back-	N Selective re	epeat-High-Level
Data Link	-	1	
Unit – II	I NETWORK LAYER	Periods	9
<ul> <li>BGP.</li> <li>Multicas</li> </ul>	Algorithms – LinkState Routing – Distance Vector Routing – Rov Virtual Circuit and Datagram Networks-Internet Protocol (II t Routing- Mobile IP	P)-IPV4-IPV6-	Broadcast and
Unit – IV	7 TRANSPORT LAYER	Periods	9
Unit – V Protocol	es to improve QoS           PRESENTATION         AND APPLICATION LAYER           Layers and Service Models – Principles of Network Applic.           Protocol – Electronic Mail – SMTP – Domain Name System		
Program	ming with TCP, Introduction to Cryptography-basic concepts-fire	walls.	
		<b>Total Periods</b>	45
Text Book	S		
1.	James F.Kurose & Keith W.Ross, "Computer Networking A To Internet", PHI, 2013.	op-down Appro	bach Featuring the
2.	Andrew S.Tannenbaum, Computer Networks, PHI, 2003		
Reference	8		
1.	Behrouz Foruzan, Data communication and Networking, Tata N		2012.
2.	Larry L.Peterson & S.Peter Davie, "Computer Networks", Harc		
3.	William Stallings, "Data and Computer Communication", PHI 2		
4.	Ying-Dar Lin, Ren-Hung Hwang, Fred Baker, —Compute Approachl, Mc Graw Hill Publisher, 2011.		*
5.	Larry L. Peterson, Bruce S. Davie, —Computer Networks Edition, Morgan Kaufmann Publishers, 2011.	s: A Systems	Approach <sup>I</sup> , Fiftl
E-Resourc			
1	https://abdulkadirsyam.files.wordpress.com/2010/02/computer-n-	etworking-a-to	n-down-approach
1.	featuring-the-internet.pdf https://theswissbay.ch/pdf/Gentoomen%20Library/Networking/P		

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		ANDHA COLLEC mous Institution, A	ffiliated	d to An	na Uni	versity, (		TÜVReit	ISO 9001:2015
NOMEN EMPOWERNEN		Elayampalaya		U			<b>D</b> 1.1		0 3115040155
Programme	B.E.			0	e Code	103	Regulation		2019
Department	ELECTRO ENGINEER	NICS AND COMP RING	_				Semester		VI
Course Code	Cou	rse Name	Period	ds Per	Week	Credit	Maxi	mum N	Iarks
Course Coue	Cou		L	Т	Р	С	CA	ESE	Total
U19EC627	Antenna an Propagation		3	0	0	3	40	60	100
Course Objective	Gi     Gi     Gi     La     an     Id     m	arning the antenna ve a thorough appro- antennas earn Modern and sp tennas. entify with various easurements.	eciative becial ar techniq	of the ntennas	radiatio such a volved	on charac s frequer in variou	ncy independe	nt and b meter	proad band
	At the end of	f the course, the stu	dent sno	oula de	able to	Э,			nowledge evel
	CO1: Study	K	2						
Course Outcomes	CO2: Under antennas	stand depth study f						K	2
	CO3: Analy	ze Modern and spe and Antenna measu			such as	frequence	су	K	4
	<u>^</u>	the depth about ap			s anteni	nas.		K	.2
		se the effect of prop					al environmer	nt K	3
Pre-	· · · ·		-						

	(3/2/	'1 indic	ates stre		CO / PO correlat			2 – Med	ium, 1 ·	Weak	2		CO/I Map		
COs				]	Program	me Out	comes (	POs)					PSOs	;	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	3	3	2							2			3		2
CO 2	3	3	2	2							2			3	
CO 3	3	3	2							2		2	3		
CO 4	3	3	2								2		3	3	2
CO 5	3	2	2	2						2			3		

Direct

1.Continuous Assessment Test I, II & III

2.Assignment

3.End-Semester examinations

Indirect

1. Course - end survey



I mit I	A NITENINI A ELINID A MENITAL C	Dorioda	A
Unit – I	ANTENNA FUNDAMENTALS	Periods	9 ala Cain Directiva
	to antenna Parameters- Radiation Pattern, Radiation intensity,		-
-	gain, Directivity, Beam Width. Band Width, Reciprocity prin	-	-
	on between gain, effective length and radiation resistance, Frii	Is Transmissio	n Iormula, Antenna
	, Polarization, Self and mutual impedances of antennas. WIRE ANTENNAS AND ANTENNA ARRAYS	Daviada	9
Unit – II		Periods	
-	vector potential- Retarded vector potential- Fields associated wi	-	
	on resistance of Hertzian dipole. Radiation from half-wave dip		-
	esistance of half wave dipole and quarter wave monopole- Imp		-
-	adside and End fire array -Expression for electric field from	two and four	element arrays – N
element line	ear array - Pattern multiplication - Binomial array.		
Unit – III	MODERN ANTENNAS AND ANTENNA MEASUREMENT	Periods	9
	ennas- UWB antennas, RFID Antennas, Special Antennas: Lo		
	antenna, Long wire antenna, V antenna, Rhombic antenna, L ntenna Measurements: Spectrum Analyzer, Network analyzer,		
	Directivity Measurements	Radiation 1 att	ern wiedstreinent,
Unit – IV	APERTURE AND LENS ANTENNAS	Periods	9
Radiation	from an elemental area of a plane wave (Huygen's Source),	Radiation fro	om a rectangular
	eated as an array of Huygen's sources, Babinet's principle, S		-
-	slot impedances, Horn antenna – Types, Parabolic reflector		
-	lens and metal plane lens antennas,		•
Unit – V	RADIO WAVE PROPAGATION	Periods	9
Modes of 1	propagation, Structure of atmosphere- Ground wave propagat	ion - Space w	ave propagation-
-	propagation, Structure of atmosphere- Ground wave propagat ropagation. Sky wave propagation-Troposcatter propagatior	-	
- Duct p	propagation, Structure of atmosphere- Ground wave propagat ropagation. Sky wave propagation-Troposcatter propagation index- Critical frequency. Skip distance - Maximum usable	n-Mechanism	of refraction
- Duct p	ropagation. Sky wave propagation-Troposcatter propagation index- Critical frequency. Skip distance - Maximum usable	n-Mechanism	of refraction
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U19EC62		Computer Networks Laboratory00216040The student should be made to,										100				
Course Objective		<ul> <li>Communicate between two desktop computers.</li> <li>Larne the Program using sockets</li> <li>Develop the various routing algorithms</li> <li>Formulate various socket programming.</li> <li>Develop and implement the different protocols</li> </ul>														
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CO 3	3		2		3	2							3			

### **Course Assessment Methods**

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Direct

CO 4

CO 5

- 1. Pre lab and Post lab Test.
- 2. Assignment
- 3. End-Semester examinations

2

2

2

2

2

Indirect

1. Course - end survey.

Content of the syllabus

List of Experiments

Course Outcome

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2

2

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2

1.	Implementation of Error Detection / Error Correction Techniques	CO4
2.	Implementation of Stop and Wait Protocol and sliding window	CO5
3.	Implementation and study of Go back-N and selective repeat protocols	CO5
4.	Implementation of High Level Data Link Control	CO3
5.	Write a socket Program for Client – Server model and Echo/Ping/Talk commands	C02
6.	To create scenario and study the performance of network with CSMA / CA protocol and compare with CSMA/CD protocols.	CO4
7.	Network Topology - Star, Bus, Ring	CO1
8.	Implementation of distance vector routing algorithm and Link state routing algorithm	CO3
9.	Study of Network simulator (NS) and simulation of Congestion Control Algorithms using NS	CO4
10.	Encryption and decryption.	CO1
11.	Mini project	CO5
	Total Periods	45
Text Boo	oks	
1.	James F.Kurose & Keith W.Ross, "Computer Networking A Top-down Approach Internet", PHI, 2013.	Featuring the
2.	Andrew S.Tannenbaum, Computer Networks, PHI, 2003	
E-Resou		
1.	https://abdulkadirsyam.files.wordpress.com/2010/02/computer-networking-a-top-de featuring-the-internet.pdf	own-approach-
2.	https://theswissbay.ch/pdf/Gentoomen%20Library/Networking/Prentice%20Hall%2 %20Computer%20Networks%20Tanenbaum%204ed.pdf	20-

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Indirect		e - end	survey.													147

Content	of the syllabus	
List of	Experiments	
	Xilinx experiments:	Course Outcome
1.	Design and simulation of Full adder, full subtractor and 8 bit adder.	CO1
2.	Design and simulation of Multiplexer, Decoder and 4 bit comparator.	CO2
3.	Verilog HDL based design entry and simulation of Ripple counter, Synchronous counter and BCD counter.	CO1
4.	Design and simulation of simple state machines.	CO4
5.	Design and simulation of 4 bit multiplier using Verilog HDL	CO4
6.	Synthesis, Place & Route and post Place & Route simulation of the components simulated in (1-5) above.	CO3,CO4
	FPGA Based Experiments:	
7.	Hardware fusing and testing of each of the blocks simulated in (1-5). Use of either Chip scope feature (Xilinx) or the signal tap feature (Altera)	CO1
	is a must. IC Design Experiments (Based on Cadence/MAGMA/Tanner)	
	Design and simulation of a simple CMOS Inverter & perform Layout	
8.	generation, parasitic extraction.	CO4
9.	Layout generation, parasitic extraction and re- simulation of the differential amplifier.	CO4
10.	Mini Project	CO5
	Total Periods	45
Text Bo	oks	
1.	Palnitkar Samir, "Verilog HDL: Guide to Digital Design and synthesis", 2nd Edition Education, New Delhi, 2017.	n, Pearson
2.	Neil Weste & David Harris, "CMOS VLSI Design-A circuits & System Perspective Edition, Pearson education, New Delhi, 2017	e", 4th
E-Resou	rces	
1.	https://www.cin.ufpe.br/~mel/pub/prototipac%E3o/referencias/CMOS_design/CMC design.pdf	
2.	http://www.icisclab.com/userfiles/file/download/Verilog%20HDL%20Synthesis%20cal%20Primer.pdf	
3.	https://www.ucursos.cl/usuario/9553d43f5ccbf1cca06cc02562b4005e/mi_blog/r/CM Design_Layout_and_Simulation_3rd_Edition.pdf	IOS_Circuit_

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VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN

(Autonomous Institution Affiliated to Anna University, Chennai) Elayampalayam, Tiruchengode – 637 205



### DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

### SUBJECT CODE & NAME: U19EC630 - MINI PROJECT

### SEMESTER-VI

Course Outcome:

### After completing this course, students will able to:

CO1: Demonstrate a sound technical knowledge of their selected mini project topic.

CO2: Undertake problem identification, formulation and solution.

CO3: Design engineering solutions to complex problems utilising a systems approach.

CO4: Demonstrate the knowledge, skills and attitudes of a professional Engineer.

CO5: Write technical report by applying different visualization tools and Evaluation metrics.

	(3/	/2/1 indi	cates s	trength			apping ) 3-Stro		Mediu	m, 1 - W	eak		CO/PSO Mapping			
		Programme Outcomes (POs)														
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CO 2	3	3	3	3	3	2	2	2	2	2	2	3	3	3	3	
CO 3	3	3	3	2	3	-	-	2	2	2	2	3	2	2	3	
CO 4	3	-	-	3	3	-	-	2	2	2	3	3	2	2	2	
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Unit – I	Ι	PLANNING	Periods	9
	-	urpose of planning – planning process – types of planning – obj		ng
5		oolicies – Planning premises – Strategic Management – Plannin	ig Tools and	
_		Decision making steps and process.		
Unit – I		ORGANISING	Periods	9
types –] decentra	Line alizat	purpose – Formal and informal organization – organization cha and staff authority – departmentalization – delegation of author tion– Job Design - Human Resource Management – HR Planni 1 Development, Performance Management , Career planning ar	rity – centraliz ng, Recruitme	zation and ent, selection,
Unit – I	V	DIRECTING	Periods	9
Founda	tions	of individual and group behavior - motivation - motivati	on theories	– motivational
techniq	ues -	- job satisfaction - job enrichment - leadership - types	and theories	of leadership -
commu	nicat	ion – process of communication – barrier in communication –	effective com	munication –
commu	nicat	ion and IT.		
Unit – Y	7	<b>ΓΟΝΤΡΟΙ Ι ΙΝ</b> Ο	~	
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Former Signature of BOS Chairman ECE

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	ion of S parameters, properties of S parameters-Reciprocal and los ntroduction to component basics, wire, resistor, capacitor and induc	-	transmission
Unit – I	I RF AMPLIFIERS DESIGN AND MATCHING NETWORKS	Periods	9
Character Noise F	ristics of Amplifiers, Amplifier power relations, Stability considerations, Constant VSWR, Broadband, High power and Multis		
-	using discrete components, Two component matching Networks, and Pi Matching Networks, Microstrip Line Matching Networks.	Frequency resp	onse and quality
Unit – I	PASSIVE AND ACTIVE	Periods	9
Circulat	ations, Attenuators, Phase shifters, Directional couplers, Hybrid for, Isolator, Impedance matching devices: Tuning screw, Stub a and Schottkey diode detector and mixers, PIN diode switch, Varact	nd quarter way	ve transformers.
Unit – I	V MICROWAVE GENERATION	Periods	9
Gunn di	er, Backwards wave oscillator; Magnetron oscillator – Theory and a iode oscillator; BARITT, TRAPATT and IMPATT diode oscillator n-Iron Garnet). W MICROWAVE MEASUREMENTS		
	ing Instruments : Principle of operation and application of VSW	1	-
	m analyzer, Network analyzer, Measurement of Impedance, Freque		
factor, I	Dielectric constant, Scattering coefficients, Attenuation, S-parameter		-
Text Bool		Total Periods	45
1.	Reinhold Ludwig and Gene Bogdanov, "RF Circuit Design: Th Education Inc., 2013.	eory and Appli	cations", Pearson
2.	Robert E.Colin, "Foundations for Microwave Engineering", Wi	ilev India 2 <sup>nd</sup> F	
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	<u>'</u> S		dition, 2011
	es David M. Pozar, "Microwave Engineering", Wiley India (P) Lte		
Reference		d, New Delhi, 2	.012.
Reference 1.	David M. Pozar, "Microwave Engineering", Wiley India (P) Lte Thomas H Lee, "Planar Microwave Engineering: A Practical G	d, New Delhi, 2 uide to Theory,	012. Measurements
Reference           1.           2.	David M. Pozar, "Microwave Engineering", Wiley India (P) Lta Thomas H Lee, "Planar Microwave Engineering: A Practical G and Circuits", Cambridge University Press, 2012.	d, New Delhi, 2 uide to Theory, ducation, 3 <sup>rd</sup> Ec	012. Measurements lition, 2012.
Reference           1.           2.           3.           4.	<ul> <li>David M. Pozar, "Microwave Engineering", Wiley India (P) Lta Thomas H Lee, "Planar Microwave Engineering: A Practical G and Circuits", Cambridge University Press, 2012.</li> <li>Samuel Y .Liao, "Microwave Devices and Circuits", Pearson E Annapurna Das and Sisir K Das, "Microwave Engineering", Ta Company Ltd, New Delhi, 2010.</li> </ul>	d, New Delhi, 2 uide to Theory, ducation, 3 <sup>rd</sup> Ec	012. Measurements lition, 2012.
Reference           1.           2.           3.           4.	<ul> <li>David M. Pozar, "Microwave Engineering", Wiley India (P) Lta Thomas H Lee, "Planar Microwave Engineering: A Practical G and Circuits", Cambridge University Press, 2012.</li> <li>Samuel Y .Liao, "Microwave Devices and Circuits", Pearson E Annapurna Das and Sisir K Das, "Microwave Engineering", Ta Company Ltd, New Delhi, 2010.</li> </ul>	d, New Delhi, 2 uide to Theory, ducation, 3 <sup>rd</sup> Ec	012. Measurements lition, 2012.
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Programme	B.I	E				Prog	amm	e Code	103	Reg	ulation		201	9	
Department	ELEC ENGI			ND CO	OMMU	JNICA	TIO	N		Se	mester		VI	[	
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	At the	end of	the cou	urse, the	e studei	nt shou	uld be	able to	,				Kno e Le	owled evel	
Course	CO1: understanding microwave components principles													K2	
Outcome	CO2: analyzing radiation pattern of antenna.													K3	
	CO3: Design and simulation of microwave components CO4: Design and simulation of microwave circuits													K3	
		U						rcuits						$\frac{K3}{K2}$	
Pre-	005:	unders	standing	g optim	ization	metho	ods							K2	
(3/	2/1 indica	ites stre	ngth of	CO / PC correlati Program	ion) <b>3-S</b>	trong,			<u>1 – Wea</u>	k		CO/PS Mappi PSOs			
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CO 43CO 53Course AssessDirect1. Pre 12. Assig3. End-Indirect	<b>ment Me</b> ab and Po gnment	ost lab 7 • examin		3											
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CO 43CO 53Course AssessDirect1. Pre 12. Assis3. End-Indirect1. Cour	ab and Po gnment Semester se - end s	ost lab examin survey.													

1.	Mode characteristics of Reflex klystron and basic microwave parameter Measurement Such as VSWR, frequency, wavelength.	CO1
2.	VI - characteristics of Gunn diode	CO1
3.	Directional Coupler Characteristics.	CO1
4.	Radiation Pattern of Horn Antenna.	CO2
5.	S-parameter Measurement of the following microwave components (Isolator, Circulator, E-plane Tee, H Plane Tee, Magic Tee)	CO1
6.	Attenuation and Power Measurement	CO1
7.	Design and simulation of Microwave components using ADS	CO3
8.	Design and simulation of Microwave Circuits using ADS	CO4
9.	Design and simulation of microwave filters using ADS	CO4
10.	Tuning and Optimization of Microwave filters using ADS	CO5
	Total Periods	45
Text Bo	oks	
1.	Robert E.Colin, "Foundations for Microwave Engineering", Wiley India, 2 <sup>nd</sup> Edition,	2011
2.	David M. Pozar, "Microwave Engineering", Wiley India (P) Ltd, New Delhi, 2012.	
E-Resou	rces	
1.	https://padeepz.net/ec6701-rf-and-microwave-engineering	
2.	https://drive.google.com/file/d/1CK4DJE4gmKFSADuE_1DL8RuYPiMOoViJ/view	
3.	https://radfiz.org.ua/share/sheva_s8_DEK/SECONDARY/%E4%C5%D2%D6/%E4% D6/%CE%D7%DE%20%D4%C5%C8%CE%A6%CB%C1/%CC%A6%D4/Collin.% ons%20for%20Microwave%20Engineering.pdf	

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		At t	he end c	of the co	urse, tł	ne stud	ent sh	ould be	able to,	1			I	Knowle Leve	-
		CO	1: Gain	industria	al expe	rience	and to	apply t	hem in	practi	cal for	m		K2	
Course	:			rstand th						electr	onics	and		K2	
Outcon	ne	CO	3: Deliv	er an eff	ective	presen	itation	and inc	ulcate t	eam w	ork et	hics	К3		
			4: Apply ect amb	y engine itions	ering a	nd ma	nagem	ent val	ues to a	ccomp	olish			K3	
		1 0		an effec	ctive ir	nternsh	ip rep	ort and	to do m	ini pro	oject			K3	
Pre-rec	uisites	-													
													CO/P	SO Map	ping
		CO / PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak											PSOs		
<u> </u>	(3	/2/1 IIId		D.	Programme Outcomes (POs)										
COs								PO 8	PO 0	PO	PO	PO	PS	PSO	PSO
COs	(3 PO 1	PO 2	PO 3	Pt PO 4	PO 5	PO 6	<b>PO</b> 7	PO 8	PO 9	PO 10	<b>PO</b> 11	PO 12	PS Ol	PSO 2	PSO 3
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VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN (Autonomous Institution Affiliated to Anna University, Chennai) Elayampalayam, Tiruchengode – 637 205



## DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

### SUBJECT CODE & NAME: U19EC834 - PROJECT WORK

SEMESTER-VIII

Course Outcome:

After completing this course, students will able to:

CO1: Demonstrate a sound technical knowledge of their selected project topic.

CO2: Undertake problem identification, formulation and solution.

CO3: Design engineering solutions to complex problems utilising a systems approach.

CO4: Demonstrate the knowledge, skills and attitudes of a professional Engineer.

CO5: Write technical report by applying different visualization tools and Evaluation metrics.

		<b>O / PO N</b> /2/1 indi		2	of corr	elation)	) 3-Stro	ng, 2 –	Mediu	m, 1 - W	eak		CO/PSO Mapping				
<b>G</b> 0		Programme Outcomes (POs)												PSOs			
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CO 1	2	3	2	2	3	-	-	2	2	2	3	3	3	3	3		
CO 2	3	3	3	3	3	2	2	2	2	2	2	3	3	3	3		
CO 3	3	3	3	2	3	-	-	2	2	2	2	3	2	2	3		
CO 4	3	-	-	3	3	-	-	2	2	2	3	3	2	2	2		
CO 5	2	-	-	1	3	3	3	2	2	-	2	3	2	3	2		

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Programme	B.E.		Pro	gramm	e Code	103	Regulation		2019
Department	ELECTR ENGINE	ONICS AND COM ERING	MUNIC	CATIO	N		Semester		
Course Code	C	ourse Name	Perio	ds Per	Week	Credit	M		n Marks
Course Coue	C	ourse manie	L	Т	Р	С	CA	ESE	Total
<b>U19ECV11</b>	Analog IC	C Design	3	0	0	3	40	60	100
Course Objective	•	<ul> <li>Evaluate the varie</li> <li>Choose the suitab</li> <li>Analyze the Single</li> <li>Design and analyze</li> </ul>	le techn e stage	ique fo and tw	or the de	esign of o op-amp	op-amp and Cl	MRR	
	At the end	of the course, the stud	lent shou	ild be a	ble to,				Knowledge level
		erstand the feedback riterion in feedback sy		used i	n an an	plifier a	nd analyze the	;	K2
Course Outcome		npare various frequer		pensat	ion tech	niques.			K2
Outcome	CO3:Anal	lyze the technique us	ed to de	sign ar	iy op-ar	np and C	CMRR		K3
	CO4:Real	ize the Single stage a	nd two	stage c	p-amp	circuit			K3
	CO5: Des	ign and analyze of Fu	ully diff	erentia	l Op-an	np and P	LL		K4
Pre- requisites	-							I	

COs	CO / PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak COs Programme Outcomes (POs)												CO/PSO Mapping PSOs		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	3	2					2				2	3	3	
CO2	3	3	2	2									2	2	
CO3	3	3	2	2								2	3	2	2
CO4	3	2	2	2				2				1		2	
CO5	3	2	2					2		2		1	3	2	

## **Course Assessment Methods**

## Direct

- 1. Continuous Assessment Test I, II & III
- 2. Assignment: Simulation using tool
- 3. End-Semester examinations

## Indirect

1. Course - end survey

## Content of the syllabus

### Unit – I INTRODUCTION AND NEGATIVE FEEDBACK

Periods

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9

	SYSTEMS		
Introductio	n, Negative feedback amplifier using an integrator; Frequency an	nd time domai	n behavior; Loop gain and
its implica	tions; Negative feedback amplifier realization; Finite DC gain;	Increasing D	C gain; Effect of multiple
poles; Neg	ative feedback systems with multiple poles and zeros in the fo	orward path; 1	Nyquist criterion; Stability
analysis us	ing Nyquist criterion.		
Unit - Il	OPAMP AND FREQUENCY COMPENSATION	Periods	9
Concept o	f the Op-amp for realizing negative feedback circuits; Reali	izing a multi	stage Op-amp-frequency
compensat	ion-miller Op-amp; Realizing a multi stage Op-amp; feed forwa	ard compensat	ted Op-amp; Op-amp as a
general blo	ock; unity gain compensation; non idealities swing limits, slew r	ate, offset; dc	negative feedback around
Op-amps.			
Unit – II	I OP-AMP AMPLIFIERS	Periods	9
Amplifiers	using Miller compensated Op-amp; Effect of input capacitance; g	ain bandwidth	product; Trans-impedance
amplifier;	lead-lag compensation; Inverting and non-inverting amplifiers-CM	IRR and its im	portance.
Unit - IV	SINGLE ENDED OPAMP DESIGN	Periods	9
Realizing a	a single stage op -amp-differential pair; small signal ac analysis; S	ingle stage Op	-amp-mismatch and noise
Single stag	e Op-amp-telescopic cascode; Replica biasing a cascode; Single s	stage Op-amp-	folded cascode; Two stage
miller com	pensated Op-amp; Three stage Op-amp; CMRR of an Op-amp and	l Op-amp circu	uits.
Unit – V	FULLY DIFFERENTIAL OPAMP DESIGN AND	Periods	9
Unit – v	PHASE LOCKED LOOP	Periods	9
Fully diffe	rential Op-amps; Differential and common mode half circuits; co	mmon mode f	eedback; Fully differential
i ung unite	rential Op-amps, Differential and common mode nam circuits, co	minon moue i	
	npensated Op-amp-common mode feedback loop and its stab		
miller con		oility; Phase	locked loop; Lock range
miller con limitations	npensated Op-amp-common mode feedback loop and its stat	oility; Phase	locked loop; Lock range
miller con limitations	npensated Op-amp-common mode feedback loop and its stat ; type II loop; Jitter & Phase noise; Continuous time approxima gh spurs; LC oscillators.	oility; Phase	locked loop; Lock range nsfer functions; Reference
miller con limitations	npensated Op-amp-common mode feedback loop and its stat ; type II loop; Jitter & Phase noise; Continuous time approxima gh spurs; LC oscillators.	oility; Phase ation; PLL tra	locked loop; Lock range nsfer functions; Reference
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Processor	selection-Concepts in Processor Architecture: Instruction set archi	tecture (ISA),	elements in Instruction
	obust processors: Vector processor, VLIW, Superscalar, CISC, 1		
	ssors, Custom-Designed processors-IP based design- on-chip men		
Unit – I		Periods	10
On-chip B	suses: basic architecture, topologies, arbitration and protocols, Bu	is standards: A	AMBA, Core Connect,
	, Avalon-Network-on-chip: Architecture-topologies-switching		uting algorithms-flow
control, qu	ality-of-service-Reconfigurability in communication architectures		
Unit – I		Periods	10
	f hardware & software- quest for energy efficiency- driving		
	Codesign space-Dualism of Hardware design and Software desig		
	ncy and Parallelism- Hardware Software tradeoffs- Introducing Da		-
Unit – Y		Periods	9
	Microblaze RISC processor - Real-time operating system (R		
·	nts, High-density FPGAs-Introduction to tools used for SO	C design: Xi	linx SoC based
developm			
		<b>Fotal Periods</b>	45
Text Book			
1.	Michael J.Flynn, Wayne Luk, "Computer system Design: System		
2.	Sudeep Pasricha, NikilDutt, "On Chip Communication Architectu	ires: System of	n Chip Interconnect",
	Morghan Kaufmann Publishers, 2008		
Reference			
1.	W.H.Wolf, "Computers as Components: Principles of Emb	edded Compu	iting System Design",
	Elsevier, 2008.		
2.		~ • •	
	Patrick Schaumont "A Practical Introduction to Hardware/Software/S	ware Co-desig	n", Patrick Schaumont,
	2nd Edition, Springer, 2012.		
3.	2nd Edition, Springer, 2012. Lin, Y-L.S. (ed.), "Essential issues in SOC design: Designing Co		
3.	2nd Edition, Springer, 2012. Lin, Y-L.S. (ed.), "Essential issues in SOC design: Designing Co 2006.		
	2nd Edition, Springer, 2012. Lin, Y-L.S. (ed.), "Essential issues in SOC design: Designing Co 2006.		
3.	2nd Edition, Springer, 2012. Lin, Y-L.S. (ed.), "Essential issues in SOC design: Designing Co 2006.	mplex System	

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Programme	B.E.		Pro	gramm	e Code	103	Regulation		2019
Department	ELECTRO ENGINEE	ONICS AND COM RING	<b>IMUNI</b>	CATI	ON		Semester		
Course Code	Cor	ırse Name	Perio	ds Per	Week	Credit	Ma	ximum	Marks
Course Coue	Cot		L	Т	Р	С	CA	ESE	Total
U19ECV13	Semicondu Modeling	ctor Device	3	0	0	3	40	60	100
Course Objective	dev • Intr • Des	nance commanding rices roduce and motivat scribes the foundat arn about the techn	te studer ion for f	nts to u forthco	se the a ming B	ndvanced Sipolar D	CMOS devic Devices course	es s	
	At the end of	of the course, the s	tudent s	hould	be able	to,			Knowledge Level
	CO1:Unde	rstand the operatio	n of var	ious M	OS dev	vice mode	eling		K2
Course	CO2: Illust	rate the operation	of MOS	FET a	nd its cl	haracteris	stics	T	K3
Outcomes	CO3:Analy	ze the operation of	f CMOS	S chara	cteristic	cs			К3
		d the operation of							K2
		re the operation an	nd chara	cteristi	cs of va	arious Bij	polar Device		K2
	Design and	display devices.							

	(3/2/	1 indic	ates stre	ngth of	CO / PO correlat	ion) <b>3-S</b>	Strong, 2		lium, 1	- Weak	ζ		CO/I Map		
COs					Program	nme Out	tcomes (	(POs)					PSOs	5	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	3	2	2	1						1		1	3	2	
CO 2	3	3										1	3		2
CO 3	3	2		1						1		1	3	2	
CO 4	3		2										3		2
CO 5	3	2	2										3	2	

### **Course Assessment Methods**

#### Direct

- 1.Continuous Assessment Test I, II & III
- 2.Assignment
- 3.End-Semester examinations

## Indirect

1. Course – end survey

# Content of the syllabus

Unit – I	Basic Device Physics	Periods	9
Electrons and h	oles in silicon, p-n junction, MOS capacitor, High field ef	ffects, BJT m	odeling: Ebers - Moll,
Static, large-sign	al, small- signal models. Gummel – Poon model. Temperatu	re and area eff	fects.



Unit – II	MOSFET Devices	Periods	9
	el MOSFETs, Short-channel MOSFETs. CMOS Device De	sign: MOSFE	T Scaling, Threshold
	OSFET channel length.		
Unit – III		Periods	9
	S circuit elements, Parasitic elements, Sensitivity of CMOS delay	to device para	ameters, Performance
	lvanced CMOS devices.		
Unit – IV		Periods	9
	sistors, Ideal current-voltage characteristics, Characteristics of		p-n transistor, Bipolar
	els for circuit and time-dependent analyses, Breakdown voltage		0
Unit – V	Bipolar Device Design	Periods	9
U	he emitter design, Design of the base region, Design of the collect	tor design, Mo	odern bipolar transistor
structures.			1
	]	otal Periods	45
<b>Text Books</b>			1
	Yuan Taur, Tak.H.Ning, Fundamentals of Modern VLSI Devices	, Cambridge U	niversity Press, 2 <sup>rd</sup>
(	edition 2018.		
	Donald Neamen, Semiconductors Physics and Devices, Tata McC		3
	M. Rudolph, Introduction to Modeling HBTs, Artech House, Bos	ton, 2006.	
References			
	Tyagi, Introduction to Semiconductor Materials and Devices, Wi		
	Semiconductor Devices, Basic Principles Jasprit Singh, Wiley Pu		
3.	S.M. Sze (Ed), Physics of Semiconductor Devices, 2 <sup>nd</sup> Edition, W	-	
4.	Analysis And Design Of Analog Integrated Circuits 4/E, Paul R.	Gray, Paul J. I	Hurst,
4.	Robert G Meyer, 2001, Wiley Publications		
5.	Physics of Semiconductor Devices 3/e S. M. Sze, Wiley Pu	blications, 20	07.
E-Resources	s		
1.	http://www.ecerelatedbooks.com/2018/03/fundamentals-of-mode	rn-vlsi-devices	s-by.html
2.	http://www.fulviofrisone.com/attachments/article/403/Semicondu	ctor%20Physi	cs%20And%20Device
۷.	s%20-%20Donald%20Neamen.pdf		
3.	https://pdflife.one/download/4660813-semiconductors-m-s-tyagi		

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		-		<u> </u>	thms for ing desi		<u> </u>		olanni	ng and j	blacem	nent			K3 K3
Pre-requ		inter desig	connect gn	ts and	to perf	Orm sy O Mapp ion) 3-S	oing trong, 2	s and	physi	ic cells cal des 1 - Wea	gn flo			SO	
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Types of	ASICs - Design flow – CMOS transistors- Transistor as resistors	- Transistor par	asitic canacitance
<b>v</b> 1	effort-Antifuse - Static RAM - EPROM and EEPROM technolog	*	astric capacitance
Unit – I		Periods	9
	T - Xilinx LCA - DC & AC inputs and outputs – Clock & power		-
Unit – I		Periods	9
Actel AC	T – Xilinx LCA - Verilog logic synthesis – Delays, Blocking	and Non block	king assignment,
	tional logic, multiplexers, Case statement, decoders, arithmetic an		•
Unit – I		Periods	9
	design flow -System partitioning - FPGA partitioning : KL alg	gorithm –Floor	planning –Types
	nt – Constructive and iterative placement algorithms	1	
Unit – `		Periods	9
	uting - Detailed routing -Area routing-Maze Algorithm-Channe	l routing- Left I	Edge Algorithm-
Special ro			
Text Book			
1.	Smith M.J.S., "Application Specific Integrated Circuits", 12th Ltd., New Delhi, 2013.	Edition, Pearson	Education Pvt.
2.	Steve Kilts, "Advanced FPGA Design: Architecture, Implemen Inter-Science, 2016	ntation, and Opt	imization" Wiley
3.	Roger Woods, John McAllister, Gaye Lightbody, Dr. Ying Yi Signal Processing Systems",2nd Edition, Wiley, 2017	"FPGA-based ]	Implementation of
Reference			
1.	D. Brown, R.J. Francis, J. Rox, Z.G. Uranesic, "Field Program Academic Publishers, 2014.	nmable Gate Arr	rays", Kluwer
2.	Wayne Wolf, "FPGA-Based System Design", 1st Edition, PHI	, New Delhi, 20	09.
3.	Erik larson, "Introduction to Advanced System-on-Chip Test E Edition, Springer, USA, 2005.	Design and Optin	mization", 1st
4.	Jose E. France, YannisTsividis, "Design of Analog - Digital V Telecommunication and Signal Processing", Prentice Hall, 201		
E Dama			
E-Resourc			
1.	https://d1.amobbs.com/bbs_upload782111/files_9/ourdev_2121	52.pdf	
2.	https://www.multisoftsystems.com/embedded-systems/asic-desi	gn-verification-	training
3.	https://nptel.ac.in/courses/106106089/magma_tutorial/magma_t	utorial.html	

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Cours Outcon	termes CO3:Design of low power circuits at architecture level										level		K4 K4			
	_	<ul><li>CO4:Use of Simulation and probabilistic method of power analysis</li><li>CO5:Perform power estimation and optimization at programming</li></ul>											K3 K4			
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CO 4	3	3	2	2	2		1					2	1	2		
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Indirec 4.		rse – en	d surv	ey												
Content	of th	e syllat	ous													
		POWE	R DIS						Dhar	aioa of m		Period			9	
Unit – I Hierarc	•	Basic p	<b>.</b>			•		iption	– Pny	sics of p	ower	uissip	ation		55	

Unit – II	POWER OPTIMIZATION	Period	
	evel power optimization - Circuit level low power design - Circuit	techniques for	reducing power
Consump	tion in adders and multipliers.		
Unit – III		Period	
	r Arithmetic techniques for low power systems - Reducing power		
-	er clock, Interconnect and layout design - Advanced techniques -		
Unit – IV		Period	
Power est power an	timation techniques – Logic level power estimation – Simulation p alysis.	ower analysis-	Probabilistic
Unit – V	SYNTHESIS AND SOFTWARE DESIGN FOR LOW POWER	Period	s 9
	for low power –Behavioral level transforms- Sources of Softw n-Power Optimization	vare Power diss	sipation- Power
	<b>^</b>	Total Periods	45
Text Boo	k		
1.	Kaushik Roy, Sarat.C.Prasad, Low power CMOS VLSI circuit of 2009.	design, 1st repri	nt, Wiley India,
2.	DimitriosSoudris, ChirstianPignet, Costas Goutis, "Designing C Power",Kluwer Academic Publishers, 2010	CMOS Circuits f	for Low
Referenc	es		
1.	J.B. Kuo and J.H Lou, "Low Voltage CMOS VLSI Circuits", W	/iley 1999.	
2.	A.P.Chandrakasan and R.W. Broadersen, "Low Power Digital C Academic Publishers, 1995.	CMOS Design",	Kluwer
3.	Gary Yeap, "Practical Low Power Digital VLSI Design", Kluw	er, 1998.	
4.	Abdellatif Bellaouar, Mohamed.I. Elmasry, "Low Power Digita Academic Publishers, 1995.	l VLSI Design"	, Kluwer
5.	James B. Kuo, Shin – chia Lin, "Low Voltage SOI CMOS VLS Wiley & sons, Inc 2001.	I Devices and C	Circuits",John
E-Resour	ices		
E1	https://nptel.ac.in/courses/106105161/58 Prof.Indiranilsengupta		
E2	https://nptel.ac.in/courses/106105034/19 Prof.Ajit Pal		
E3	https://archive.nptel.ac.in/courses/106/105/106105034/38		
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Pre-requisite	8				<b>.</b>							DCO	
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Unit –		12	VLSU	DESIGN	метн		OGIF	S		Periods			9
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		LSI Design methodologies – Review of Data structures an		
		on tools – Algorithmic Graph Theory and Computational C		able and
		ems - general purpose methods for combinatorial optimization		
Unit		DESIGN RULES	Periods	
		tion – Design rules – problem formulation – algorithms for		ompaction –
-		artitioning – Circuit representation – Placement algorithms	– partitioning.	
Unit -	- III	FLOOR PLANNING	Periods	9
Floor pla	nning c	oncepts - shape functions and Floor plan sizing - Types of	local Routing prol	olems – Area
routing –	channe	el routing – global routing – algorithms for global routing.		
Unit -	- IV	SIMULATION	Periods	9
Simulatio	on – Ga	te-level Modeling and simulation – Switch-level Modeling	and simulation- C	ombinational
Logic Sy	nthesis	- Binary Decision Diagrams - Two Level Logic Synthesis.		
Unit	$-\mathbf{V}$	MODELLING AND SYNTHESIS	Periods	9
High leve	el Synth	nesis – Hardware models – Internal representation – Allocat	ion –assignment a	nd scheduling –
Simple so	cheduli	ng algorithm – Assignment problem – High level transform	ations.	-
		1	Total Periods	45
TEXT B	OOK			
1.	S.H. C	Gerez, "Algorithms for VLSI Design Automation", John Wi	ley & Sons,2019	
Reference	es			
1.	N.A.	Sherwani, "Algorithms for VLSI Physical Design Automat	tion". Kluwer Aca	demic
		ishers, 2002.	,	
E-Resourc	ces			
E1	https:/	//nptel.ac.in/courses/108102042/CO-ORDINATED BY : II	Г DELHI	
E2	https:/	//nptel.ac.in/courses/106102062/ CO-ORDINATED BY : II	T DELHI	
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Indirect	- end sur	vey												
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Content of the				INTR										9
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gyroscopes, she	ar mode piezo actuator, gripping piezo actuator, Inchworm techn	ology.	
Unit – II	THERMAL SENSORS AND ACTUATORS	Periods	9
	basics and heat transfer processes, thermisters, thermo devices, t		
	probe, peltier effect heat pumps, thermal flow sensors, micro hot		
	ectricity, shape memory alloys (SMA), U-shaped horizontal and v		thermal actuator,
thermally activa	ated MEMS relay, micro spring thermal actuator, data storage car	ntilever.	
Unit – III	MICRO-OPTO-ELECTRO MECHANICAL SYSTEMS	Periods	9
-	MOEMS technology, properties of light, light modulators, beautions	-	
	l micro mirror device (DMD), light detectors, grating light valv	ve (GLV), optio	cal switch, wave
0	ng, shear stress measurement.	Devie 1	0
Unit – IV	MAGNETIC SENSORS AND ACTUATOR           erials for MEMS and properties, magnetic sensing and detection,	Periods	9
on hall effect, mag MEMS ac	magneto diodes, magneto transistor, MEMS magnetic sensor, pr ctuators, by directional micro actuator, feedback circuit integrated lator, magnetic probe based storage device.	ressure sensor u	itilizing MOKE,
Unit – V	MICRO FLUIDIC SYSTEMS	Periods	9
	to thermal flow, thermo capillary effect, electro osmosis flow.	, opto electro	wetting (OEW),
tuning using m micro pumps. inductors, vara	nicro fluidics, typical micro fluidic channel, microfluid dispenser RADIO FREQUENCY (RF) MEMS: RF – based communication actors, tuner/filter, resonator, clarification of tuner, filter, reso	r, micro needle, on systems, RF	, molecular gate, MEMS, MEMS
tuning using m micro pumps.	nicro fluidics, typical micro fluidic channel, microfluid dispenser RADIO FREQUENCY (RF) MEMS: RF – based communication actors, tuner/filter, resonator, clarification of tuner, filter, reso	r, micro needle, on systems, RF	, molecular gate, MEMS, MEMS
tuning using m micro pumps. inductors, vara	nicro fluidics, typical micro fluidic channel, microfluid dispenser RADIO FREQUENCY (RF) MEMS: RF – based communication actors, tuner/filter, resonator, clarification of tuner, filter, reso	r, micro needle, on systems, RF onator, MEMS	, molecular gate, MEMS, MEMS switches, phase
tuning using m micro pumps. inductors, vara shifter.	nicro fluidics, typical micro fluidic channel, microfluid dispenser RADIO FREQUENCY (RF) MEMS: RF – based communication actors, tuner/filter, resonator, clarification of tuner, filter, reso	r, micro needle, on systems, RF onator, MEMS	, molecular gate, MEMS, MEMS switches, phase
tuning using m micro pumps. inductors, vara shifter. <b>Text Books</b>	nicro fluidics, typical micro fluidic channel, microfluid dispenser RADIO FREQUENCY (RF) MEMS: RF – based communication actors, tuner/filter, resonator, clarification of tuner, filter, reso	r, micro needle, on systems, RF onator, MEMS Total Periods	, molecular gate, MEMS, MEMS switches, phase
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tuning using m micro pumps. inductors, vara shifter. <b>Text Books</b> 1. 2.	ADIO FREQUENCY (RF) MEMS: RF – based communication actors, tuner/filter, resonator, clarification of tuner, filter, resonator Fundamental of MEMS by N.P.G.S Mahalik, TMH Foundations of MEMS by Chang Liu (2nd edition), 2012, PHI	r, micro needle, on systems, RF onator, MEMS Total Periods	, molecular gate, MEMS, MEMS switches, phase
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Unit –	II MIXERS	Periods	9
	Aixer - Qualitative Description of the Gilbert Mixer - Converse		
	ysis of Gilbert Mixer - Distortion - High-Frequency Case		
	Mixer - Distortion in Unbalanced Switching Mixer - Conversio	n Gain in Unbalance	ed Switching Mixer -
	balanced Switching Mixer		I
Unit – III	FREQUENCY SYNTHESIZERS	Periods	9
	ed Loops - Voltage Controlled Oscillators - Phase Detector -		
	Frequency Dividers - LC Oscillators - Ring Oscillators - Phase DECT Application).	Noise - A Complete	e Synthesizer Design
Unit –	UB SYSTEMS	Periods	9
IV			
Data conv	erters in communications, adaptive Filters, equalizers and trans	ceivers	
Unit –		Periods	9
VLSI arch	itecture for Multitier Wireless System - Hardware Design Issue		ion CDMA System.
		<b>Total Periods</b>	45
Text Book			
1.	B.Razavi, "RF Microelectronics", Prentice-Hall, 2019.		
2.	Bosco H Leung "VLSI for Wireless Communication", Pearso	n Education, 2015	
Reference	es		
1.	Thomas H.Lee, "The Design of CMOS Radio – Frequency In Press ,2003.	egrated Circuits', C	ambridge University
2.	Emad N Farag and Mohamed I Elmasry, "Mixed Signal VLS Systems", Kluwer Academic Publishers, 2000.	Wireless Design -	Circuits and
3.	BehzadRazavi, "Design of Analog CMOS Integrated Circuits	" McGraw-Hill, 199	99
4.	J. Crols and M. Steyaert, "CMOS Wireless Transceiver Design 1997.	n," Boston, Kluwer	Academic Pub.,
E-Resourc	es		
E1	https://nptel.ac.in/courses/106105161/58 Prof.Indiranilsengu	ota	
E2	https://nptel.ac.in/courses/106105034/19 Prof.Ajit Pal		

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					rse, the st										nowledg level
C					fundame		-	al imag	e proc	essing					<u>52</u>
Course Outcome		<b>CO2:</b>	Differei	ntiate in	nage tran	sform	s.								32
outcome		CO3: technic		various	techniqu	les for	image	enhanc	ement	and re	storat	ion			<b>K</b> 4
		CO4:	Utilize	approp	riate prep	proces	sing teo	chnique	s for m	anipu	lation	of in	nages	K	3
		CO5:	To bec	come fa	miliar a	nd ap	ply vari	ous im	age con	npress	ion n	nethod	S	K	<b>K</b> 4
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	(	3/2/1 ind	icates st		<b>CO / PO</b> f correlati		-	7 Med	ium 1	Weak			CO/I Map		
COs		<i>5/2/1</i> IIId	ieuces su		Programm				iuiii, 1	weak			PSOs		
	PO	1 PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	3	2					2		10			3	2	5
CO2	3	3	2	2	+			2		2			3	2	2
CO3 CO4	3		2	2				2		2			3	2	2
CO5	3	2	2							2			3	2	+
500				1	<u> </u>		1	I			1	1			<u> </u>
	ssessi	nent Me	ethods												
Course As Direct					I, II & III										

9 of visual perception, relationship between aliasing and Moire 9 9 patial filters. Image patial filtering, mean filtering, constrained 9 global, multiple and
of visual perception, relationship between aliasing and Moire 9 patial filters. Image patial filtering, mean filtering, constrained 9
relationship between aliasing and Moire 9 patial filters. Image patial filtering, mean filtering, constrained 9
9 patial filters. Image patial filtering, mean filtering, constrained 9
patial filters. Image patial filtering, mean filtering, constrained 9
patial filters. Image patial filtering, mean filtering, constrained 9
patial filtering, mean filtering, constrained 9
nage representation: and skeletons. 9 coding, run length dard, MPEG.
45
essing", Pearson
essing", Pearson
Hall of India- 2012
Ic Graw-Hill,
med,McGraw-Hill,
ing_2ndEd.pdf

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		VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN (Autonomous Institution, Affiliated to Anna University ,Chennai) Elayampalayam, Tiruchengode – 637 205       Image: Content of Content														
Programn	ne	B.E.						Progra	mme	Code	103	Re	gulatio	n	2019	
Departme	nt		CTRON INEER		AND CO	OMMU	JNICA	TION				S	Semeste	er		
Course Co	oda		C	ourso N	Jamo		Pe	riods l	Per We	eek	Credit		Maxi	Maximum Marks		
Course Co	Jue	Course Name					Ι		Г	Р	С		CA	ES	E Tot	
U19ECV2	22	Medical Image Processing							C	0	3		40	60	) 10	
Course Objectiv																
		<ul> <li>Understand the concepts of Neuro Magnetic Imaging and MRI</li> <li>Analyze the principle and operation modes of Ultrasound Imaging</li> <li>At the end of the course, the student should be able to,</li> </ul>								Knov edge Leve						
Course		<b>CO1:</b> Identify the nuclear medical imaging techniques for acquisition of images													K2	
Outcome		<b>CO2:</b> Apply 2D and 3D transforms required for image reconstruction													K3	
	·	<b>CO3:</b> Analyze the x-ray medical imaging techniques and its imaging quality													K4	
	-	CO4:	<b>CO4:</b> understand the concept of Neuro Magnetic Science in MRI													
	-	CO5: Analyze the principle and operation modes of Ultrasound Imaging									K4					
Pre-requisit	tes	Knowledge on Mathematics														
	(3/2)	/1 india	ates stra			<b>) Mapp</b> ion) <b>3-S</b>		2 _ Mo	lium 1	- Wo	ək		CO/P Mapp			
COs	(3/2/	1 mate		0		me Out	U,						PSOs			
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	
CO 1	3	3	2					2				2	3	2		

### **Course Assessment Methods**

Direct

CO 2

CO 3

CO 4

CO 5

1.Continuous Assessment Test I, II & III2.Assignment3.End-Semester examinations

Indirect

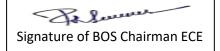
1. Course - end survey

 Content of the syllabus

 Unit – I
 ACQUISITION OF IMAGES
 Periods
 9

 Introduction to Imaging Techniques
 Single crustal scintillation camera
 Principles of scintillation

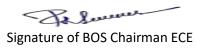
Introduction to Imaging Techniques - Single crystal scintillation camera - Principles of scintillation camera - multiple crystal scintillation camera - solid state camera - rectilinear scanner- Emission



computed Tomog	graphy.		
Unit – II	MATHEMATICAL PRELIMINARIES FOR IMAGE RECONSTRUCTION	Periods	9
Image Reconstr	uction from Projections in Two dimensions- Mathematical Pr	eliminaries fo	or Two and
Three dimensio	nal Image Reconstructions - Radon Transform- Projection	Theorem - o	central slice
	gram- Two Dimensional Projection Reconstruction- Three	Dimensional	Projection
	Iterative Reconstruction Techniques.		
Unit – III	FLUOROSCOPY, CT, IMAGE QUALITY	Periods	9
Tomographic Ir quality: Unshar	copy- Automatic Brightness control - cinefluorography- Princ naging - Reconstruction algorithms - Scan motions- X-ray sources. I pness- contrast - Image Noise.	Influences of I	mages
Unit – IV	MAGNETIC RESONANCE IMAGING AND SPECTROSCOPY	Periods	9
resonance imag FMRI.	f magnetic resonance- overview -Pulse techniques- spatial encoding of ing signal- motion suppression techniques- contrast agents- tissue cor	e	
Unit – V	ULTRASOUND, NEUROMAGNETIC IMAGING	Periods	9
dynamic Range	sentation modes- Time required to obtain Images- System componente- Ultrasound Image Artifacts- Quality control, Origin of Doppler		•
dynamic Range Doppler system	- Ultrasound Image Artifacts- Quality control, Origin of Doppler s.		•
dynamic Range	- Ultrasound Image Artifacts- Quality control, Origin of Doppler s.	shift- Limitati	ons of
dynamic Range Doppler system	- Ultrasound Image Artifacts- Quality control, Origin of Doppler s.	shift- Limitati <b>Total Periods</b>	ons of <b>45</b>
dynamic Range Doppler system Text Books	- Ultrasound Image Artifacts- Quality control, Origin of Doppler s s. William R. Hendee, E. Russell Ritenour, Medical Imaging Physics	shift- Limitati <b>Fotal Periods</b> s: A John Wile	ons of 45 y & sons, Inc.,
dynamic Range Doppler system Text Books 1.	<ul> <li>Ultrasound Image Artifacts- Quality control, Origin of Doppler s.</li> <li>William R. Hendee, E. Russell Ritenour, Medical Imaging Physics Publication, Fourth Edition 2002.</li> <li>Z.H. Cho., J-oie, P. Jones and Manbir Singh, Foundations of Medical</li> </ul>	shift- Limitati <b>Fotal Periods</b> s: A John Wile	ons of 45 y & sons, Inc.,
dynamic Range Doppler system Text Books 1. 2.	<ul> <li>Ultrasound Image Artifacts- Quality control, Origin of Doppler s.</li> <li>William R. Hendee, E. Russell Ritenour, Medical Imaging Physics Publication, Fourth Edition 2002.</li> <li>Z.H. Cho., J-oie, P. Jones and Manbir Singh, Foundations of Medical</li> </ul>	shift- Limitati <b>Fotal Periods</b> s: A John Wile cal Imaging: Jo	ons of 45 y & sons, Inc., ohn Wiley and
dynamic Range Doppler system Text Books 1. 2. References 1. 2.	<ul> <li>Ultrasound Image Artifacts- Quality control, Origin of Doppler s.</li> <li>William R. Hendee, E. Russell Ritenour, Medical Imaging Physics Publication, Fourth Edition 2002.</li> <li>Z.H. Cho., J-oie, P. Jones and Manbir Singh, Foundations of Medic sons Inc.</li> <li>Avinash C. Kak, Malcolm Shaney, "Principles of Computerized Topology 2012 (2012)</li> </ul>	shift- Limitati <b>Total Periods</b> s: A John Wile cal Imaging: Jo omographic In	ons of 45 y & sons, Inc., ohn Wiley and naging", IEEE
dynamic Range Doppler system Text Books 1. 2. References 1.	<ul> <li>Ultrasound Image Artifacts- Quality control, Origin of Doppler s.</li> <li>William R. Hendee, E. Russell Ritenour, Medical Imaging Physics Publication, Fourth Edition 2002.</li> <li>Z.H. Cho., J-oie, P. Jones and Manbir Singh, Foundations of Medic sons Inc.</li> <li>Avinash C. Kak, Malcolm Shaney, "Principles of Computerized To Press, Newyork-1998.</li> </ul>	shift- Limitati <b>Total Periods</b> s: A John Wile cal Imaging: Jo omographic In Ahmed,McGra	ons of 45 y & sons, Inc., ohn Wiley and naging", IEEE w-Hill, 1995
dynamic Range Doppler system Text Books 1. 2. References 1. 2. 3. 4.	<ul> <li>Ultrasound Image Artifacts- Quality control, Origin of Doppler s.</li> <li>William R. Hendee, E. Russell Ritenour, Medical Imaging Physics Publication, Fourth Edition 2002.</li> <li>Z.H. Cho., J-oie, P. Jones and Manbir Singh, Foundations of Medic sons Inc.</li> <li>Avinash C. Kak, Malcolm Shaney, "Principles of Computerized To Press, Newyork-1998.</li> <li>image Processing Theory, Algorithm and Architectures, M.A.Sid A</li> </ul>	shift- Limitati <b>Total Periods</b> s: A John Wile cal Imaging: Jo omographic In Ahmed,McGra ver, NJ: Prentic	ons of 45 y & sons, Inc., ohn Wiley and naging", IEEE w-Hill, 1995 ce Hall, 2003
dynamic Range Doppler system Text Books 1. 2. References 1. 2. 3.	<ul> <li>Ultrasound Image Artifacts- Quality control, Origin of Doppler s.</li> <li>William R. Hendee, E. Russell Ritenour, Medical Imaging Physics Publication, Fourth Edition 2002.</li> <li>Z.H. Cho., J-oie, P. Jones and Manbir Singh, Foundations of Medic sons Inc.</li> <li>Avinash C. Kak, Malcolm Shaney, "Principles of Computerized To Press, Newyork-1998.</li> <li>image Processing Theory, Algorithm and Architectures, M.A.Sid A Epstein, C. L. Mathematics of Medical Imaging. Upper Saddle Riv</li> </ul>	shift- Limitati <b>Total Periods</b> s: A John Wile cal Imaging: Jo comographic In Ahmed,McGra ver, NJ: Prentio & Francis, 20	ons of 45 y & sons, Inc., ohn Wiley and naging", IEEE w-Hill, 1995 ce Hall, 2003 18.
dynamic Range Doppler system Text Books 1. 2. References 1. 2. 3. 4.	<ul> <li>Ultrasound Image Artifacts- Quality control, Origin of Doppler s.</li> <li>William R. Hendee, E. Russell Ritenour, Medical Imaging Physics Publication, Fourth Edition 2002.</li> <li>Z.H. Cho., J-oie, P. Jones and Manbir Singh, Foundations of Medic sons Inc.</li> <li>Avinash C. Kak, Malcolm Shaney, "Principles of Computerized To Press, Newyork-1998.</li> <li>image Processing Theory, Algorithm and Architectures, M.A.Sid A Epstein, C. L. Mathematics of Medical Imaging. Upper Saddle Riv Webb, S. The Physics of Medical Imaging. New York, NY: Taylor</li> </ul>	shift- Limitati <b>Total Periods</b> s: A John Wile cal Imaging: Jo comographic In Ahmed,McGra ver, NJ: Prentio & Francis, 20	ons of 45 y & sons, Inc., ohn Wiley and naging", IEEE w-Hill, 1995 ce Hall, 2003 18.
dynamic Range Doppler system Text Books 1. 2. References 1. 2. 3. 4. 5.	<ul> <li>Ultrasound Image Artifacts- Quality control, Origin of Doppler s.</li> <li>William R. Hendee, E. Russell Ritenour, Medical Imaging Physics Publication, Fourth Edition 2002.</li> <li>Z.H. Cho., J-oie, P. Jones and Manbir Singh, Foundations of Medic sons Inc.</li> <li>Avinash C. Kak, Malcolm Shaney, "Principles of Computerized To Press, Newyork-1998.</li> <li>image Processing Theory, Algorithm and Architectures, M.A.Sid A Epstein, C. L. Mathematics of Medical Imaging. Upper Saddle Riv Webb, S. The Physics of Medical Imaging. New York, NY: Taylor</li> </ul>	shift- Limitati <b>Total Periods</b> s: A John Wile cal Imaging: Jo comographic In Ahmed,McGra ver, NJ: Prentio & Francis, 20	ons of 45 y & sons, Inc., ohn Wiley and naging", IEEE w-Hill, 1995 ce Hall, 2003 18.
dynamic Range Doppler system Text Books 1. 2. References 1. 2. 3. 4. 5. E-Resources	<ul> <li>Ultrasound Image Artifacts- Quality control, Origin of Doppler s.</li> <li>William R. Hendee, E. Russell Ritenour, Medical Imaging Physics Publication, Fourth Edition 2002.</li> <li>Z.H. Cho., J-oie, P. Jones and Manbir Singh, Foundations of Medic sons Inc.</li> <li>Avinash C. Kak, Malcolm Shaney, "Principles of Computerized To Press, Newyork-1998.</li> <li>image Processing Theory, Algorithm and Architectures, M.A.Sid A Epstein, C. L. Mathematics of Medical Imaging. Upper Saddle Riv Webb, S. The Physics of Medical Imaging. New York, NY: Taylor Macovski, A. Medical Imaging Systems. Upper Saddle River, NJ: F</li> </ul>	shift- Limitati <b>Total Periods</b> s: A John Wile cal Imaging: Jo comographic In Ahmed,McGra ver, NJ: Prentio & Francis, 20	ons of 45 y & sons, Inc., ohn Wiley and naging", IEEE w-Hill, 1995 ce Hall, 2003 18.

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		VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN (Autonomous Institution, Affiliated to Anna University ,Chennai) Elayampalayam, Tiruchengode – 637 205															
Program	ne l	B.E.			<i>y</i> 1	•		me Co		103		ilation		201	9		
Departme	nt ]	ELECI	<b>FRONI</b>		ND CO		0				0	nester			-		
Course Co			Course		I	Periods Per Week					Max	imum	mum Marks				
				L	Т	P		С	С	A	ES	SE	Total				
U19ECV2		Biomedical Signal300340Processing											6	0	100		
Course Objectiv		<ul> <li>The main objective of the course is to</li> <li>Understand and gain complete knowledge about the fundamentals of biomedic signal processing</li> <li>Develop a theoretical foundation of biomedical signal processing techniques.</li> <li>Provide analytic skills to process the ECG and EEG</li> <li>Develop analytic skills to algorithms for HRV and Arrhythmia analysis</li> <li>Understand the knowledge gained to model, analyse and predict various pathological conditions</li> </ul>															
Course	•														Knowledge Level K2		
Outcome	<u>ر</u>	CO2: Model the biomedical systems													K3		
Outcome	(	CO3: Analyze EEG & ECG signals													K4		
		<b>CO4:</b> Apply various algorithms for HRV and Arrhythmia analysis <b>CO5:</b> Apply the knowledge gained to model, analyse and predict various												K3			
						ained to	o mode	el, anal	yse a	and pred	ict varie	ous		K3			
Pre-			gical con	attions	•												
requisites																	
						) Mapp					_		CO/				
COs	(3/2	(3/2/1 indicates strength of correlation) <b>3-Strong, 2 – Medium, 1 - Weak</b> Programme Outcomes (POs)								k		Mapping PSOs					
005	PO 1	PO 2	PO 3	PO 4	<b>PO</b> 5	PO 6	<b>PO</b> 7	PO 8	P( 9	O PO 10	PO 11	PO 12	PS 01	PSO 2	PS O 3		
CO 1	3	2	2	·			,	Ť	Ĺ			2	2				
CO 2	2	3	2	2									2	2			
CO 3	2		3	3	-	-							3	3			
CO 4 CO 5	2	2	2		+	+		2	+		-	2	22	2			
Course As			_	l	1	1	1	1	1	I	1		L <del>-</del>	1	L		
Direct 1.Con 2.Ass	ntinuo signm	ous Ass ient	essmen		I, II &	: III											
Indirect	1-9611	icstel e	ланнна	10115													
A REAL PROPERTY.																	
	ourse	- end s	urvev														



Content	of the syllabus							
Unit – l	INTRODUCTION	Periods	9					
Biomedic	al Signals – Sources, Properties, Objectives and Difficulties		al Signal Analysis,					
	or removal of artifacts – Time domain filters, Frequency do							
Unit – I		Periods	9					
1	cess, Parametric System Modeling, All Pole Modeling, Applications.	Pole-Zero N	Modeling, Spectral					
Unit – Il		Periods	9					
	n and its potentials; The Electrophysiology origin of brain v	vaves; the EEO	G Signal and its					
character theory;	ristics; EEG analysis; Statistical parameter mapping of E The autoregressive (AR) method; Wiener filtering proble eepest – descent algorithm; Windrow-hoff least–mean-square	EG signal; Li em; Principle	near prediction of an adaptive					
Unit – I		Periods	9					
estimation noise car	ectrocardiography; ECG data acquisition; ECG lead system on; Use of multi-scale analysis for parameters estimation of nceller; Long term continuous ECG recording; The wavele transform (DWT); Multi-resolution analysis; Pyramid algorithms	ECG wavefo et approximati	rms, Adaptive					
Unit – V		Periods	9					
	te variability; comparison of short-term and long term HR domain parameters of short term recording.							
		<b>Total Period</b>	ds 45					
Text Boo								
1.	Rangaraj M.Rangayyan, "Biomedical Signal Analysis", W		· · · · · 1					
2.	Kayvan Najarian and Robert Splinter, "Biomedical Signal	and Image Pro	ocessing", 2nd					
Referenc	Edition, CRC Press, 2012							
1.	D.C.Reddy, Biomedical Signal Processing Principles and Education, New Delhi, 2009.							
2.	Arnon Cohen "Biomedical Signal Processing" Crc Pr I Llo		-					
3.	W.J.Tompkins, Biomedical Digital signal processing, Prentice Hall, New Jersey-1993.							
4.	Tompkins W J "Biomedical Signal Processing", Prentice h	nall of India, N	lew Delhi, 1999.					
5.	IEEE Engineering Medicine and Biology Magazine.							
E-Resour	rces							
1.	https://go-pdf.online/biomedical-signal-processing-by-d-c-	-reddy.pdf						
2.	https://www.intechopen.com/books/8851#:~:text=Neural% 0a,of%20neuroscience%20and%20neural%20engineering							
3.	https://ocw.mit.edu/courses/hst-582j-biomedical-signal-an 2007/pages/lecture-notes/	d-image-proce	essing-spring-					

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WOMEN EMPO	WERNENT		Elayampalayam, Tiruchengode – 637 205         B.E.       Programme Code       103       Regulation       2019         ELECTRONICS AND COMMUNICATION       Elevent       Elevent       100													_			
Prog	ramme									ode	103	Re	gulation	1	201	9			
Depa	rtment			ONIC ERIN		D CON					Semester								
Course	Code	Course Name     Periods Per Week     Credit     Maximum M       L     T     P     C     CA     ESE									Aarks Total								
U19E0	CV24			nd Nat			3	0	0		3		50	50					
Objec Cou Outco	Size v24       Language Processing       3       0       0       3       30         Course       The main objective of the course is to       To learn production and classifications of speech.       To learn different speech modeling and implementation issues         bjective       To learn different speech modeling and implementation issues         bjective       To learn the natural language processing algorithms and ambig         To learn the natural language processing models and evaluatio         At the end of the course, the student should be able to,         Course       CO1: Understand the production and classifications of speech signals         CO2: Understand different speech modeling and implementation issues         CO3: Understand different speech recognition system and applications         CO4: Understand natural language processing algorithms and ambiguit         CO5: Understand natural language processing models and evaluation         orequisites       -								cations d ambig valuation gnals n issues ations nbiguiti	guities on Knowled Level K2 s S K2 K2									
COs	(3/2)	/1 indio	cates st	rength		elation) ramme				1 <b>m</b> , 1	l - Wea	k		Mappi PSOs	ng				
	PO	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	РО	10 P	0 11	РО	PSO1	PSO	PSO			
CO 1	1 3	3	2	2	2	2							<u>12</u> 1	3	$\frac{2}{2}$	3			
$\frac{\text{CO I}}{\text{CO 2}}$	3	3	2	2	2	2							1	3	2	2			
$\frac{\text{CO 2}}{\text{CO 3}}$	3	3	2	2	2	2							1	3	2	2			
$\frac{\text{CO} \text{ J}}{\text{CO} \text{ 4}}$	3	3	2	2	2	2							1	3	2	2			
$\frac{\text{CO4}}{\text{CO5}}$	3	3	2	2	2	2							1	3	2	2			
	Assessn Continue Assignm	ous As			t I, II &	k III													
	End-Sen		examir	nations															
1 F																			
J.E Indired	Course	- end	survey																
Indire		syllab	us																
Indireo 1.	of the	•			DTO							Pe	riods		9				
Indired 1. Content		BAS	SIC C	ONCF	UPTS				and (	1000	ificatio			Sounda	-				
Indirec 1. Content Unit Speech Acoust	– <b>I</b> Funda ic Phor	menta	– Acou	iculato ustics o	ory Pho of spee	ch pro	duction	n; Rev	iew of				rocessir						
Indired 1. Content Unit Speech	– <b>I</b> Funda ic Phor Time F	menta netics - 'ourier	ls: Art – Acou Trans	iculato ustics o	ory Pho of spee Filter-I	ch pro Bank a	duction	n; Rev	iew of			nal P							

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Search, B	aum-Welch Parameter Re-estimation, Implementation issues.		
Unit – I		Periods	9
	ocabulary Continuous Speech Recognition: Architecture of a		
-	ecognition system - acoustics and language models - n-grams	s, context depe	endent sub-word
units; A	oplications and present status.		
Unit – I	REGULAR EXPRESSIONS	Periods	9
	lge in Speech and Language Processing, Ambiguity, Models and	•	•
	gular Expression Patterns, Disjunction, Grouping, and Precedence	e, Example: Si	mple and
Complex	a, Advanced Operators	1	
Unit – Y	AND LANGUAGE MODELING	Periods	9
	Corpora, Word tokenization and normalization, Word segment		
Minimu	n edit distance algorithm N-Grams, Evaluating Language Modelin	ng, Smoothing	algorithm
		<b>Total Periods</b>	45
Text Book			
	Thomas F Quatieri, "Discrete-Time Speech Signal Pr	ocessing –	Principles and
1.	Practice", Pearson Education, 2012.	C	1
2	L.R.Rabiner, R.W.Schafer, "Digital Processing Of Speech Sign	als", Pearson I	Education 4 <sup>th</sup>
2.	Edition, 2009.		
3	Lawrence Rabiner and Biing-Hwang Juang, "Fundamentals of Education, 2003.		
4	Jurafsky, Daniel Martin & James H., "Speech and Language Pr Natural Language Processing, Computational Linguistics, and Edition, Pearson Education India, New Delhi, 2019.		
Reference			
1.	Steven W. Smith, "The Scientist and Engineer's Guide to Digit California Technical Publishing, 1997.	al Signal Proce	essing",
	Daniel Jurafsky and James H Martin, "Speech and Language Pr	ocessing – An	Introduction to
2.	Natural Language Processing, Computational Linguistics, and S Education, 2002.		
3.	Frederick Jelinek, "Statistical Methods of Speech Recognition"	, MIT Press, 19	997.
4.	Eisenstein & Jacob, "Natural Language Processing", 1st Edition		
	Ben Gold and Nelson Morgan, "Speech and Audio Signal Proce		
5.	Perception of Speech and Music", Wiley- India Edition, 2006.	6,	8
E-Resourc			
1.	https://research.iaun.ac.ir/pd/mahmoodian/pdfs/UploadFile_2643	3.pdf	
2.	http://mu.ac.in/wp-content/uploads/2014/04/SPEECH-RECOGN	ITION.pdf	
3.	https://doc.lagout.org/science/0_Computer%20Science/9_Others ing/The%20Scientist%20and%20Engineer%27s%20Guide%20to	/1_Digital%20	Signal%20Proces

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		ANANDHA COL onomous Institutio Elayampala	on, Affiliate	ed to A	.nna Uni	versity ,C		110	Kontelent Revented RTREED Processors 0 encoders		
Programme	B.E.		Pro	gramm	ne Code	103	Regulation	2019			
Department	ELECTRONIC ENGINEERIN	DNICS AND COMMUNICATION         Semester           RING         Semester									
Course Code	Cour	se Name	Perio	ds Per	Week	Credit	Maxir	mum Marks			
Course Coue	Cour	se manne	L	Т	Р	С	CA	ESE	Total		
U19ECV25	Digital Video Pi	ocessing	3	0	0	3	40	60	100		
Course Objective	The main objecti	ve of the course is	s to								
	At the end of the		Knowledge level								
	CO1: Demonstra videos, how digit spatio-temporal i		K2								
Course Outcome	<b>CO2:</b> Perform te and compensatio	chniques for motion.	on analysis	on, estimation	К3						
		eo processing tech in order to perfor				ent, segm	entation for		K3		
		lynamic imagery in order to perform higher level analysis CO4: Learn fundamentals of video compression techniques and their applications									
	CO4: Learn fund	lamentals of video	compress	ion tec	hniques	and their	applications		K4		
	CO5: Identify as	lamentals of video well as apply thes propose solutions	se techniqu	ies to s	-		~ ~		K4 K3		

	(3/2/1	indicat	tes strei			<b>O Map</b> tion) 3-	<b>ping</b> -Strong	, 2 – M	edium,	1 - We	eak		CO/PS	O Mapj	ping
COs					PSOs	PSO PSO 3									
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	<b>PO</b> 7	PO 8	PO 9	PO 10	P 0 11	PO 12	PSO1	PSO 2	PSO 3
CO1	3	2	2									2	2		
CO2	2	3	2	2									2	2	
CO3	2		3	3									3	3	
CO4	2							2					2	2	
CO5	3	2	2									2	2		

### **Course Assessment Methods**

	Direct									
	1.	Continuou	is Assessment	Test I, II & I	II					
	2.	Assignme	nt: Simulation	using tool						
	3.	End-Seme	ester examinati	ons						
	Indire	et								
	1.	Course - e	end survey							
Conte	nt of th	e syllabus								
Ur	nit — I	DIGIT	AL VIDEO F	ORMATIO	N		Pe	eriods	9	
Introdu	uction	to	digital	video	and	digital	video	processing,	An	nalog
							1		182	
				$\leq$	R. S.					

Sensors, Vic formats- Storag	leo sampling and interpolation- Interlaced and Progr e devices, NVR, DVR- Different types of Video Cameras, IP Camera	acquisition, C essive scanni	ing- Video file
Unit - II	MOTION ANALYSIS	Periods	9
	on – Hypothesis testing with Fixed/Adaptive thresholding Motion Estim	mation-Pixel bas	sed approaches-
	g approaches- Motion compensation for videos	Devie 1	0
Unit – III	VIDEO ENHANCEMENT:	Periods	8
Unit - IV	- Spatio-temporal noise filtering- Order statistics filtering, Blotch dete	Periods	<u>9</u>
	GUARANTEED SERVICE MODEL letection- Motion segmentation- Video shot boundary detection- Motion		
Feature based t	•	ion tracking-con	nour based tracking-
Unit – V	VIDEO COMPRESSION TECHNIQUES:	Periods	10
Inter frame coo H.264	ling-MPEG-1,MPEG-2 and MPEG-4video compression standards – I		
		<b>Total Periods</b>	45
Text Books	1		
1.	Yao.Wang, Jom Ostermann, & Ya-Oin Zhang, "Video Processing & 2002. (ISBN 0-13-017547-1)	Communication	s", Prentice Hall,
2.	A. Murat Tekalp, "Digital Video Processing, Pearson Education", Pro (ISBN-10: 0-13-399100-8)	entice Hall, 201:	5.
References			
1.	Oge Marques, "Practical Image and Video Processing using MATLA Press. 2011.	B", Wiley-IEE	Ξ
2.	H.264 and MPEG-4 Video Compression: Video Coding for Next Ger Richardson, Wiley, 2003	neration Multim	edia – Iain E.G.
3.	Al Bovik, "Handbook of Image & Video Processing", 0121197905)	Academic Pre	ess, 2000. (ISBN:
4.	J. W. Woods, "Multidimensional Signal, Image and W Academic Press, 2006. (ISBN 0-12-088516-6)	ideo Processi	ng and Coding",
5.	lain E.G. Richardson, "H.264 and MPEG-4 Video Co Next Generation Multimedia", Wiley, 2003. (ISBN: 978-0-470-8696		ideo Coding for
<b>E-Resources</b>			
1.	https://preetikale.files.wordpress.com/2018/07/handbook-of-image-a	nd-video-proces	sing-al-bovik1.pdf
2.	https://yslaiseblog.files.wordpress.com/2013/10/gfx-multimedia-mak	ing-it-work-8th	-edition.pdf
3.	https://doc.lagout.org/network/H.264%20and%20MPEG4%20Video	-	-
4.	https://ptgmedia.pearsoncmg.com/images/9780133991000/samplepa		*
5.	https://books.google.co.in/books/about/Digital_Image_Sequence_Pro AAQBAJ&redir_esc=y	-	*

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CO 2 CO 3	3	3	2	22	22	22						1	3	2	2					
CO 4	3	3	2	2	2	2						1	3	2	2					
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Cross-Co	rrelation Receiver, Efficiency of Non-Matched Filters, Matched Fil	lter for Non-W	hite Noise.
Unit – I	II DETECTION OF RADAR SIGNALS IN NOISE	Periods	9
Sequentia Detection Signal M	n Criteria – Neyman-Pearson Observer, Likelihood-Ratio Receiver al Observer, Detectors – Envelope Detector, Logarithmic Dete n- CFAR Receiver, Cell Averaging CFAR Receiver, CFAR Loss anagement – Schematics, Component Parts, Resources and Constra	ector, I/Q Det s, CFAR Uses aints.	tector. Automatic s in Radar. Radar
Unit – I	II WAVEFORM SELECTION	Periods	9
Case, Si	Ambiguity Function and Ambiguity Diagram – Principles and Pro ingle Pulse of Sine Wave, Periodic Pulse Train, Single Linear FM rm Design Requirements, Optimum Waveforms for Detection rms.	Pulse, Noise	Like Waveforms,
Unit – I	IV         PULSE COMPRESSION IN RADAR SIGNALS	Periods	9
Reduction Scheman	ction, Significance, Types, Linear FM Pulse Compression – Bloon of Time Side lobes, Stretch Techniques, Generation and Decodi tic and Characteristics of Passive System, Digital Compression, SA	ng of FM Wa W Pulse Com	veforms – Block pression.
Unit –	V         PHASE CODING TECHNIQUES           es, Binary Phase Coding, Barker Codes, Maximal Length Sequ	Periods	9
Diagran	n of a Phase Coded CW Radar. Poly Phase Codes : Frank Codes, Compression, Doppler Tolerant PC Waveforms – Short Pulse		
Diagram Pulse C	Compression, Doppler Tolerant PC Waveforms – Short Pulse IFM),Side lobe Reduction for Phase Coded PC Signals.		
Diagran Pulse C (LPM/H	Compression, Doppler Tolerant PC Waveforms – Short Pulse IFM),Side lobe Reduction for Phase Coded PC Signals.	e, Linear Per Fotal Periods	iod Modulation 45
Diagram Pulse C (LPM/H Text Book	Compression, Doppler Tolerant PC Waveforms – Short Pulse IFM),Side lobe Reduction for Phase Coded PC Signals. T ss G. Richard Curry, "Radar System Performance Modeling", Volu	e, Linear Per Fotal Periods ume 1, Artech	iod Modulation 45
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Diagram Pulse C (LPM/H Text Book 1. 2.	Compression, Doppler Tolerant PC Waveforms – Short Pulse IFM),Side lobe Reduction for Phase Coded PC Signals.	e, Linear Per Fotal Periods ume 1, Artech	iod Modulation 45
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Diagram Pulse C (LPM/H <b>Text Book</b> 1. 2. <b>Reference</b> 1. 2. 3. 4. 5.	Compression, Doppler Tolerant PC Waveforms – Short Pulse IFM),Side lobe Reduction for Phase Coded PC Signals. T S G. Richard Curry, "Radar System Performance Modeling", Volu Edition, 2015. M.I. Skolnik, "Introductions to Radar Systems", TMH, 3 <sup>rd</sup> Edition S Peyton Z. Peebles, "Radar Principles", John Wiley, 2014. Peyton Z. Peebles, "Radar Design Principles: Signal Processing Edition, 2013. R. Nitzberg, "Radar Signal Processing and Adaptive Systems", J M.I. Skolnik, "Radar Handbook", McGraw Hil , 2 <sup>nd</sup> Edition, 2015. F.E. Nathanson, "Radar Design Principles", McGraw Hil ,2015.	e, Linear Per <b>Fotal Periods</b> Jume 1, Artech on, 2013. and The Envi Artech House, 15. 5.	iod Modulation 45 House, 2 <sup>nd</sup> ronment", PHI. 2 <sup>nd</sup>
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# VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN

(Autonomous Institution, Affiliated to Anna University, Chennai)

Elayampalayam, Tiruchengode – 637 205



Programme																				
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# Content of the syllabus

Unit – I Fundamentals Of Programmable DSPs

186

Introduction t	Programmable DSPs, Architectural Features of PDSPs - Multiplier and	d Multiplier ac	cumulator Modified
	s and Memory access – Multiple access memory – Multi-port memory		
	ssing modes in P-DSPs – On chip Peripherals, Applications of Program		intecture- r ipenning –
Unit - II	TMS320C5X Processor	Periods	9
Architecture of	f C5X Processor – Addressing modes – Assembly language Instructions	s - Pipeline stru	cture. On-chip
	Block Diagram of DSP starter kit (DSK) – Software Tools, DSK on-boa		
	processing real time signals.		11
Unit – III	TMS320C6X Processor	Periods	8
Architecture of	f the C6x Processor - Instruction Set – Addressing modes, Assembler di	rectives, On-c	hip peripherals, DSP
	System: DSP Starter Kit - Code Composer Studio - Support Files – Intro		
on-board perij	pherals, Real-Time Programming Examples for Signals and Noise gener	ation, Frequen	cy analysis, Filter
design			
Unit - IV	ADSP Processors	Periods	9
	of ADSP-21XX and ADSP-210XX series of DSP processors- Addres	sing modes ar	nd assembly language
instructions -	Application programs – Filter design, FFT calculation.	•	
Unit – V	TI's Advanced Processors	Periods	10
Study of TI's	s advanced processors - TMS320C674x and TMS320C55x DSPs,	ADSP's Black	cfin and Sigma DSP
Processors, N	XP's DSP56Fxx Family of DSP Processors, Comparison of the features	s of TI, ADSP	and NXP DSP family
processors			
processors		Total Periods	45
processors Text Books	,	Total Periods	45
Text Books			
	B. Venkataramani and M. Bhaskar, Digital Signal Processors – Archite Applications– McGraw Hill Education, II Edition,2017.		
Text Books	B. Venkataramani and M. Bhaskar, Digital Signal Processors – Archite	ecture, Program	nming and
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Cour Object		<ul> <li>To provide the design engineers with the tools necessary for efficient implementation of digital transceivers</li> <li>To focus on the multirate systems arising in the communications, especially wireless</li> </ul>													
		•	and s	oftwar	e define	ed radio	os		-				-	-	
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		At the end of the course, the student should be able to, Knowledge Level													
_	CO1: Implement a resampling architecture for digital RF front end systems K2														
Cour	se	CO2: Differentiate efficient filtering methods for baseband transceivers design. K2													
Course Outcomes	CO3: Acquire knowledge of various cascade systems. K4														
		CO3: Acquire knowledge of various caseade systems.R4CO4: Make use of multirate systems for communication systemsK3													
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CO 2	3	3	2	2	-	-	-	-			-	2	3	2	-
CO 3 CO 4	3	3	22	3	-	-	-	-		 	-	2	3	2	-
CO 4	3	3	2	2	-	-	-	-			-	2	3	2	-
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Unit – I	Multirate Signal Processing	Periods	9
	ls of Multirate Signal Processing – Nyquist and Square root Nyquister – Quadrature Mirror Filters (QMF) – Theory and Application		
Unit – II	Filter implementations for baseband transceivers	Periods	9
	IR filter – Resampling Filter – Half-band Filters – Dyadic filter – -Recursive polyphase filter	- Arbitrary Sam	pling Rate
Unit – III	Cascaded Systems	Periods	9
	tegrator Comb Filter (CIC) – Cascade and multiple stage filters – converters for SDR.	- Analog to Dig	gital and Digital
Unit – IV	Multirate systems for carrier	Periods	9
Timing rec	n in communication systems – Conventional Digital down conver overy in digital demodulation – Carrier recovery and phase recov lio – Review of telecommunication concepts and systems	very – Introduc	
Unit – V	Digital filtering	Periods	9
	l Digital Communication System – Front-end RF system – Link I		
ratios – Dig	gital filtering – Signal recovery – Baseband and Band pass Sampl ds in SDR-RFNM: a next generation SDR.	ling – Complet Total Periods	e SDR systems –
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Unit – I	I WIRELESS CHANNEL MODELING	Periods	9
Free space	ce propagation model, Reflection- Diffraction - Scattering -	Log-normal sh	adowing. Small-scale
multipath	propagation, Types of small scale fading, Rayleigh and Ricean d	istribution, Inpu	it /output model of the
wireless c	channel - Time and frequency coherence - Statistical channel mod	els.	
Unit – II	I MULTIPLE ACCESS SCHEMES AND DIVERSITY	Periods	9
FDMA,	TDMA, CDMA, SDMA and CSMA, OFDMA. Diversity Tec	hniques – Freq	uency diversity, Time
diversity	v, Code diversity, Antenna diversity -RAKE Receiver - SI	MO, MISO, M	IIMO, MIMO-OFDM
Techniq	ue		
Unit – I	V CAPACITY OF WIRELESS CHANNELS	Periods	9
AWGN	channel capacity - capacity of flat fading channels , Frequency-s	elective fading	channels, Multiuser
capacity	, Downlink channel capacity, Uplink channel capacity, Outage ca	pacity	
Unit – V	<b>INTRODUCTION TO CELLULAR CONCEPTS</b>	Periods	9
	concept- system design fundamentals Handoff Strategies- Int ng Coverage and Capacity	erference and s	ystem capacity,
		<b>Total Periods</b>	45
Text Book	SS		
1.	Andrea Goldsmith, "Wireless Communications", Cambridge Ur	iversity Press, 2	2012.
2.	David Tse, Pramod Viswanath, "Fundamentals of Wireless Con Press, 2015.	nmunication", C	Cambridge University
Reference			
1.	Kamilo Feher, "Wireless Digital Communications, Modulation 2015.	& Spread Spect	rum Applications", PHI,
2.	William C. Y. Lee, "Mobile Communication Engineering", Mc	Graw Hill, 2014	
3.	Theodore S. Rappaport, "Wireless Communications", Pearson	Education, 2017	•
4.	Andreas F. Molisch, "Wireless Communications", Wiley, 2011		
E-Resourc	00		
	cs (		
1.	http://ee.sharif.edu/~wireless.comm.net/references/Rappaport%20 %20Wireless%20Communications,Principles%20and%20Practice		422320.pdf
1. 2.	http://ee.sharif.edu/~wireless.comm.net/references/Rappaport%20	-ISBN%2001304	422320.pdf
	http://ee.sharif.edu/~wireless.comm.net/references/Rappaport%20 %20Wireless%20Communications,Principles%20and%20Practice	-ISBN%2001304	122320.pdf

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2.Assignment

3.End-Semester examinations

### Indirect

1. Course - end survey

## Content of the syllabus

Unit – I	CELLULAR CONCEPT AND PROPAGATION MODEL	Periods

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Frequency reuse–Channel assignment strategies, Handoff strategies, Interference and system capacity, Co-channel interference and system capacity- Free space propagation model- Terrestrial propagation: Reflection- Two ray ground model- Scattering model- Indoor propagation model – Outdoor propagation



model – Durk	ins model.		
Unit – II	CHANNEL MODEL, EQUALIZERS AND DIVERSITY TECHNIQUES	Periods	9
	multipath propagation and measurements - Mobile multipath		
	fading- Rayleigh and Rician channel model- Equalizers: Lin		
Equalizer al	gorithms – Zero forcing- Least mean square- Selection diversity	model - RAKE	z receiver.
Unit – III	MULTIPLE ACCESS TECHNIQUES FOR WIRELESS COMMUNICATIONS	Periods	9
	MA- Spread spectrum multiple access-Capacity of cellular o protocols- Capture effect in packet radio.	CDMA – SD	MA- WCDMA-
Unit – IV	4G & 5G WIRELESS NETWORKS	Periods	9
	of LTE - Evolution of LTE Technology to beyond 4G — 5G of		
	G – 5G Architecture – 5G Internet - channel access method/	air interface -	Cognitive Radio
Technology	in 5G Wireless Communication.		
Unit – V	FUTURE WIRELESS NETWORKS	Periods	9
	e: Applications, radio wave propagation Physical layer desi	ign and algor	ithms mmWave
	llenges channel modeling channel estimation Beam forming.		
	hablers: Wireless energy harvesting, machine learning, visible li	ght communic	ation, Intelligent
reflecting s	urface (IRS), Extremely Large Aperture Massive MIMO,		
		Total Periods	45
Text Books			
1.	Theodore S. Rappaport, "Wireless Communications", Pearson	Education, 20	17.
2.	R. Vannithamby and S. Talwar, Towards 5G: Application	is, Requireme	nts and Candidate
۷.	Technologies., John Willey & Sons, West Sussex, 2017.		
3.	Manish, M., Devendra, G., Pattanayak, P., Ha, N., 5G and Beyo	ond Wireless S	ystems PHY Layer
	Perspective, Springer Series in Wireless Technology. 2020		
References			
1.	Christopher Cox, "An Introduction to LTE: LTE, LTE Advance Communications", 2nd Edition, Wiley Publications, New Dell		TE and 4G Mobile.
2.	Saad Z. Asif, "5G Mobile Communications Concepts and Tec	hnologies", 1st	t Edition, CRC
2.	Press Taylor & Francis Group, USA, 2019.		
3.	Simon Haykin, Michael Moher, David Koilpillai, —Modern	Wireless Com	nunications <sup>I</sup> , First
5.	Edition, Pearson Education 2013		
<b>E-Resources</b>			
1.	https://web.uettaxila.edu.pk/CMS/SP2013/teMCTTms/tutorial% JochenSchiller.pdf	%5CMobile-Co	ommunications-
2.	https://www.vssut.ac.in/lecture_notes/lecture1428730613.pdf		
2.	https://www.vssut.ac.in/lecture_notes/lecture1428730613.pdf http://ee.sharif.edu/~wireless.comm.net/references/Rappaport% %20Wireless%20Communications,Principles%20and%20Pract		

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• •	cal propagation, Parameters, fiber materials, Photonic crystal f l components - Optical couplers, Filters, Isolators.	fiber, fiber fat	prication techniques,
Unit – II	TRANSMISSION CHARACTERISTICS	Periods	9
Introduction, Optical signation dispersion, Int	Optical signal attenuation mechanisms in guided and ungul Dispersion – Group delay, material dispersion, wavegui ermodal dispersion, profile dispersion, Modified single mode attened Fibers, Polarization, Principles of fiber non linearity.	de dispersion	, polarization mode
Unit – III	OPTICAL TRANSMITTERS	Periods	9
Semiconducto efficiency, Str	optical sources, Light-Emitting Diodes - Power and Eff r Laser Diodes - Basic Principles and emission, Tempe uctures, longitudinal modes, Gain and index-guiding, power-cu eristics, Laser sources and Transmitters for free space commun	rature effects urrent characte	, External quantum
Unit – IV	OPTICAL RECEIVERS	Periods	9
Photo diode, structure, Prea	and requirements for optical detectors, Principles of optical detectors, Principles of optical detectors, APD, Receiver noises, Signal to Noise Ratio (SNR) and amplifier types, Principles of coherent detection, Link power e time budget in practical link/network planning.	Bit Error Ra	ate (BER), Receiver
Unit – V	OPTICAL AMPLIFIERS AND NETWORKS	Periods	9
	iers: Erbium doped fiber amplifiers, Semiconductor optical an onents - Networking Concepts: SONET optical networks.	plifiers, Optic	al switches, Optical
		<b>Fotal Periods</b>	45
Text Books			
1.	Gerd Keiser, "Optical Fiber Communications", Tata McGr 2013.	aw –Hill, Nev	v Delhi, 5 <sup>th</sup> Edition,
2.	John M. Senior, "Optical Fiber Communications - Principl Education, 3 <sup>rd</sup> impression, 2012.	es and Practice	e", Pearson
References	1		
1.	Gerd Keiser, "Optical communications Essentials", Tata M Indian Edition ,2008.	Ac Graw Hill,	New Delhi, Special
2.	Govind P. Agrawal, "Fiber-Optic Communication System Edition 2012.	s", John Wiley	& Sons, Third
3.	Rajiv Ramasamy & Kumar N. Sivarajan, "Optical Network Edition, Morgan Kauffman, 2011.	ks – A Practica	ll Perspective", 3rd
E-Resources			
1.	https://shijuinpallotti.files.wordpress.com/2019/07/optical-files.	ber-communic	cations-principles-
2.	http://gsundar.weebly.com/uploads/5/4/5/6/54560163/optica	l_fiber_comm	unication_by_gerd_k
2.	eiser.pdf https://shijuinpallotti.files.wordpress.com/2019/07/optical-fi		

Former Signature of BOS Chairman ECE

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Unit – II	CAPACITY AND INFORMATION RATES OF MIMO CHANNELS	Periods	9
	Information rates of noisy, AWGN and fading channels strained signaling for MIMO communications.	, Capacity of	f non-coherent MIMO
Unit – III	SPACE TIME BLOCK AND TRELLIS CODE	Periods	9
space-time tre	me, Orthogonal and Quasi- orthogonal space-time block cod llis codes, Basic space-time code design principles, Represen tion, Performance analysis for space-time trellis codes, Co	tation of space	e-time trellis codes for
Unit – IV	CONCATENATED CODES AND ITERATIVE DECODING	Periods	9
	of concatenated codes, Concatenated codes for AWGN and N MIMO channels, Concatenated space-time block coding.	IIMO channels	s, Turbo coded
Unit – V	SPACE-TIME CODING FOR FREQUENCY SELECTIVE FADING CHANNELS	Periods	9
	ncy - Selective channels, Capacity and Information rates of M ding and Channel detection for MIMO FS channels, MIMO C		
	Total Perio	ds	45
Text Books			
1.	Tolga M. Duman and Ali Ghrayeb, "Coding for MIMO Con & Sons, West Sussex, England, 2008.	nmunication S	Systems", John Wiley
2.	A.B. Gershman and N.D. Sidiropoulus, "Space-Time Proce Wiley, Hoboken, NJ, USA, 2005.	ssing for MIM	O Communications",
References	· · ·		
1.	E.G. Larsson and P.Stoica, "Space-time block communications", Cambridge University Press, 2003.	coding for W	Vireless
2.	M. Janakiraman, "Space-Time Codes and MIMO systems",	Artech House	, 2004.
3.	H. Jafarkhani, "Space-Time Coding: Theory & Practice", C		
5.			
E-Resources			
	https://pcefet.com/common/library/books/29/5940_[Erik_G Time_Block_C(b-ok.org).pdf	Larsson,_Pe	tre_Stoica]_Space-
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CO 5 3	2	2		2							2		2	
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	s, orbital elements, orbital perturbations, station keeping, -a o stationary orbits- Look Angle Determination- Limits of v		
U U	age-Launching orbits	isionity –eenp	se-sub saterine point –
Unit – II	SPACE SEGMENT AND SATELLITE LINK DESIGN	Periods	9
Introduction-	Power supply, Attitude and Orbit control, Thermal contro	ol and Propula	sion, transponders, the
	stems. Telemetry, Tracking and command. Satellite uplink		
	ission Losses, link power budget equation, System noise, C	C/N calculation	, inter modulation and
	ter-satellite links.		<u>^</u>
Unit – III	SATELLITE ACCESS	Periods	9
analysis, TDM analysis for di	single access, pre-assigned FDMA, demand assigned FDM IA-basic equipment in TDMA system, pre-assigned and or igital transmission, comparison of uplink power requiremen IA.CDMA-DSS, code signal ,acquisition and tracking, sp hput.	demand assign its for FDMA	ed TDMA, downlink and TDMA, satellite-
Unit – IV	EARTH SEGMENT AND SATELLITE IN NETWORKS	Periods	9
introduction, b TCP over sate	Introduction, TVRO, MATV, CATV, Transmit and Receive andwidth, asynchronous transfer mode, ATM over satellite, s llite channels using standard mechanism, request for commen	satellite links a	nd TCP, Enhancing
Unit – V	<b>SATELLITE APPLICATIONS</b> tion, orbital spacing, power rating and number of trans	Periods	9
transponders c			
home indoor a	apacity, bit rates for digital television, MPEG compression s and outdoor unit, downlink analysis, HDTV, Video frequency eries, INSAT, VSAT, Radarsat, GPS, Orbcomm ,polar orbitir	standards, forw y bandwidth, S ng satellites.	ard error correction, the Satellite mobile services,
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Department		LECTRONICS AND COMMUNICATION         Semester           NGINEERING         Periods Per Week         Credit         Max											
Course Code	C	Course Name Periods Per Week Credit Max											
Course Code	C	Course Name   L   T   P   C   CA											
U19ECV36	Green Te	chnology	60	100									
Course Objective	tecl	hnology a ovide gree of the cou	and efficient on engined arse, the st	ency, a ering so udent sl	nd sust olution hould b	tainabil s to end e able t	ity. ergy den o,	ronment, ene	d energy	footprint. edge Level K3			
Course	CO2:To le	arn about	pollution	using ha	azardou	is chem	icals and	solvents		K3			
Outcomes	CO3:To m	odify prod	cesses and	produc	ts to m	ake the	n green a	nd safe.		K4			
	CO4:To de	esign proc	esses and	product	s using	green t	echnolog	У		K4			
	CO5:To ut	nderstand	advanced	technol	ogy in	green sy	nthesis			K4			
Pre-requisites	-												
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	CO 5	3	3	3		2							2		
Co	urse As	sessme	nt Met	hods											

Direct

1.Continuous Assessment Test I, II & III

2.Assignment

3.End-Semester examinations

Indirect

1. Course - end survey

# Content of the syllabus Unit – I PRINCIPLES OF GREEN CHEMISTRY

Periods



200

Historical Pe	rspectives and Basic Concepts. The twelve Principles of Green Che	emistry and green	engineering. Green
chemistry m	etrics- atom economy, E factor, reaction mass efficiency, and other a	green chemistry n	netrics, application of
greenmetrics	analysis to synthetic plans.		
Unit – I	POLLUTION TYPES	Periods	9
Pollution – t	ppes, causes, effects, and abatement. Waste - sources of waste, differen	t types ofwaste,ch	emical, physical and
biochemical	nethods of waste minimization and recycling.		
Unit – II	I GREEN REAGENTSAND GREEN SYNTHESIS	Periods	9
Environment	ally benign processes- alternate solvents- supercritical solvents, ionic liq	uids, water asarea	ctionmedium,energy-
efficientdesig	nofprocesses-photo, electroands on chemical methods, microwave-assiste	d reactions	
Unit – IV	<b>DESIGNINGGREEN PROCESSES</b>	Periods	9
Safe design,	process intensification, in process monitoring. Safe product and process	design -Design f	or degradation, Real-
time Analysi	for pollution prevention, inherently safer chemistry for accident prevention	ion	
Unit – V	GREEN NANOTECHNOLOGY	Periods	9
Nano materia	als for water treatment, nanotechnology for renewable energy, nanotech	nology for enviro	onmental remediation
and waste m	anagement, nano technology products as potential substitutes for harm	ful chemicals, env	vironmental concerns
with nanotec	nnology		
		<b>Total Periods</b>	45
Text Books			
1.	Green technology and design for the environment, SamirB.Billator	s, NadiaA.Basaly	, Taylor &Francis,
	Washington, DC, ©1997		
2.	Green Chemistry–An introductory text-M. Lancaster, RSC, 2016.		
3.	Green chemistry metrics-Alexi Lapkin and david Constable (Eds),	Wiley publication	ons,2008
References			
1.	Environmental chemistry, Stanley E Manahan, Taylor and Francis,	2017	

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Objec				•	d desig			•									
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				-	owlrdge			-									
		At th			ourse, tl					.0,					owledge Level		
C		CO1	: Get th	nrough	knowle	dge on	the Ar	ntenna	ı funda	mentals					K2		
Cour Outco		CO2	: Analy	ze and	design	of Arr	ay ante	ennas.							K2		
Outco	mes	CO3	: Analy	ze and	design	of var	ios typ	es of a	apertu	e anten	nas.			K2			
		CO4	: Analy	ze and	design	of var	ious ty	pes of	f Micro	ostrip an	tennas	8			K2		
		CO5	: Acqui	ire kno	wledge	on Mo	dern ai	ntenna	ıs						K2		
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					<	3	8	and a							20		

surface a	ion –Types – Radiation Mechanism – Antenna parameters - Radi and line current distributions – dipole, monopole, loop antenna Balance to unbalance transformer.	; Image; Indu	
Unit – I	II ANTENNA ARRAYS	Periods	9
of pointin	Array basics, General structure of phased array, linear array theory, ag direction, effects of phase quantization, frequency scanned array Active modules, digital beam forming, MEMS technology in phase ed arrays.	s, analog beam	forming
Unit – I		Periods	9
distribut	uivalence principle, Radiation from Rectangular and Circular apert tion on an infinite ground plane; Babinets principle, Slot antenna; H , aperture blockage, and design consideration.		
Unit – I		Periods	9
patch, a	on Mechanism and Excitation techniques : Microstrip dipole; Patch nd Ring antenna – radiation analysis from cavity model; input imper patch antenna; Microstrip array and feed network; Reconfiguration	edance of recta	ngular and
<u>Unit – `</u> IFA – \		Periods eaky Waye An	9 itennas –Plasma
IFA – V	/ivaldi Antennas - UWB Antennas - Antennas in Medicine – Le as – Wearable Antennas – RFID Antennas - Automotive antenn aterials	eaky Wave An	itennas –Plasma
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Unit –	BASIC CONCEPTS OF SPACE MECHANICS	Periods	9
and its as Universal	system – reference frames and coordinate systems – terminolog sociated concepts – Kepler's laws of planetary motion and proof gravitation – Two body and Three-body problems – Jacobi' n of orbital and escape velocities	of the laws –	Newton's Law of
Unit – I	· · · · · · · · · · · · · · · · · · ·	Periods	9
perturbati	ronous and geostationary satellites- factors determining life time of ons – orbit transfer and examples –Hohmann orbits – calculation of ation of satellite rectangular coordinates from orbital elements.		
Unit – I	II ROCKET MOTION	Periods	9
motions	e of operation of rocket motor – thrust equation – one dimensional in free space and homogeneous gravitational fields – Description of ectories – determinations of range and altitude – simple approxima	of vertical, inc	lined and gravity
Unit – I	V ROCKET DYNAMICS	Periods	9
moment coordina vacuum	ation of launch vehicles and missiles – Rocket systems – Airframes s acting on a rocket – Propulsion, aerodynamics, gravity – inertial te transformation – Equations of motion for three-dimensional mo – numerical problems.	and non-inertiation through a	al frames – tmosphere and
Unit – Y	STAGING AND CONTROL OF ROCKET VEHICL	ESPeriods	9
	multi staging of rocket vehicles – multistage vehicle optimization ration techniques- aerodynamic and jet control methods of rocket	vehicles – SIT	VC.
Text Book		Fotal Periods	45
1.	Cornelisse, JW, "Rocket Propulsion and Space Dynamics", J.W. 1982.	. Freeman & C	o., Ltd., London,
2.	Parker, ER, "Materials for Missiles and Spacecraft", McGraw-H	lill Book Co., l	Inc., 1982.
Reference			
1.	Suresh. B N & Sivan. K, "Integrated Design for Space Transpor 2015.	rtation System	", Springer India,
2.	Sutton,GP, "Rocket Propulsion Elements", John Wiley & Sons 2010.	Inc., New Yor	k, 8 <sup>th</sup> Edition,
3.	Van de Kamp, "Elements of Astromechanics", Pitman Publishin	ng Co., Ltd., L	ondon, 1980.
4.	Joseph Jimmerson, "The Rocket Files", Lulu.com, 2nd Ed., 201	3	
E-Resourc			
1.	https://archive.nptel.ac.in/noc/courses/noc16/SEM2/noc16-ae04/		
2.	https://archive.nptel.ac.in/courses/101/101/101101079/		

Former Signature of BOS Chairman ECE

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Outcome	CO3: I and utili	Develop	the a	bility to			rious p	eripher	als wi	th mi	crocor	ntrolle	rs	K3
	CO4: U embedde	Indersta	and the	conce	pts and	d princ						ines i	in	K2
	CO5: U systems	ndersta	nd the	fundan	nental o	concept	s and p					peratir	ng	K2
Pre- requisites	Microcon	ntrollers	5			-							·	
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CO3	3 3	2		2					3	1	1	3	3	
CO4	3 3				2	2	2		3		1	2	2	
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									Level				
		ognize the various cali			•	• •			K2				
Course Outcome		cribe the working prin ressure and temperatu	<b>.</b>				•		K2				
	CO3:Dete	ermine the principles o	f Force,	magn	etic and	Heading	sensors		K3				
	CO4:Ana	lyze different optica	l and th	nermal	sensor	`S			K3				
	CO5:Sele	ct suitable sensor for r	eal time	applic	cations				K4				
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	CO / PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak														) g		
	Programme Outcomes (POs)														PSOs		
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CO3	2	2	3				1						2				
CO4	2	2	3				1					1	2				
CO5	2	2	3				1					1	3				

#### **Course Assessment Methods**

Direct

- 4. Continuous Assessment Test I, II & III
- 5. Assignment: Simulation using tool
- 6. End-Semester examinations

# Indirect

2. Course - end survey

Content of t	he syllabus		
Unit – I	INTRODUCTION	Periods	9
	f Physical and Chemical Sensors –Classification of sensors-Static		characteristics-Sensor
-	echniques-Sensor output Signal types	5	
Unit - II	MOTION, PROXIMITY AND RANGING SENSORS	Periods	9
	sors-Potentiometers, Resolver, Encoders-Optical, Magnetic, Indu		
•	Microsyn, Accelerometer- GPS, Bluetooth, Range Sensors -	RF beacons,	Ultrasonic Ranging,
	eacons, Laser Range Sensor (LIDAR).	1	
Unit – III		Periods	9
	, Load Cell, Magnetic Sensors -types, principle, requirement and		agneto resistive – Hall
Effect – Cur	rent sensor Heading Sensors – Compass, Gyroscope, Inclinometer	S	
Unit - IV	OPTICAL, PRESSURE AND TEMPERATURE SENSOR	Periods	9
	active cell, photo voltaic, Photo resistive, LDR - Fiber optic senso		
	c – Tactile sensors, Temperature – IC, Thermistor, RTD, Thermo		
	rement, Radiation Sensors - Smart Sensors - Film sensor, MEMS &		s, LASER sensors.
Unit – V	APPLICATIONS OF SENSORS	Periods	9
Application	ns and case studies of Sensors in Automobile Engineering,	Aeronautics,	, Machine tools and
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Text Books           1.           2.           3.           References           1.           2.           3.           E-Resources           1.	Patranabis D., "Sensor and Actuators", Prentice Hall of Ind 2013(revised). G.K.Anantha Suresh "Micro and smart systems", Wiley Editi Ernest O. Doebelin, "Measurement systems Application and Edition, VI Edition, Tata McGraw-Hill Book Company, 2012 Bradley D.A., and Dawson, Burd and Loader, "Mechatronics 2004. Ian R Sinclair, —Sensors and TransducersI, Third Edition, N Robert B.Northrop, "Introduction to Instrumentation and Me Press–Taylor and Francis Group,2005 s	ia (Pvt) Ltd., s on,2010. Design", Inte 2. s, Thomson Pr lewnes publis asurement" ,3	second edition rnational Student ress India Ltd", hers,2011. Brd Edition" ,CRC–

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• Learn to design, construct, program, verify, analyze and troubleshoo	ake the									
Course CodeCourse NameLTPCCAESEU19ECV43ARM System Architecture30034060The main objective of the course is to•Give the students a thorough exposure to ARM architecture and mastudents to learn the ARM programming & Thumb programming modelCourse Objective•Learn to design, construct, program, verify, analyze and troubleshoo	ake the									
U19ECV43ARM System Architecture30034060The main objective of the course is to• Give the students a thorough exposure to ARM architecture and mastudents to learn the ARM programming & Thumb programming modelCourse Objective• Learn to design, construct, program, verify, analyze and troubleshood	100 ake the									
Course Objective Course Course Chiestive	ake the									
	<ul> <li>assembly and C language programs and supporting hardware.</li> <li>Describe the architecture of a typical embedded RISC processor (e.g. ARM</li> </ul>									
At the end of the course, the student should be able to,         CO1: Interpreting the organization, architecture, memory and operation of the	Knowledge Level K2									
Course         ARM processors.           CO2: Become aware of the Thumb mode operation of ARM.	K2									
Outcomes         CO3: Analyze the architectural support for higher level language.           CO4:Identify the architectural support of ARM for operating system and analyze the function of memory Management unit of ARM.	K3 K3									
CO5: Analyze various types of coprocessors and suitable design model. Pre-requisites -										

		CO/PO Mapping												CO/PSO			
	(3/2/	(3/2/1 indicates strength of correlation) <b>3-Strong, 2 – Medium, 1 - Weak</b>												Mapping			
COs	Programme Outcomes (POs)										PSOs						
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3		
CO 1	3	3	2										3	2	1		
CO 2	3	3	2	2									3	2	1		
CO 3	3	3	2	2									3	2	1		
CO 4	3	2	2	2									3	2	2		
CO 5	3	2	2	2	2								3	2	2		

**Course Assessment Methods** 

Direct

1.Continuous Assessment Test I, II & III

2.Assignment

3.End-Semester examinations

Indirect

1. Course - end survey

Content of the syllabus

Unit – IINTRODUCTIONPeriods9ARM Architecture:ARM Processor fundamentals, ARM Architecture, ARM Design Philosophy, Registers,<br/>PSR, Pipeline, Interrupts and Vector Table, ARM Processor Families.9Instruction Set:Data Processing Instructions, Branch, Load, Store Instructions, PSR Instructions, Conditional



Instruction	115.						
Unit –	Π	ARM PI	ROGRAMI	MING MOD	DEL	Periods	9
Thumb	Instruction	Set:	Register	Usage,	Other		structions, Dat
				lti Register L	Load-Store Inst	ructions, Stack,	, Interrupts, Softwar
Interrupt ]	Instructions, Ex						1
Unit –		M PROGR	AMMING LANG	USING HIO UAGE	GH LEVEL	Periods	9
Simple	C Programs us	ing Functio	on Calls, Po	ointers, Strue	ctures, Integer	and Floating	Point Arithmetic,
Assembl	ly Code using I	nstruction So	cheduling, F	Register Allo	cation, Conditi	onal Execution	and Loops.
Unit –		MEMO		Periods	9		
Cache A Content		lices, Flushi	ng and Cac	ches, MMU,	Page Tables, '	Translation, Ac	cess Permissions,
		ARM APP	PLICATIO	N DEVELO	PMENT		
Unit –	V		AN	<b>ID</b>	Periods	9	
		ADVAN	NCED ARN	A PROCESS	SORS		
Advanced its Archite	d ARM Proces	sors: Introd	luction to C			analita atuma C	MAP Processor and
1.5 / 1101110	ecture			CORTEX Pro	ocessor and its		
				CORTEX Pro	ocessor and its	Total Periods	
Text Boo	ks					Total Periods	45
	<b>ks</b> Sloss, D.Syn	nes & C.Wri	ght, "ARM			Total Periods	
<b>Text Boo</b> 1.	<b>ks</b> Sloss, D.Syn Software", E	nes & C.Wri Isevier.2005	ght, "ARM	system Deve	eloper's guide-	Total Periods	45
<b>Text Boo</b> 1. 2.	ks Sloss, D.Syn Software'', E S. Furber, "A	nes & C.Wri Isevier.2005	ght, "ARM	system Deve		Total Periods	45
<b>Text Boo</b> 1.	ks Sloss, D.Syn Software", E S. Furber, "A es The Definitiv	nes & C.Wri Isevier.2005 RM System 7e Guide to 7	ght, "ARM 5. 1 Architectu ARM® Cor	system Deve re", Addison	eloper's guide- -Wesley, 1996	Total Periods	45 Optimizing System
Text Boo 1. 2. Reference	ks Sloss, D.Syn Software", E S. Furber, "A es The Definitiv Joseph Yiu, 1 Jonathan W.	nes & C.Wri Isevier.2005 RM System 7e Guide to 7 Elsevier 201 Valvano – H	ght, "ARM Architectu ARM® Cor 5 Brookes / Co	system Deve re", Addison tex®-M3 and ole, "Embedd	eloper's guide- -Wesley, 1996 d Cortex®-M4	<b>Total Periods</b> Designing and	45 Optimizing System ird Edition by
Text Boo           1.           2.           Reference           1.	ks Sloss, D.Syn Software", E S. Furber, "A es The Definitiv Joseph Yiu, 1	nes & C.Wri lsevier.2005 RM System ve Guide to A Elsevier 201 Valvano – F 2012, Thom	ght, "ARM Architectu ARM® Cor 5 Brookes / Co as Learning	system Deve re", Addison rtex®-M3 and ole, "Embedo g.	eloper's guide- -Wesley, 1996 d Cortex®-M4	Total Periods Designing and	45 Optimizing System ird Edition by
Text Boo           1.           2.           Reference           1.           2.	ks Sloss, D.Syn Software", E S. Furber, "A es The Definitiv Joseph Yiu, 1 Jonathan W. Interfacing", Recent litera Technical re	nes & C.Wri Isevier.2005 RM System 7e Guide to A Elsevier 201 Valvano – E 2012, Thom ture in ARM ference man	ght, "ARM Architectu ARM® Cor 5 Brookes / Co has Learning I System Ar hual for ARI	system Deve re", Addison tex®-M3 and ole, "Embedo g. rchitecture.	eloper's guide- -Wesley, 1996 d Cortex®-M4 led Microcomj	Total Periods Designing and	45 Optimizing System ird Edition by Real Time
Text Boo           1.           2.           Reference           1.           2.           3.	ks Sloss, D.Syn Software", E S. Furber, "A es The Definitiv Joseph Yiu, I Jonathan W. Interfacing", Recent litera Technical re ARM 7 proc	nes & C.Wri Isevier.2005 RM System 7e Guide to A Elsevier 201 Valvano – F 2012, Thom ture in ARM ference man essor familie and reference	ght, "ARM <u>5.</u> a Architectu ARM® Cor <u>5</u> Brookes / Co as Learning I System Ar aual for ARI es. e manuals f	system Deve re", Addison tex®-M3 and ole, "Embedo g. chitecture. M processor	eloper's guide- -Wesley, 1996 d Cortex®-M4 ded Microcomp cores, includin ware developm	Total Periods Designing and G . Processors, Th puter Systems, I g Cortex, ARM	45 Optimizing System ird Edition by Real Time
Text Boo           1.           2.           Reference           1.           2.           3.           4.           5.	ks Sloss, D.Syn Software", E S. Furber, "A es The Definiting Joseph Yiu, 1 Jonathan W. Interfacing", Recent litera Technical re ARM 7 proc User guides a Seal, ARM A	nes & C.Wri Isevier.2005 RM System 7e Guide to A Elsevier 201 Valvano – F 2012, Thom ture in ARM ference man essor familie and reference	ght, "ARM <u>5.</u> a Architectu ARM® Cor <u>5</u> Brookes / Co as Learning I System Ar aual for ARI es. e manuals f	system Deve re", Addison tex®-M3 and ole, "Embedo g. chitecture. M processor	eloper's guide- -Wesley, 1996 d Cortex®-M4 led Microcomp cores, includin	Total Periods Designing and G . Processors, Th puter Systems, I g Cortex, ARM	45 Optimizing System ird Edition by Real Time
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Text Boo           1.           2.           Reference           1.           2.           3.           4.           5.           E-Resourt	ks Sloss, D.Syn Software", E S. Furber, "A es The Definitiv Joseph Yiu, I Jonathan W. Interfacing", Recent litera Technical re ARM 7 proc User guides Seal, ARM A	hes & C.Wri lsevier.2005 RM System //e Guide to A Elsevier 201 Valvano – H 2012, Thom ture in ARM ference man essor familie and reference architecture gout.org/ele -Designing_	ght, "ARM <u>Architectu</u> ARM® Cor <u>5</u> Brookes / Co as Learning I System Ar nual for ARI es. e manuals f Reference M ctronics/Ga and_Optim	system Deve re", Addison tex®-M3 and ole, "Embedd g. chitecture. M processor for ARM soft Manual, Addi me%20boy% izing_System	eloper's guide- -Wesley, 1996 d Cortex®-M4 ded Microcomp cores, includin ware developm ison-Wesley.	Total Periods Designing and 0 5. Processors, Th puter Systems, I g Cortex, ARM nent and modell RM_BOOKS/A	45 Optimizing System ird Edition by Real Time 111, ARM 9 & ling tools. David

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Program	ne	B.E.					Progra	mme (	Code	103	Regi	ilation		201	2019		
Departme	-m	ELEC' ENGIN			ND CO	MMU	NICA	FION			Se	mester					
Course Co	de		Cours	se Nam	ne		eriods l		-	Credit				n Marks			
U19ECV4	4	LTPCCAESICloud Technologies and its30034060Applications													Total 100		
Course Objective Course Outcome	Applications       3       0       0       3       10       <											Kno Leve	wledge sl K1 K3 K4 K3 K3 K3				
					CO/PC								<b>CO</b> /	PSO			
	/2/1	indicate	es stren	-					Iediu	ım, 1 - V	Veak		•	oping			
COs		1.20	-		Program			-			1-	-	PSO				
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	Р( 9	D PO 10	P 0 11	PO 12	PS O1	PS O 2	PS O 3		
<b>CO 1</b>	2	1	1	1	-	1	1	-	2	1	3	1	2	3	2		
CO 2	1	1	2	1	1	3	1	-	2	1	3	1	3	3	2		
<b>CO 3</b>	2	2	1	1	-	3	1	1	2	1	3	1	3	3	3		
<b>CO 4</b>	1	1	1	2	2	1	-	2	1	3	1	2	2	2	1		
<b>CO 5</b>	2	1	1	1	1	3	1	-	2	1	3	1	2	3	2		
Direct 1.Con 2.Assi	tinu	ous Ass			I, II & II	I		-			-						

Content of the syllabus

INTRODUCTION

Periods Unit – I Introduction to Cloud Computing- The Evolution of Cloud Computing - Hardware Evolution - Internet





<u> </u>		1 01 1	~ · ·
	Evolution – Server Virtualization - Web Services Deliver from		
	Infrastructure-as-a-Service – Monitoring-as-a-Service – Platfo	orm-as-a-Servi	ce – Software-as-a-
$\frac{\text{Service} - I}{\text{Unit} - I}$	Building Cloud Network.         I       CLOUD INFORMATION SYSTEMS	Periods	9
	in the Cloud - Presence in the Cloud - Privacy and its Relation to		-
	in the Cloud - Presence in the Cloud - Privacy and its Kelaton to in the Cloud - Common Standards in the Cloud – End-User Acces		
Unit – I		Periods	<b>9</b>
	ion– Evolving IT infrastructure – Evolving Software Applications		,
	erability Standards for Data Center Management - Virtualization		
-	Automated Provisioning - Policy Based Automation - Applica	• •	0
	anagement Technology - Virtual Test and development Environme		0
Unit – I	V CLOUD APPLICATIONS	Periods	9
Software	Utility Application Architecture - Characteristics of a SaaS - Soft	ware Utility A	pplications - Cost
Versus V	alue - Software Application Services Framework - Common 1	Enablers – Co	onceptual view to
	Business Profits - Implementing Database Systems for Multitenan		-
•	ents to develop cloud based applications. Development environ		
	Azure, Google App		<b>I</b>
Unit – V	<b>FUTURE OF CLOUD</b>	Periods	9
Other De	sign Considerations - Design of a Web Services Metering Interface	e - Application	Monitoring
		<b>Total Periods</b>	45
Text Book	(S		
Text Book		e University P	Press. First
<b>Text Book</b>	Sandeep Bhowmik, & quot; Cloud Computing ",Cambridg	e University P	ress; First
	Sandeep Bhowmik, & quot; Cloud Computing ",Cambridg edition,2017	•	
	Sandeep Bhowmik, & quot; Cloud Computing ",Cambridg edition,2017 Cloud Computing: Concepts, Technology Architecture'', Pearson	•	
1. 2.	Sandeep Bhowmik, & quot; Cloud Computing ",Cambridg edition,2017 Cloud Computing: Concepts, Technology Architecture", Pearsor January 2014).	Education In	dia, 1st edition (1
1.	Sandeep Bhowmik, & quot; Cloud Computing ",Cambridg edition,2017 Cloud Computing: Concepts, Technology Architecture", Pearsor January 2014). Kai Hwang, Geoffrey C. Fox, Jack G. Dongarra, "Distributed an	n Education Ind	dia, 1st edition (1
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1. 2. 3.	<ul> <li>Sandeep Bhowmik, &amp; quot; Cloud Computing ",Cambridg edition,2017</li> <li>Cloud Computing: Concepts, Technology Architecture", Pearson January 2014).</li> <li>Kai Hwang, Geoffrey C. Fox, Jack G. Dongarra, "Distributed an Processing to the Internet of Things", Morgan Kaufmann Publish</li> </ul>	n Education Ind d Cloud Comp ners, 2012.	dia, 1st edition (1 buting, From Parallel
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1. 2. 3. <b>Reference</b>	<ul> <li>Sandeep Bhowmik, &amp; quot; Cloud Computing ",Cambridg edition,2017</li> <li>Cloud Computing: Concepts, Technology Architecture", Pearsor January 2014).</li> <li>Kai Hwang, Geoffrey C. Fox, Jack G. Dongarra, "Distributed an Processing to the Internet of Things", Morgan Kaufmann Publisis</li> <li>s</li> <li>Sanjiva Shankar Dubey ," Cloud Computing and Beyond", Dreat John W. Rittinghouse and james F. Ransome, "Cloud Computing</li> </ul>	n Education Ind d Cloud Comp ners, 2012. mtech Press 2c g Implementati	dia, 1st edition (1 puting, From Parallel edition,2019
1. 2. 3. <b>Reference</b> 1. 2.	<ul> <li>Sandeep Bhowmik, &amp; quot; Cloud Computing ",Cambridg edition,2017</li> <li>Cloud Computing: Concepts, Technology Architecture", Pearsor January 2014).</li> <li>Kai Hwang, Geoffrey C. Fox, Jack G. Dongarra, "Distributed an Processing to the Internet of Things", Morgan Kaufmann Publish</li> <li>s</li> <li>Sanjiva Shankar Dubey ," Cloud Computing and Beyond", Dreat John W. Rittinghouse and james F. Ransome, "Cloud Computing and Security", CRC Press, Taylor Francis Group, Boca Raton Low</li> </ul>	n Education Ind d Cloud Comp ners, 2012. mtech Press 2c g Implementation	dia, 1st edition (1 buting, From Parallel edition,2019 fon, Management ork, 2010.
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1. 2. 3. <b>Reference</b> 1. 2. 3. <b>E-Resource</b>	<ul> <li>Sandeep Bhowmik, &amp; quot; Cloud Computing ",Cambridg edition,2017</li> <li>Cloud Computing: Concepts, Technology Architecture", Pearsor January 2014).</li> <li>Kai Hwang, Geoffrey C. Fox, Jack G. Dongarra, "Distributed an Processing to the Internet of Things", Morgan Kaufmann Publish s</li> <li>Sanjiva Shankar Dubey ," Cloud Computing and Beyond", Dreat John W. Rittinghouse and james F. Ransome, "Cloud Computing and Security", CRC Press, Taylor Francis Group, Boca Raton Lo George Reese, "Cloud Application Architectures", O"reilly Publication Architectures", O"reilly Publication</li> </ul>	n Education Ind d Cloud Comp ners, 2012. mtech Press 2c g Implementation	dia, 1st edition (1 buting, From Parallel edition,2019 fon, Management ork, 2010.
1. 2. 3. <b>Reference</b> 1. 2. 3.	<ul> <li>Sandeep Bhowmik, &amp; quot; Cloud Computing ",Cambridg edition,2017</li> <li>Cloud Computing: Concepts, Technology Architecture", Pearsor January 2014).</li> <li>Kai Hwang, Geoffrey C. Fox, Jack G. Dongarra, "Distributed an Processing to the Internet of Things", Morgan Kaufmann Publish s</li> <li>Sanjiva Shankar Dubey ," Cloud Computing and Beyond", Dreat John W. Rittinghouse and james F. Ransome, "Cloud Computing and Security", CRC Press, Taylor Francis Group, Boca Raton Lo George Reese, "Cloud Application Architectures", O"reilly Publication Architectures", O"reilly Publication</li> </ul>	n Education Ind d Cloud Comp ners, 2012. mtech Press 2c g Implementation	dia, 1st edition (1 buting, From Parallel edition,2019 fon, Management ork, 2010.
1. 2. 3. <b>Reference</b> 1. 2. 3. <b>E-Resource</b>	<ul> <li>Sandeep Bhowmik, &amp; quot; Cloud Computing ",Cambridg edition,2017</li> <li>Cloud Computing: Concepts, Technology Architecture", Pearsor January 2014).</li> <li>Kai Hwang, Geoffrey C. Fox, Jack G. Dongarra, "Distributed an Processing to the Internet of Things", Morgan Kaufmann Publish</li> <li>s</li> <li>Sanjiva Shankar Dubey ," Cloud Computing and Beyond", Dreat John W. Rittinghouse and james F. Ransome, "Cloud Computing and Security", CRC Press, Taylor Francis Group, Boca Raton Lot George Reese, "Cloud Application Architectures", O"reilly Publication</li> </ul>	n Education Ind d Cloud Comp ners, 2012. mtech Press 2c g Implementation	dia, 1st edition (1 buting, From Parallel edition,2019 fon, Management ork, 2010.
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		VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN (Autonomous Institution, Affiliated to Anna University ,Chennai) Elayampalayam, Tiruchengode – 637 205B.E.Programme Code103Regulation												TÜVR	KO 5001.2015		
Program	nme	B.E.					<u> </u>		Code	103	Reg	ulation		201	9		
Departr	nent	ELECTRONICS AND COMMUNICATION     Semester       ENGINEERING     Deside															
Course C	Code	Course NamePeriods Per WeekCreditMaximumLTPCCAES															
U19ECV	V45										60		100				
Cours Objecti		<ul> <li>Pro</li> <li>Lea mie</li> </ul>	<ul> <li>Study the exception handling and interrupts in CORTEX M3</li> <li>Program the CORTEX M3</li> <li>Learn the architecture of STM 32L15XXX ARM CORTEX M3/M4 microcontroller</li> <li>Understand the concepts of System - On - Chip(SoC)</li> </ul>														
	-	At the end of the course, the student should be able to, <b>CO1:</b> Explain the architecture and features of ARM. <b>CO2:</b> List the concepts of exception handling.											Knowledge Level K2				
Cours	-							•		1					K2		
Outcom	ies	CO3: Write a program using ARM CORTEX M3/M4 CO4: Learn the architecture of STM32L15XXX ARM CORTEX M3/M4													K3 K2		
		CO5: I	Design	an SoC	for any	y applic	cation.								K3		
Pre- requisite	s	-															
	(3/2	2/1 indic	ates stre		CO / PO correlat			2 – M	edium	, 1 - We	ak		CO/F Map				
COs					Program								PSOs				
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	<b>PO 7</b>	PO 8	PO	9 PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3		
CO 1	3	3	3	2	2	2	-	-	-	-	-	3	3	3	3		
CO 2	3	3	3	3	2	2	-	-	-	-	-	2	3	3	3		
CO 3	3	3	3	3	2	2	-	-	-	-	-	2	2	2	2		
	3	3	2	2	2	2	-	-	-	-	-	2	2	2	2		
CO 4 CO 5			2	2	2	1						3	3	2	2		

Direct

1.Continuous Assessment Test I, II & III

2.Assignment

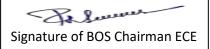
3.End-Semester examinations

### Indirect

1. Course - end survey

### Content of the syllabus

Unit – IOVERVIEW OF ARM AND CORTEX-M3Periods9ARM Architecture– Versions, Instruction SetDevelopment, Thumb 2 and Instruction SetArchitecture, Cortex M3 Basics: Registers, Stack Pointer, Link Register, Program Counter, SpecialRegisters, Operation Mode, Exceptions and Interrupts, Vector Tables, Stack Memory Operations,



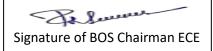
Pasat Sagu	nce, CORTEX M3 Instruction Sets: Assembly Basic	ne Instructio	n List Instruction
-	, CORTEX M3 – Implementation Overview: Pipeline, Blo		
-	– Code Bus, System Bus- External PPB and DAP Bus.	Jek Diagram.	Dus interfaces, I –
Coue Dus, L			
Unit – II	CORTEX EXCEPTION HANDLING AND INTERRUPTS	Periods	9
Exception T	ypes, Priority, Vector Tables, Interrupt Inputs and Pendin	ng behaviour	, Fault Exceptions,
Supervisor	Call and Pendable Service Call, NVIC: Nested Vector	Interrupt Con	ntroller, Overview,
Basic Interr	upts, SYSTICK Time, Interrupt Behaviourm Interrupt/E	xception Sec	uences, Exception
Exits, Neste	I Interrupts, Tail – Chaining Interrupts, Late Arrivals and	Interrupt Late	ency.
Unit – III	CORTEX M3/M4 PROGRAMMING	Periods	9
	M4 Programming: Overview, Typical Development F		
	Excepiton Programming Using Interrupts, Exception		
	ector Table Relocation, Memory Protection Unit and other		M3 Features, MPU
Registers, Se	tting up the MPU, Power Management, Multiprocessor C	onfiguration.	
	STM32L15XXX ARMCORTEX M3/M4		
Unit – IV	MICROCONTROLLER 6 AND DEBUGGING	Periods	9
	TOOLS		
	XXX ARM CORTEX M3/M4 Microcontroller: Memory		
	set and Clock Control, STM32L15XXX Peripherals:		
	NVIC, ADC, Comparators, GP Timers, USART Devel	-	
	d Hardware tools like Cross Assemblerm Compiler, De	bugger, Simu	ılator, In – Circuit
	E), Logic Analyser.		
Unit – V	INTRODUCTION TO SYSTEM – ON – CHIP	Periods	9
System Are	hitecture: An Overview, Components of the System	m Processor	s, Memories and
•	s, Processor Architectures, Memory and Addressing, Syst		
	r SOC Design – Chip basics – Cycle Time – Die Area –		
	ade – Offs in Processor Design – Reliability and Configur		
	n Studies – AES, 3D Graphics Processor. Image Compress		
	Total Periods		45
Text Books			
1. J	oseph Yiu, The Definitive Guide to the ARM CORTEX M3/M4	<ol><li>Second Edit</li></ol>	ion Elsevier 2010
I. (		,	1011, 2010, 2010.
2	Andrew N Sloss, Dominic Symes, Chris Wright, ARM System I		
2. d	•	Developers Gu	ide Designing and
2. d	Andrew N Sloss, Dominic Symes, Chris Wright, ARM System I ptimising System Software, Elsevier, 2006	Developers Gu	ide Designing and
2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2	Andrew N Sloss, Dominic Symes, Chris Wright, ARM System I ptimising System Software, Elsevier, 2006	Developers Gu stem On Chip,	ide Designing and Wiley India 2011.
2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2	Andrew N Sloss, Dominic Symes, Chris Wright, ARM System I ptimising System Software, Elsevier, 2006 Aichael J Flynn and Wayne Luk, Computer System Design, System	Developers Gu stem On Chip,	ide Designing and Wiley India 2011.
2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2	Andrew N Sloss, Dominic Symes, Chris Wright, ARM System I ptimising System Software, Elsevier, 2006 Aichael J Flynn and Wayne Luk, Computer System Design, Sys Steve Furber, ARM System – on – Chip Architecture, 2nd Editi	Developers Gu stem On Chip,	ide Designing and Wiley India 2011.

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TOTAL THE				nous Ir	<b>A COL</b> Istitutio ayampa	n, Affi	liated	to Ar	ina Un	iver	sity, C				TÜVRheinland CERTIFIED	001-2015 0 2 2 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0		
Progra	mme	B.E.					Prog	ramm	e Code	e	103	Reg	ulatio	n	20	2019		
Depart			TRON		ND CO	OMMU					S	emest	-					
Course (	Code		Cour	se Nan	ne	F	Periods	s Per T	Week P		redit C	(	Ma: CA	ximun E	n Marl SE	ks Total		
U19EC	V46	IoT E Desig	nabled n	Syster	ns		3	0	0		3	40			50	100		
Cour Object		<ul> <li>The main objective of the course is to</li> <li>Understand the basics of IoT.</li> <li>Get knowledge about the various services provided by IoT.</li> <li>Familiarize themselves with various communication techniques and netw</li> <li>Know the implementation of IoT with different tools.</li> <li>Understand the various applications in IoT.</li> </ul>													twork	ing.		
Cour Outcoi		At the end of the course, the student should be able to,													Knowledge Level K2 K2 K4 K4 K4 K4 K2			
Pre- requisite	es	-																
COs	(3/2	2/1 indic	ates stre	ngth of	<b>CO / PO</b> correlat Program	ion) <b>3-</b> 5	Strong			n, 1 ·	• Weal	k		CO/I Map PSOs	ping			
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO	8 PC	)9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3		
CO 1	3		2										3	2				
CO 2 CO 3	3	2	2	2	3									2	2			
CO 3 CO 4	3	2	3	3					,					3 2	3			
CO 5	3	2	3	3	2	2	2						3	3	2	3		
Course A	Assessi	nent M	ethods						- I									
2.A	ssignn				, II & II	ſ												
Indirec		- end s	urvey															
Content	of the	syllabu	S															
standar	on of l dized a inctior	architec	ture, Si	ngs, En implifie	ed IoT	Techno Archite	ologies cture,	, M2 Core	IoT F	unct	ional	on, Io Stack	, Fog,	Edge	and C	oTWF) Cloud in g Smart		

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Unit – II	MIDDLEWARE AND PROTOCOLS OF IOT	Periods	9
	tem Overview - Horizontal Architecture Approach for Io		
	- Middleware architecture of RFID,WSN,SCADA,M2M -Inte		
	r RFID,WSN,SCADA,M2M- Zigbee, KNX, BACnet, MODB		
	Middleware (Technological Requirements of 5G Systems - I		nd a Middleware
Approach T	oward 5G (COMPaaS Middleware) - Resource management in		
Unit – III	COMMUNICATION AND NETWORKING	Periods	9
	Technologies: Physical and MAC layers, topology and Security		
	1901.2a, 802.11ah and LoRaWAN - Network Layer: IP ve		
	d Networks – Optimizing IP for IoT: From 6LoWPAN to 6Lo		
	works - Application Transport Methods: Supervisory Con		ta Acquisition –
	Layer Protocols: CoAP and MQTT- Data aggregation and diss	emination.	1
Unit – IV	IOT IMPLEMENTATION TOOLS	Periods	9
	n to Python, Introduction to different IoT tools, Developing a		
	g sensor based application through embedded system platform	n, Implementi	ng IoT concepts
with pytho	n, Implementation of IoT with Raspberry Pi	1	
Unit – V	APPLICATIONS AND CASE STUDIES	Periods	9
Home auto	mations - Smart cities – Environment – Energy – Retail – Log	istics – Agricu	Iture –Industry -
	life style – Case study.	C	,
	r	<b>Fotal Periods</b>	45
<b>Text Books</b>			
	lasios Tsiatsis, Jan Höller, Catherine Mulligan "Internet of Thi		
A	pplications for a New Age of Intelligence", Elsevier Academic		
	ijay Madisetti and Arshdeep Bahga, "Internet of Things (A	Hands-onAp	proach)", VPT, 1 <sup>st</sup>
E	dition, 2015.		
	lonbo Zhou, "Internet of Things in the cloud: A middleware per	spective", CR	C press, 2012.
References			
	ethuru Raj and Anupama C. Raman, "The Internet of Things: E nd Use Cases", CRC Press, 2017	nabling Techn	ologies, Platforms,
C	onstandinos X. Mavromoustakis, George Mastorakis, Jordi Mo	ongayBatalla, ʻ	"Internet of Things
2. (1	oT) in 5G Mobile Technologies" Springer International Publish	ing Switzerlar	nd
2	016.	C	
, D	vieter Uckelmann, Mark Harrison, Florian Michahelles, "Arch	nitecting the I	nternet of Things"
3. S	pringer-Verlag Berlin Heidelberg, 2011.	-	-
E-Resources			
1. h	ttp://docshare04.docshare.tips/files/23353/233530586.pdf		
2. h	ttps://profile.iiita.ac.in/bibhas.ghoshal/teaching_iot.html		
	ttps://beckassets.blob.core.windows.net/product/readingsample/827 1.pdf	79126/9783642	2191565_excerpt_0



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Progra	mme	B.E.					Progra	amme (	Code	103	Reg	ulation	ı 🗌	201	19
Depart			TRON		ND CC	OMMU	INICA	TION				emester	_		
Course (	ode		Cour	se Nan	ne		eriods	Per We	eek	Credit		Max	imun	n Mark	S
	5000						L	Т	Р	С	(	CA	ES	SE	Total
U19EC	V47	Indus 4.0	trial IC	)T and	Indust	try	3	0	0	3	50	)	5	0	100
Cours Object		The m	Lear Appl To le	n and u ly the I earn abo	oT conout the b	and the cepts in pasics o	Impor n build of IOT	ing sol protoco	ution ols	' in indu s to Ind scenario	ustria			IS	
		At the	At the end of the course, the student should be able to, Level												
Cours	se	<b>CO1:</b> Understand the elements of IoT to build a total control plane in an Industrial application											K2		
Outcor	nes	CO2: Realize the importance of Data Analytics in IoT.												K3	
		CO3: Understand the concepts of Protocols. CO4: Study various IoT platforms and Security												K4	
					e conce				nσ						K3 K3
Pre- requisite	es	-	0110010				2 001811								
COs	(3/2	2/1 indica	ates stre	ngth of	CO / PC correlati Program	ion) <b>3-S</b>	trong,		dium, i	1 - Weal	<u>x</u>		CO/I Map PSOs	ping	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	1	-	-	2	2	2	-	-	-	3	3	3	2	2	1
CO 2	1	1	-	2	2	2	-	-	-	3	3	3	2	2	1
CO 3 CO 4	1	-	- 1	2	2 2	1 2	-	-	-	2	3	1 3	$\frac{1}{2}$	1 2	1
CO 5	1	-	-	2	2	1	-	-	-	2	3	1	1	2	1
2.A	ontinu ssignn	ous Ass	essmen	t Test I,											
Indirec	t	- end si													

Unit – I INDUSTRIAL IoT

Periods

IIoT-Introduction, Industrial IoT: Business Model and Reference Architecture: IIoT-Business Models,



9

Industrial Io	T- Layers: IIoT Sensing, IIoT Processing, IIoT Communication	, IIoT Network	ing
Unit – II	IIOT ANALYTICS	Periods	9
e	analytics and Software Defined Networks, Machine Learn g, Data Management with Hadoop	ing and Data	Science, Julia
Unit – III	PROTOCOLS AND CLOUD	Periods	9
SPI, I2C, Overview o	otocols; Types of Protocols, Wi-Fi, Wi-Fi direct, Zigbee, Z w IIoT protocols –COAP, MQTT, 6LoWPAN, LWM2M, A of COTS cloud platforms, Predix, PTC Thing Worx, Micros ces, Business models: SaaS, PaaS, IaaS.	MPQ IIoT cl	oud platforms:
Unit – IV	IOT SECURITY	Periods	9
Industrial Io Security in	oT: Security and Fog Computing - Cloud Computing in IIoT, Fo IIoT	og Computing	in IIoT,
Unit – V	CASE STUDY	Periods	9
Industrial I	OT- Application Domains: Oil, chemical and pharmaceutical in	dustry, Applic	ations of UAVs
in Industrie	s, Real case studies: Milk Processing and Packaging Industries,	Manufacturing	g Industries
	]	<b>Fotal Periods</b>	45
Text Books			
	ndustrial Internet of Things: Cyber manufacturing Systems" by recher, Houbing Song, Danda B. Rawat (Springer), 2017	Sabina Jeschk	e, Christian
2. In	dustry 4.0: The Industrial Internet of Things", by Alasdair Gilc	hrist (Apress),	2017
References			
	ands-On Industrial Internet of Things: Create a powerful Indust ntonio Capasso, Packt, 2018.	rial IoT by Gia	acomo Veneri,
	he Internet of Things: Key Applications and Protocols, Olivio mar Elloumi,2ndEdition, Willy Publications 2017	er Hersent, Da	wid Boswarthick,
<b>E-Resources</b>			
1. ht	tps://download.e-bookshelf.de/download/0007/6832/86/L-G-0007	683286-001473	31014.pdf
2. ht	tps://www.ifm.eng.cam.ac.uk/uploads/DIAL/industrial-internet-of	-things-report.p	df

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		KANANDHA COI utonomous Instituti Elayampa	on, Aff	iliated	to Anna	a Univers	sity ,Chennai)	EN	Difference Control Con		
Programme	B.E.		Pro	gramm	e Code	103	Regulation		2019		
Department		ELECTRONICS AND COMMUNICATION Semester									
Course Code	Cou	Course Name Periods Per Week Credit Maximum									
Course Code		L T P C CA ES									
U19ECV48	IOT SECU TRUST										
Course Objective	<ul> <li>Design</li> <li>Solve no</li> <li>Build se</li> <li>Build T</li> <li>Solve I</li> </ul>	jective of the cours and implement cry etwork security pro- curity systems usi rustable cloud base oT security proble f the course, the stu	ptograp oblems ng elen ed IoT s ms usir	in IoT nentary system ng light	device block s weigh	s in IoT t cryptog	devices		Knowledge		
	The the end o	i the course, the stu	dent sh			<i>,</i>			Level		
	CO1:unders	stand the Fundame	ntals of	encry	ption fo	or cyber	security.		K3		
Course	CO2:study t	he IoT security fra	mewor	k					K3		
Outcomes	CO3:unders	stand IoT Security	& Mod	els for	Identi	ty Manag	gement syster	ns	K4		
	CO4:unders	stand Trust establis	shment	and se	curity a	analysis			K4		
		the Security and I Crimes	Digital	Identity	y in Clo	oud Com	puting		K3		
Pre- requisites	-										

	CO / PO Mapping (3/2/1 indicates strength of correlation) <b>3-Strong, 2 – Medium, 1 - Weak</b>												CO/I Map		
COs	Os Programme Outcomes (POs)											PSOs	5		
	PO 1	PO 1         PO 2         PO 3         PO 4         PO 5         PO 6         PO 7         PO 8         PO 9         PO         PO         PO           10         11         12										PSO 1	PSO 2	PSO 3	
CO 1	1	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$										2	3	2	
CO 2	1	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$											3	3	2
CO 3	2	2	1	1	-	3	1	1	2	1	3	1	3	3	3
CO 4	1	1	1	2	2	1	-	2	1	3	1	2	2	2	1
CO 5	2	1	1	1	1	3	1	-	2	1	3	1	2	3	2

#### Direct

1.Continuous Assessment Test I, II & III

2.Assignment

3.End-Semester examinations

Indirect

1. Course - end survey

### Content of the syllabus



Unit – I	Fundamentals of IoT ecosystem	Periods	9
IoT security	v issues, how to design an IoT system, Hardware, software a	and network s	security related to
IoT system	s - Basics of cryptographic solutions to IoT systems - Appl	ied Cryptogr	aphy & Intrusion
Detection,	One Way Hash Function and Integrity, Encryption Algorithm	ms and Confi	dentiality, Digital
Signature a	nd Authentication (DH, RSA, 2 class)		
Unit – II	Security concepts in context to IoT devices	Periods	9
	Things Security, Security and Privacy for IoT Case Stu		Home, Smart Grid
	Iodern Vehicle, Wearable Computing & BYOD, Mobile He		0
Unit – III	IoT security threats and countermeasures	Periods	9
	ecific Attacks: Guest hopping, attacks on the VM (delete th , code or file injection into the virtualized file structure), VM		
Unit – IV	Trust establishment	Periods	9
Trust man	agement lifecycle, Identity and Trust, Web of trust models.	Establishmer	nt:
cryptosyst	ems – Mutual establishment phases – Comparison on securi	ty analysis.	
Unit – V	Security and Digital Identity in Cloud Computing Cyber Crimes	Periods	9
with the ri	se tide of Cyber Crimes	<b>Fotal Periods</b>	45
Text Books		lotar r crious	
1.	John R. Vacca, "Computer and Information Security Handbook", Parikshit Narendra Mahalle ,Poonam N. Railkar, "Identity Manag River Publishers, 2015.		
	William Stallings, "Cryptography and Network security: Principl 2014, Pearson Education, India.	es and Practic	e", 5th Edition,
	Brian Russell, Drew Van Duren, "Practical Internet of Things Sec framework for an Internet connected ecosystem", 2nd Edition, 20		a security
	•		
References			
1	Christo Paar and Jan Pelzl, "Understanding Cryptography – A Te Practitioners", Springer, 2014.	xtbook for Stu	idents and
1.			idents and
1. 2.	Practitioners", Springer, 2014.	17.	
1. 2.	Practitioners", Springer, 2014. Alasdair Gilchrist, "IoT security Issues", Oreilly publications, 20 Maryline Laurent, Samia Bouzefrane, "Digital Identity Managem	17.	
1. 2. 3. <b>E-Resource</b>	Practitioners", Springer, 2014. Alasdair Gilchrist, "IoT security Issues", Oreilly publications, 20 Maryline Laurent, Samia Bouzefrane, "Digital Identity Managem	17.	
1. 2. 3. <b>E-Resource</b> 1.	Practitioners", Springer, 2014. Alasdair Gilchrist, "IoT security Issues", Oreilly publications, 20 Maryline Laurent, Samia Bouzefrane, "Digital Identity Managem S	17.	

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Programme	B.E.				]	Prog	amm	e Coo	le 1	103	Regu	lation		20	19
Departmen		CTROI INEER		ND CO	MMU	JNIC	ATI	ON		•	Sei	nester			
Course Code		Cour	se Nam	ne	Pe I		Per T	Week P		redit C	C	Maz A	ximun ES		ks Total
U19ECV51	Mobi	le Adh	oc Net	works	3	3	0	0		3		40	60	)	100
Course Objective	• 1 • 1 • 1 • 1 • 1 • 1	Fo be av Fo Und Fo fami network Fo Stud QoS and	ware of erstand liarize cs. ly about d archit	of the co fundame the design with diff t design i ecture of	ental c gn issu erent l issues, f sensc	conce ues o MAC , chal or net	f ad ł C, rou lenge work	noc ne ting a es and	etworl nd m goal	k MA( ulticas s in de	C prot sting p esignir	ocols protoco ng secu	ols of a urity p	adhoc rotoco	ols and advances
	At the	e end of	f the co	urse, the	stude	nt sh	ould	be abl	e to,						owledge
Course	CO1: Compare the differences between cellular and ad hoc networks and the analyze the challenges at various layers and applications         CO2: Summarize the protocols used at the MAC layer and scheduling												K2		
Outcomes	CO3:	mechanismsK2CO3: Compare and analyze types of routing protocols used for multicastK2routing and security protocolsK2													
Pre-requisites	CO5: soluti wirele	Evalua	ate the e d hoc ne	network energy m etworks	anage	ment	sche	emes a	and Q	uality	of ser	vice			K2 K2
(3	•	ates stre	ngth of	CO / PO correlatio	on) <b>3-S</b>	trong			ım, 1	- Wea	k		CO/I Map	ping	
COs	T	T		Programn						T	-	r	PSOs		
CO 1 3	PO 2 3	PO 3	PO 4	PO 5	PO 6	PO 7	P	08	PO 9	PO 10	PO 11	PO 12	PSO 1 3	<b>PSO</b> 2	PSO 3
CO 2 3	3	2	2	2	2							1	3		2
CO 3 3	3	2	2	2	2							1	3	2	
CO 4         3           CO 5         3	3	2	2	22	$\frac{2}{2}$							1	3	2	2
Course Assess			2	2	2							1	3	2	
Direct 1.Continu 2.Assignr 3.End-Ser Indirect 1. Course	nent nester ex	aminati		II & III											
Content of the	syllabus	5		<	Z.	8	لعجور			]					222

Unit –	INTRODUCTION	Periods	9
Cellular a networks-	nd ad hoc wireless networks, Applications of ad hoc wireless ne medium access scheme, routing, multicasting, transport layer prot ng, self organization, addressing and service discovery, scalability	tworks. Issues cocols, scheme	s in ad hoc wireless
Unit – l	I MEDIUM ACCESS PROTOCOLS	Periods	9
schedulin protocols	tocols: design issues, goals and classification. Contention bas g algorithms, protocols using directional antennas. Multichanne and power control MAC protocols	-	
Unit – I	I ROUTING AND MULTICASTING PROTOCOLS	Periods	9
routing issues an	Protocols: Design issues, goals and classification. Table driven protocols, Hybrid routing protocols, Hierarchical routing proto ad classification of multicast routing protocols, Tree based and s. multicasting with QOS and application dependent multicast rout	col, power ro mesh based i	outing protocols,
Unit – I	V SECURITY PROTOCOLS ,QOS AND WIRELE SENSOR NETWORK	Periods	9
routing	security requirement-Issues and challenges, network security attorotocols. Issues and challenges in providing QOS, classificatio rks-QOS models, INSIGNIA, INORA, SWAN, Proactive RTMA	n of QOS sol	utions and QOS
Unit – Y	ENERGY MANAGEMENT AND RECENT ADVANG           IN WIRELESS NETWORKS	CES Pe	riods 9
manager	nanagement schemes-Battery management, transmission power m nent schemes. RECENT ADVANCES- Ultra wide band radio con	mmunication,	Wireless fidelity
architect	optical wireless networks, The multimode 802.11-IEEE 8 ure.	302.11a/b/g,	The Meghadoot
		<b>Fotal Periods</b>	45
Text Book			
1.	C.Siva Ram Murthy and B.S.Manoj, "Ad hoc Wireless Network Protocols",Pearson Education,2 <sup>nd</sup> edition, 2015	ts Architecture	es and
2.	Charles E. Perkins, "Ad hoc Networking", Addison – Wesley, 2	2015	
Reference			
1.	Stefano Basagni, Marco Conti, Silvia Giordano and Ivar Networking", Wiley-IEEE press, 2010.	n Stojmenovio	c, "Mobile ad hoc
2.	Mohammad Ilyas, "The Handbook of adhoc Wireless Networks	", CRC press,	2002.
3.	T.Camp, J. Boleng, and V. Davies, "A Survey of Network Research, Wireless Commun. and Mobile Comp." Hoc Networking Research, Trends and Applications, vol. 2, no	, Special Iss	sue on Mobile Ad
E-Resourc			
1.	https://www.pdfdrive.com/ad-hoc-wireless-networks-architecture murthy-bs-manoj-d77724424.html	es-and-protoco	ls-c-siva-ram-
2.	https://doc.lagout.org/network/Mobile%20Ad%20Hoc%20Netwo	orking.pdf	
3.	https://library.oapen.org/handle/20.500.12657/41721		

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		VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN (Autonomous Institution, Affiliated to Anna University, Chennai) Elayampalayam, Tiruchengode – 637 205										
Programme	B.E.		Pro	gramm	e Code	103	Regulation	,	2019			
Department	ELECTR ENGINE	ONICS AND COMI ERING										
Course Code	C	ourse Name	imum Ma									
U19ECV52	Wireless S	Sensor Networks	ESE 60	Total 100								
Course Objective	<ul> <li>U1</li> <li>Ha</li> <li>U1</li> </ul>	<ul> <li>The main objective of the course is to</li> <li>Learn Sensor Network fundamentals.</li> <li>Understand the different routing protocols.</li> <li>Have an in-depth knowledge on sensor network architecture and design issues</li> <li>Understand the transport layer and security issues possible in Sensor networks</li> <li>Have an exposure to mote programming platforms and tools.</li> </ul>										
	At the end		Knowledge level									
	CO1: Kno	K2										
Course	CO2: Illus based on the		K3									
Outcome	networks.	erstand the transport							K3			
	MAC laye	ly the knowledge to i r protocols.	•					ıd	K4			
	CO5: Be f	amiliar with the OS ι ıles	ised in '	Wirele	ss Sens	or Netwo	orks and build		K4			
Pre- requisites	-							ł				

	<b>CO / PO Mapping</b> (3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak												CO/PSO Mapping		
COs		Programme Outcomes (POs)										PSOs			
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3											2			
CO2	2	3	2	2									2	2	
CO3	2		3	3									3	3	
CO4	2							2					2	2	
CO5	3	2	2									2	2		

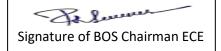
Direct

- 1. Continuous Assessment Test I, II & III
- 2. Assignment: Simulation using tool
- 3. End-Semester examinations

Indirect

1. Course - end survey

### Content of the syllabus



Unit – I	INTRODUCTION	Periods	9
	le Architecture - Hardware Components, Energy Consumption		
	re - Sensor Network Scenarios, Transceiver Design Consideration	ns, Optimizatio	on Goals and Figures
of Merit.			
Unit - II	WSN NETWORKING CONCEPTS AND PROTOCOLS	Periods	9
	ocols for Wireless Sensor Networks, Low Duty Cycle Protocols		
	tion Device Protocol, Contention based protocols - PAMAS, Sc		
	15.4 MAC protocol, Routing Protocols- Energy Efficient Routing,	Challenges ar	nd Issues in Transport
layer proto			
Unit – II		Periods	9
	ecurity Requirements, Issues and Challenges in Security Provis		
	e attacks in wireless sensor networks, possible solutions for jamr		
-	tack. Key Distribution and Management, Secure Routing – SPIN	S, reliability re	equirements in sensor
networks.			
Unit - IV		Periods	9
•	s for Wireless Sensor Networks-Characteristics requirements-	·	
	obile ad-hoc and sensor networks, Applications of sensor network	s Topology	Control, Clustering,
Time Sync	chronization		
	_		
Unit – V		Periods	9
Sensor No	de Hardware – Berkeley Motes, Programming Challenges, Node-	level software	platforms - TinyOS,
Sensor Noo nesC, CON	de Hardware – Berkeley Motes, Programming Challenges, Node- VTIKIOS, Node-level Simulators – NS2 and its extension to se	level software	platforms - TinyOS,
Sensor Noo nesC, CON	de Hardware – Berkeley Motes, Programming Challenges, Node- NTIKIOS, Node-level Simulators – NS2 and its extension to se ng beyond individual nodes – State centric programming.	level software nsor networks	platforms – TinyOS, s, COOJA, TOSSIM,
Sensor Noo nesC, CON Programmi	de Hardware – Berkeley Motes, Programming Challenges, Node- NTIKIOS, Node-level Simulators – NS2 and its extension to se ng beyond individual nodes – State centric programming.	level software	platforms - TinyOS,
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	VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN (Autonomous Institution, Affiliated to Anna University ,Chennai) Elayampalayam, Tiruchengode – 637 205         B.E.       Programme Code       103       Regulation											
Programme	B.E.					103	Regulation					
Department		ELECTRONICS AND COMMUNICATION ENGINEERING Semester										
Course Code	Course Name Periods Per Week Credit Maximum											
	Course runneLTPCCAESECryptography and Cyber30034060											
U19ECV53	Cryptograp Security	60	100									
Course Objective	mechar Implen	<ul> <li>Study the Cryptography Theories, Algorithms and Systems.</li> <li>Understand necessary Approaches and Techniques to build protection mechanisms in order to secure computer networks. Implement machine learning techniques WEB Security &amp; Os Security</li> <li>Learn the Security Testing For Web Applications</li> </ul>										
	At the end of	the course, the stu	ident sh	ould be	e able to	D,			Knowledge Level			
		stand the fundament ulnerabilities	ntals of	networ	ks secu	irity, secu	arity architectu	ure,	K2			
Course Outcomes	algorithms	the different crypt	•	•		-			K3			
		the different cryp							K3			
	CO4: apply	the machine learning	ing tech	niques	WEB S	Security of	& Os Security		K3			
	CO5: Write real-world.	software/project in	npleme	ntation	s of lea	rning alg	orithms applie	ed to	K2			
Pre-	-											

	(3/2/	1 indica	ates stre		CO / PC correlati			2 – Med	lium. 1	- Weal	k		CO/PSO Mapping			
COs		(3/2/1 indicates strength of correlation) <b>3-Strong, 2 – Medium, 1 - Weak</b> Programme Outcomes (POs)														
	PO 1	PO	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO	РО	PO	PSO	PSO	PSO	
		2								10	11	12	1	2	3	
CO 1	3	3	2					2		2			3			
CO 2	3	3	2	2			2				2		3			
CO 3	3	3	2	2									3	2		
CO 4	3	2	2	2				2	2		2		3	2		
CO 5	3	2	2										2			

Direct

1.Continuous Assessment Test I, II & III

2.Assignment

3.End-Semester examinations

Indirect

1. Course - end survey

Content of the	Content of the syllabus													
Unit – I	INTRODUCTION		Periods	9										
Security tren	nds - Legal, Ethical	and Professional Aspects of Sec	curity, Need	for Security at										
Multiple leve	els, Security Policies	- Model of network security - S	Security attac	cks, services and										

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technique		of modern
	phy: perfect security – information theory – product cryptosystem – cryptanalysi	
Unit – I		9
	MATICS OF SYMMETRIC KEY CRYPTOGRAPHY: Algebraic struc	
	c-Euclid's algorithm- Congruence and matrices - Groups, Rings,	
	YMMETRIC KEY CIPHERS: SDES - Block cipher Principles of DE	
DES –	Differential and linear cryptanalysis - Block cipher design principles	<ul> <li>Block cipher</li> </ul>
mode of	operation – Evaluation criteria for AES – Advanced Encryption Sta	andard - RC4 –
Key distr		
Unit – Il	I PUBLIC KEY CRYPTOGRAPHY	9
MATHEM	IATICS OF ASYMMETRIC KEY CRYPTOGRAPHY: Primes – Pr	imality Testing –
Factorizati	on - Euler's totient function, Fermat's and Euler's Theorem - C	Chinese Remainder
Theorem	– Exponentiation and logarithm - ASYMMETRIC KEY	CIPHERS: RSA
cryptosyste	em – Key distribution – Key management – Diffie Hellman	key exchange -
	ryptosystem – Elliptic curve arithmetic-Elliptic curve cryptography.	
Unit – I		9
	v, various types of web application vulnerabilities, Reconnaissance, Authenticatio	on. Authorization
	and Privilege Escalation), Session Management, Cross Site Scripting (XSS), Cross	
	(CSRF), SQL Injection and Blind SQL Injection. Memory and Address protection	
	file protection mechanisms –User authentication –models of security –Trusted O	
Unit – V		9
	dy of Client server application for a basic cryptosystem- Buffer overflow attack-	-
		rforming attacks
•	'ireshark Tool to perform the traffic analysis attack- Password authentication. Pe	rforming attacks
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Cours Object		<ul> <li>The main objective of the course is to</li> <li>Understand the concepts of Frequency, Time division multiplexing, digital</li> <li>Analyze space switching, time switching and combination switching, exam switch namely No.4 ESS Toll switch.</li> <li>Illustrate the need for network synchronization and study synchronization i</li> <li>To Study the concepts of ISDN, DSL / ADSL, and fiber optic systems in su loop.</li> <li>Understand the concepts of Traffic Characterization, Delay Systems, Exponservice Times and Constant Service Times.</li> </ul>											mple o issues subscri	f a iber			
		At the	e end o	f the co	urse, the	student	should	be able	to,					Leve			
Cours		CO2:	<b>CO1:</b> Recall the different multiplexing technique. <b>CO2:</b> Illustrate the concepts space switching, time switching and combination witching, example of a switch namely No.4 ESS Toll switch.												K2 K2		
Outcon	nes	<b>CO3:</b> Understand Network Synchronization.											K2				
			Sumn	narize IS	SDN, DSI	L / ADS	L, and	fiber op	ptic sy	sten	ns in s	ubscri	ber	K3			
		loop.	Anoly	ura tha '	Traffic Cl	o mo otom	ization							K4			
Pre-requ	isites	-	Anary			laracter	IZation							<u>K4</u>			
COs	(3/2	/1 indic	ates stre	ength of	<b>CO / PO</b> I correlation Programm	n) <b>3-Stro</b>	ong, 2 –		n, 1 - V	Weal	x		CO/I Map PSO	ping			
	PO 1	PO 2	PO 3	PO 4				· · · · ·	09	PO	РО	РО	PSO	PSO	PSO		
CO 1	3	3	2				2			10	11	12	1 3	2 2	3		
CO 2	3	3	2	2			2			2			3	2	2		
CO 3	3	3	2	2									3	2			
CO 4 CO 5	3	2	2	2			2			$\frac{2}{2}$			3	2	2		
Course A	2	-	-							2			5	2			
2.As 3.En Indirect 1. C	signm d-Sem course	ent ester ex - end su	aminat rvey	Test I, ions	II & III												
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Unit -	•							J				4U	1	,	223		
					$\leq$	Z. I			-								

Multiplexing	Systems, FDM, TDM, Digital Transmission and Mul- Overview, SONET Frame Formats SONET Operations, ing and Frequency Justification, Virtual Tributaries, DS	Administration	and Maintenance,
	VET Optical Standards, SONET Networks. SONET Rings: U		
	Line-Switched Ring.	multectional Pa	am- Switched King,
Unit – II	DIGITAL SWITCHING	Periods	9
	ictions, Space Division Switching, Time Division Switching,		
Switching, TS	T Switching, No.4 ESS Toll Switch, System 75 Digital PBX		
UNIT – III	ing in an Analog Environment.	Periods	0
	NETWORK SYNCHRONIZATION		<u>9</u>
Timing Inacconstruction	ng Recovery: Phase-Locked Loop, Clock Instability, Jitter M curacies: Slips, Asynchronous Multiplexing, Network nization, U.S. Network Synchronization.	x Synchroniza	tion: Master-
Unit – IV	DIGITAL SUBSCRIBER ACCESS	Periods	9
	Basic Rate Access Architecture, ISDN U Interface, ISDN		
Universal Dig	ubscriber Loops: Asymmetric Digital Subscriber Line, VD ital Loop Carrier Systems, Integrated Digital Loop Carrier iberintheLoop,HybridFiberCoaxSystems,VoicebandModems ervice	Systems, Next	-Generation Digital
Unit – V	TRAFFIC ANALYSIS	Periods	9
	cterization: Arrival Distributions, Holding Time Distrib		Systems. Network
Blocking Prob	abilities: End-to-End Blocking Probabilities, Overflow Traff Constant Service Times.		
		<b>Fotal Periods</b>	45
Text Books			
1.	J. Bellamy, "Digital Telephony", John Wiley, 3 <sup>rd</sup> Edition, 2	011.	
2.	R.A.Thomson, "Telephone switching Systems", Artech H		s 2000
References	The Armonizon, Telephone Switching Systems, Theorem		., 2000
1.	W. Stalling, "Data and Computer Communications", Prent	ice Hall, 10 <sup>th</sup> ec	lition, 2013.
2.	T.N.Saadawi, M.H.Ammar, A.E.Hakeem, "Fundamentals Networks", Wiley Interscience, 1994.	of Telecommun	ication
E-Resources			
1.	https://emdaduits.files.wordpress.com/2011/12/digital-tele bellamy.pdf	phonythird-edit	ionjohn-c-
2.	https://ccsuniversity.ac.in/bridge- library/pdf/EC_8th_Sem_Electronic%20Switching_P_Gna %20Telecommunication%20Switching%20and%20Netwo		n-2008.pdf
3.	http://index-of.es/Varios-2/Fundamentals%20of%20Teleco		

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					,		ed simp			s				Le	evel 3	
Course							y issues	<u> </u>			ng			K	2	
Outcom	ies	CO3:	Explain	the da	ta extra	ction a	nd mini	ing of s	ocial r	networl	ζS			K	2	
		<b>CO4:</b>	Discus	ss the p	redictio	on of hu	ıman be	ehavior	in soc	ial con	nmun	ities		K	3	
		CO5:	Describ	e the a	pplicati	ons of	social r	network	s					K	[4	
re-		-														
Pre- requisit	es															
		(3/2/1 in	dicates st	trength o	f correlat		trong, 2		m, 1 - V	Veak					apping	
					f correlat Prograr	tion) <b>3-S</b> nme Out	trong, 2 comes (F	POs)		-			PSOs	3		
requisit		(3/2/1 in PO 2	dicates st PO 3	PO 4	f correlat	tion) <b>3-S</b>	trong, 2		m, 1 - V PO 9	Veak PO 10	P 0 11	PO 12				
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COs	<b>PO 1</b> 3 3	PO 2 2 2	<b>PO 3</b> 2 2	<b>PO 4</b> 2 2 2	f correlat     Program     PO 5     2     2     2     2     2     2	nme Out	trong, 2 comes (F PO 7	POs)	<b>PO 9</b> 1 1	PO 10 2 2	0 11	<b>12</b> 2 2	PSOs PS 01 3 3	<ul> <li>PSO</li> <li>2</li> <li>2</li> <li>2</li> </ul>	PS 0 3	
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and behavio	rs, Anonymity in a networked world		
Unit – Il	NGDATA	Periods	9
Definition	evolution of Web Community from a Series of Web Archive, De of community, Evaluating communities, Methods for community mining algorithms, Tools for detecting communities social netwo vacy	detection and min	ing, Applications of
Unit – I	V PREDICTINGHUMANBEHAVIORAND PRIVACYISSUES	Periods	10
Distribution	ing and predicting human behavior for social communities, , Enabling new human experiences, Reality mining, Context, Awar ine environment, What is Neo4j, Nodes, Relationships, Properties		
Unit – V	ACCESS CONTROL, PRIVACY AND IDENTITY MANAGEMENT	Periods	9
and Author Authenticat	the access control requirements for Social Network, Enforcing A rization, Roles- based Access Control, Host, storage and netw ion, and Authorization in Social Network, Identity & Access Identity providers and service consumers, The role of Identity provi	ork access control Management, Sing	options, Firewalls,
,		Total Periods	45
Text Book	S		
1.	Peter Mika, Social Networks and the Semantic Web, First E	<u> </u>	
2.	BorkoFurht, Handbook of Social Network Technologies and Edition, Springer, 2010.	Application, First	
3.	LearningNeo4j3.xSecondEditionByJérôme Baton, Rik VanH	ruggen, Packt pub	lishing
4.	DavidEasley,JonKleinberg,Networks,Crowds,andMarkets:R nnectedWorldl,FirstEdition,CambridgeUniversityPress,2010	asoningaboutaHi	ghlyCo
REFER	ENCES:		
1.	Easley D.KleinbergJ., Networks, Crowds, and Markets– Rea World, Cambridge University Press, 2010	soning about a Hig	ghly Connected
2.	Jackson, Matthew O., Social and Economic Networks, Princ	eton University Pr	ess, 2008.
3.	Dion Goh and Schubert Foo, Social information Retrieval S Applications for Searching the Web Effectively, IGI Global	ystems: Emerging	
4.	Guandong Xu, Yanchun Zhang and LinLi,—Web Mining and applications ,First Edition,Springer,2011.		orking–Techniques
5.	Max Chevalier, Christine Julien and Chantal Soulé-Dupuy, Retrieval and Access: Techniques for Improved user Modeli		
6.	John G. Breslin, Alexander Passant and Stefan Dec		

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Outco	Course Dutcomes CO2: understand the Security Progra CO3: understand they represent kn CO4: apply the machine learning te CO5: Write software/project implem real-world.								WEB S	Securit	/ & Ōs			K K	2 3
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	s - Malware - viruses and other malicious code - Targeted M		
Unit – I		Periods	9
	t application layer: email security – SMIME- Security at trans	ort layer: SSL prot	ocol. Security at
	ayer: firewalls – intrusion detection system – IPsec	Devie 1	10
Unit – I		Periods	
	, various types of web application vulnerabilities, Reconnaissa and Privilege Escalation), Session Management, Cross Site		
	CSRF), SQL Injection and Blind SQL Injection. Memory and		
	tion mechanisms –User authentication –models of security –T		- Access Control -
	SECURITY TESTING FOR WER		
Unit – V	APPLICATIONS	Periods	9
using Wir	y of Client server application for a basic cryptosystem- Bu eshark Tool to perform the traffic analysis attack- Password a th attack tools.	uthentication. Perfo	orming attacks and
		<b>Total Periods</b>	45
<b>Text Bool</b>	ks		
1.	James Graham, Richard Howard and Ryan Olson, Cyber Se		
1.	2011	curity Essentials, C	RC Press,USA,
2.		-	
	2011 Forouzan.B.A. and Mukhopadhyay.D, Cryptography and N 2nd Edition, 2012	-	
2.	2011 Forouzan.B.A. and Mukhopadhyay.D, Cryptography and N 2nd Edition, 2012	etwork Security, T	
2. Reference	2011 Forouzan.B.A. and Mukhopadhyay.D, Cryptography and N 2nd Edition, 2012	etwork Security, T ntice Hall, 2017.	ata McGraw Hill,
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2. <b>Reference</b> 1. 2. 3.	2011         Forouzan.B.A. and Mukhopadhyay.D, Cryptography and N         2nd Edition, 2012         es         William Stallings, Cryptography and Network Security, Pr         Roberta Bragg, Mark Rhodes, Keith Strass Berg J, –Netwo         Referencel, Tata McGraw Hill, 2006.         Brian Sullivan, Vincent Liu, —Web Application security: A         2012.         Charles P Fleeger, Shari Lawrence P Fleeger, —Security in	etwork Security, T ntice Hall, 2017. k Security- The Co beginners guide, T Computing <sup>II</sup> , Pearso	ata McGraw Hill, mplete ata McGraw Hill, n Education,
2. <b>Reference</b> 1. 2. 3. 4.	2011         Forouzan.B.A. and Mukhopadhyay.D, Cryptography and N         2nd Edition, 2012         es         William Stallings, Cryptography and Network Security, Pr         Roberta Bragg, Mark Rhodes, Keith Strass Berg J, –Netwo         Referencel, Tata McGraw Hill, 2006.         Brian Sullivan, Vincent Liu, —Web Application security: A         2012.         Charles P Fleeger, Shari Lawrence P Fleeger, —Security in         2004.         Bruce Schneier,"Applied Cryptography: Protocols, Algori         Edition, Wiley, John & Sons, Incorporated, October 1995.	etwork Security, T ntice Hall, 2017. k Security- The Co beginners guide, T Computing <sup>II</sup> , Pearso	ata McGraw Hill, mplete ata McGraw Hill, n Education,
2. <b>Reference</b> 1. 2. 3. 4. 5.	2011         Forouzan.B.A. and Mukhopadhyay.D, Cryptography and N         2nd Edition, 2012         es         William Stallings, Cryptography and Network Security, Pr         Roberta Bragg, Mark Rhodes, Keith Strass Berg J, –Netwo         Referencel, Tata McGraw Hill, 2006.         Brian Sullivan, Vincent Liu, —Web Application security: A         2012.         Charles P Fleeger, Shari Lawrence P Fleeger, —Security in         2004.         Bruce Schneier,"Applied Cryptography: Protocols, Algori         Edition, Wiley, John & Sons, Incorporated, October 1995.	etwork Security, T ntice Hall, 2017. k Security- The Co beginners guide, T Computing <sup>II</sup> , Pearso	ata McGraw Hill, mplete ata McGraw Hill, n Education,
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Objec		<ul> <li>Acquire knowledge about magnetic sensors and its faraday effect.</li> <li>Understand the operation of Chemical sensors and Biosensors.</li> </ul>													
		•												• • • •	
		• Apply the knowledge of optic sensors in Temperature analysis and also the operation of smart structures.													strate
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CO 1	3	3	2	2	2	2						1	3	2	
CO 2	3	3	2	2	2	2						1	3		2
CO 3	3	3	2	2	2	2						1	3	2	
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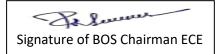
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Signature of BOS Chairman	ECE

-	Modu	e of Fiber Optic Sensor Technology-Optical Fibers-Ligh lators- Intensity-Based and Interferometric Sensors-F		
Michelson Unit – I		GRATING SENSORS	Periods	9
Multimod	le Grat	ting and Polarization Sensors-Sensors Based on Relative Mo Modulation-Sensors Based on the Photo elastic Effect-Ret	ovement of O	pposed Gratings-
Unit – I	II	DISTRIBUTED AND MAGNETIC SENSORS	Periods	9
	exing-		-	
Unit – I	V	CHEMICAL AND BIOSENSOR	Periods	9
Hydroge – Surfac	en sens e Plasi	hemical and Biosensor: Reagent Mediated sensor-Humidit for $-CO_2$ sensor $-$ Ammonia sensor $-$ Chloride sensor $-$ Glu monic Resonance based sensor	• •	Oxygen sensor
Unit – V	V	APPLICATIONS	Periods	9
	1014	tion measurements – Current -voltage measurement – Cher		
		– Applications –skins.	Fotal Periods	45
Text Book		* *		1
	<b>cs</b> Eric	* *	Fotal Periods	45
Text Book	ts Eric Scie Bha	: Udd, William B. Spillman, Jr., "Fiber Optic Sensors: An In	<b>Fotal Periods</b>	45 Engineers and
<b>Text Book</b> 1.	cs Eric Scie Bha App	Udd, William B. Spillman, Jr., "Fiber Optic Sensors: An In entists", John Wiley & Sons 2011. gavanadasa Gupta, Banshi Das Gupta, "Fiber Optic S	<b>Fotal Periods</b> troduction for ensors: Princ	45 Engineers and iples and
<b>Text Book</b> 1. 2.	s Eric Scie Bha App Day Frai	Udd, William B. Spillman, Jr., "Fiber Optic Sensors: An In entists", John Wiley & Sons 2011. Igavanadasa Gupta, Banshi Das Gupta, "Fiber Optic S plications", New India Publishing 2006.	<b>Fotal Periods</b> troduction for ensors: Princ ations", ISA Pr	45 Engineers and iples and ublishing 2000.
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Text Book           1.           2.           3.           4.           References	s Eric Scie Bha App Dav Fran Pub s B.C KT	Udd, William B. Spillman, Jr., "Fiber Optic Sensors: An In entists", John Wiley & Sons 2011. gavanadasa Gupta, Banshi Das Gupta, "Fiber Optic S plications", New India Publishing 2006. vid A. Krohn, "Fiber optic sensors: fundamentals and applica ncis T.S. Yu, Shizhuo Yin, Paul B. Ruffin, "Fiber Optic S lisher 2010.	Total Periods troduction for ensors: Princ ations", ISA Pl ensors", CRC	45 Engineers and iples and ublishing 2000. Press tech House 1989.
Text Book           1.           2.           3.           4.           References           1.	s Eric Scie Bha App Dav Fran Pub s B.C KT Aca	2 Udd, William B. Spillman, Jr., "Fiber Optic Sensors: An In entists", John Wiley & Sons 2011. agavanadasa Gupta, Banshi Das Gupta, "Fiber Optic S olications", New India Publishing 2006. vid A. Krohn, "Fiber optic sensors: fundamentals and applica ncis T.S. Yu, Shizhuo Yin, Paul B. Ruffin, "Fiber Optic S lisher 2010. Culshaw and J.Daykin, "Optic fiber Sensors Systems and App V Grattan & BT Meggit, "Optical fiber sensor technology &	Total Periods troduction for ensors: Princ ations", ISA Pl ensors", CRC	45 Engineers and iples and ublishing 2000. Press tech House 1989.
Text Book           1.           2.           3.           4.           References           1.           2.	s Eric Scie Bha App Dav Frai Pub s B.C KT Aca	2 Udd, William B. Spillman, Jr., "Fiber Optic Sensors: An In entists", John Wiley & Sons 2011. agavanadasa Gupta, Banshi Das Gupta, "Fiber Optic S olications", New India Publishing 2006. vid A. Krohn, "Fiber optic sensors: fundamentals and applica ncis T.S. Yu, Shizhuo Yin, Paul B. Ruffin, "Fiber Optic S lisher 2010. Culshaw and J.Daykin, "Optic fiber Sensors Systems and App V Grattan & BT Meggit, "Optical fiber sensor technology &	Total Periods troduction for ensors: Princ ations", ISA Pl ensors", CRC	45 Engineers and iples and ublishing 2000. Press tech House 1989.

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Department			FRON IEERI		ND CO	MMU	NICAT	ION			Se	emest	er				
Course Code			Cours	se Nam	e			eriods L	s Per T	Wee P		redit C	(	Maz CA	kimum ESI	Marks	s Fota
U19ECV58	Opt	ical	Netw	orks				3	0	0		3		40	60		100
Course Objective	•	<ul> <li>ro chaote the student to understand the importance of the backbone influstration for our present and future communication needs and familiarize them with the architectures and the protocol stack in use.</li> <li>Design of wavelength routing and virtual topology design.</li> <li>To enable the student to understand the differences in the design of data plane and the control plane</li> <li>Judge the concept of multiplexing and switched based network.</li> </ul>															
Course Outcomes	At the CO1 need CO2 test he CO3 CO4 appr	Compose the concept of Access network functions and analyze the wavelength routi protocol.     At the end of the course, the student should be able to,     Knowledg Level     CO1: Use the backbone infrastructure for our present and future communication     needs     CO2: Design and analyze different wavelength routing networks use the various     K2     test beds.     CO3: Interpret different network management skills     K2     CO4: Describe the advances and recent trends in the networking and switching     approaches     CO5: Analyze the concept of different network architectures     K2															
Pre- requisites	-																·
COs	(3/2/1 in	dica	ates stre	ength of	correlat	O Mapp ion) 3-8	Strong,		ediur	n, 1 -	Weak			CO/I Map	ping		
P	D1 PC		PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	5 P	09	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	
CO 1 CO 2		2 2	$\frac{2}{2}$	1		2	$\frac{2}{2}$							2	1	+	-
CO 2		2	2	1		2	2							2	1	+	-
CO 4		2	2	1		2	2							2	1		
CO 5 Course Assess Direct	-	2 [eth	2 nods	1		2	2							2	1		]
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content of the							ORK A							iods	-	9	-

Unit - IOPTICAL NETWORK ARCHITECTUREPeriodsFDDI - SONET/SDH - Computer Interconnects – Metropolitan Area Networks – Layered Architecture.Broadcast and Select Networks: Topologies for Broadcast Networks – Media-Access Control (MAC)



Protocols –	Test beds.								
Unit – II	WAVELENGTH ROUTING NETWORKS	Periods	9						
The optical	layer, Node Designs, Optical layer cost tradeoff, Routing and wa	avelength as	signment, Virtual						
topology de	sign, Architectural variations.Wavelength Routing Testbeds : O	NE/Sea Me	We-3 – AON – NTT						
Ring – MW	TN – ONTC – Alcatel"s-WDM Ring – MONET.								
Unit – II		Periods	9						
	anagement functions – Configuration Management – Performan	ce Managem	ent – Faulty						
	tt – Optical Safety – Service Interface.								
	PHOTONIC PACKET SWITCHING	Periods	9						
OTDM - M	ultiplexing and De-multiplexing – Synchronization – Broadcast	OTDM Net	works - Switch-Based						
Networks –	OTDM Test beds.								
Unit – V	ACCESS NETWORKS	Periods	9						
Network A	chitecture Overview - Enhanced HFC - Fiber to the Curb (FTTC	) - PON Evo	lution- Today's						
Access Net	vorks – Future Access Networks.								
Total Period	S		45						
Text Books									
1.	Rajiv Ramasami Kumar and Sivarajan N, "Optical Networks: A	Practical Pe	erspective", 4 <sup>th</sup>						
1.	Edition Harcourt Asia PTE Ltd Singapore, 2011.								
References									
1.	Siva Ram Murthy and Mohan Gurusamy, "WDM Optical Netwo	orks", Prenti	ce-Hall of India						
	Private Limited, New Delhi, 2004.								
2.	Debasish Datta," Optical Networks", Oxford University Press,	, USA							
3.	Mrs. Pratibha D. Kulkarni Miss Sharvari D. Kulkarni," Optical	l Network ar	nd satellite communication"						
E-Resource	S								
1.	https://archive.nptel.ac.in/courses/108/106/108106167/								
2.	2. https://www.coursera.org/specializations/optical-engineering								

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Course C	ode		Coi	ırse Na	me		Period			Credit				um Ma			
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U19ECV	/61			telligeı arning		1	3	0	0	3		40		60	100		
Cours Objecti		<ul> <li>The main objectives of this course are to:</li> <li>Study about uninformed and Heuristic search techniques.</li> <li>Learn techniques for reasoning under uncertainty</li> <li>Introduce Machine Learning and supervised learning algorithms</li> <li>Study about ensembling and unsupervised learning algorithms</li> <li>Learn the basics of deep learning using neural networks</li> </ul>															
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Cours	e	Use appropriate search algorithms for problem solving Apply reasoning under uncertainty													K3		
Outcom	les	Build supervised learning models													K4		
					U	superv	vised n	nodels							K4		
						networ									K4		
re-requis	ites	-															
COs	(3/2	/1 indic	ates stre	ength of	correlat	O Mapp tion) 3-S	Strong, 2		dium, 1	- Weal	<u>s</u>		CO/ Map PSO	ping			
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	РО	PO	РО	PSO	PSO	PSO		
CO 1	2	2	2	2	1	2	2			10	11	12	1	2	3		
CO 2	3	$\frac{2}{2}$	$\frac{2}{2}$	3	1	3	$\frac{2}{2}$	-	-	-	-	1	3	3	3		
CO 3	1	2	1	3	2	3	2	-	-	-	-	1	3	3	3		
CO 4	1	2	3	1	3	3	2	-	-	-	-	1	3	3	3		
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Unit –						LEMSC						Periods			9		
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					<	-Zi	8			7					238		

Heuristic searc	ch strategies-Local search and optimization problems-adversaria	l search- con	nstraint satisfaction
problems(CSP	)		
Unit – II	PROBABILISTIC REASONING	Periods	9
Acting under	uncertainty - Bayesian inference - naïve bayes models. Pro	babilistic reas	oning –Bayesian
networks –exa	ct inference in BN-approximate inference in BN- causal networks.		
Unit – III	SUPERVISED LEARNING	Periods	9
Introduction	to machine learning - Linear Regression Models: Least squa	res, single &	multiple variables
Bayesian line	ear regression, gradient descent, Linear Classification Models: Dis	scriminant fun	ction – Probabilistie
discriminativ	e model - Logistic regression, Probabilistic generative model	–Naïve Bayes	, Maximum margin
classifier-Suj	pport vector machine ,Decision Tree, Random forests		
Unit – IV	ENSEMBLE TECHNIQUES AND UNSUPERVISED LEARNING	Periods	9
Combining m	ultiple learners: Model combination schemes, Voting, Ensemble	e Learning - ł	bagging, boosting,
stacking, Uns	upervised learning: K-means, Instance Based Learning: KNN,	Gaussian mi	xture models and
Expectation m	aximization		
Unit – V	NEURAL NETWORKS	Periods	9
Perceptron-Mu	ultilayer perceptron, activation functions, network training-gradien	t descent optin	nization –
stochastic grad	lient descent, error back propagation, from shallow networks to dee	ep networks –U	Jnit saturation
(aka the vanish	ning gradient problem) – ReLU, hyper parameter tuning, batch norr	nalization, reg	ularization,
		<b>Fotal Periods</b>	45
<b>Text Books</b>			
1.	Stuart Russell and Peter Norvig, "Artificial Intelligence-Modern	Approach", F	ourth
	Edition, Pearson Education, 2021.		
2.	EthemAlpaydin, "IntroductiontoMachineLearning", MITPress, Fou	urthEdition,202	20
References			
1.	DanW.Patterson, "IntroductiontoAIandES", PearsonEducation, 200		
2.	KevinNight,ElaineRich,andNairB.,"ArtificialIntelligence",McGr		
3.	Patrick H.Winston,"ArtificialIntelligence", ThirdEdition, Pearson		)6
4.	Deepak Khemani, "Artificial Intelligence", Tata McGraw Hill	Education,	
5.	ChristopherM.Bishop, "PatternRecognitionandMachineLearning"	,Springer,200	5
6.	TomMitchell, "MachineLearning", McGrawHill, 3rdEdition, 1997.		
7.	CharuC.Aggarwal,"DataClassificationAlgorithmsandApplication	s",CRCPress,2	2014
8.	Mehryar Mohri, Afshin Rostamizadeh, Ameet Talwalkar, "Founda Learning", MIT Press, 2012.	tions of Machi	ne
9.	IanGood fellow, Yoshua Bengio, Aaron Courville, "Deep Learni	ng", MIT Pres	ss,2016

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		VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN (Autonomous Institution, Affiliated to Anna University, Chennai) Elayampalayam, Tiruchengode – 637 205										
Programme	B.E.		Pro	gramm	ne Code	103	Regulation		2019			
Department	ELECTR ENGINEI	ONICS AND COMN ERING	MUNIC	CATIC	N	S	emester					
Course Code	C	ourse Name	Period	ls Per	Week	Credit	Max	imum M	larks			
Course Code	L T P C CA E								Total			
U19ECV62	Deep Lear	rning	3	0	0	3	40	60	100			
Course Objective	<ul> <li>The main objective of the course is to</li> <li>Apply the idea of artificial neural networks and their architecture.</li> <li>Illustrate techniques used for training artificial neural networks.</li> <li>Enable design of an artificial neural network for classification.</li> <li>Intend and exploitation of deep learning models for machine learning problems.</li> <li>Implementations of learning algorithms applied to real-world.</li> </ul>											
		of the course, the stu derstand the mathe					of artificial	neural	Knowledge level K2			
Course	CO2: An	alyze the given datas	et for de	esignir	ng a neu	ral netwo	ork based solu	tion.	К3			
Outcome		y out design and imp ge processing applica		tion o	f deep l	earning 1	nodels for		K4			
		ign and deploy simple on problems	e Tenso	r Flow	-based	deep lear	rning solutions	s to	К3			
	CO5: Writ	ing software/project in	nplemer	ntation	s of lear	ning algo	orithms.		К3			
Pre- requisites												

COs	CO / PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak Os Programme Outcomes (POs)													CO/PSO Mapping PSOs			
	PO 1												PSO 1	PSO 2	PSO 3		
CO1	3	3															
CO2		3	2											2			
CO3		2	3	2									3	3			
CO4	2	2	2	2				2					3	2			
CO5	3	2	2							1		2	2				

### Direct

- 1. Continuous Assessment Test I, II & III
- 2. Assignment: Simulation using tool
- 3. End-Semester examinations

Indirect

1. Course - end survey

## Content of the syllabus



Unit – l	INTRODUCTION	Periods	9
Artificial 1	Neural Networks - The Neuron-Expressing Linear Percept	rons as Neurons -	Feed-Forward Neural
	- Linear Neurons and Their Limitations - Sigmoid, Tanh, and	ReLU Neurons - S	oftmax Output Layers
- Training	Feed-Forward Neural NetworksGradient Descent		
Unit - I		Periods	9
	and Learning Rates - Gradient Descent with Sigmoidal Neur		
	and Mini batch Gradient Descent - Test Sets - Validation Set		Preventing Over
	eep Neural Networks - Implementing Neural Networks in Te		
Unit – Il		Periods	9
	ima in the Error Surfaces of Deep Networks- Model Identifi		
	- Flat Regions in the Error Surface - Momentum-Based Op		e .
	onal Neural Networks (CNN)- Architecture- Accelerating	g Training with B	atch Normalization -
	Convolutional Network using Tensor Flow		<u>^</u>
Unit - IV		Periods	9
	g Learning in Convolutional Networks-Embedding and		
	re-Implementing an Auto encoder in TensorFlow - Denoisin	g- Sparsity in Auto	encoders. Models for
	Analysis - Recurrent Neural Networks - Vanishing Gradient.	D 1	0
$\frac{\text{Unit} - V}{V}$		Periods	9
÷	t-Term Memory (LSTM) Unit s- TensorFlow Primitives for		0
	with Attention. Deep Learning Automated ECG Noise Dete , traffic prediction and classification, Application of ML in C		
Tor routing	, traffic prediction and classification, Application of ML in C	Total Periods	45
Text Book		Total Ferious	45
Text Dook	Nikhil Buduma, "Fundamentals of Deep Learning: Designing	ng Next Generation	Machina Intelligence
1.	Algorithms", O'Reilly, 2017.	lig Next-Generation	Machine Interrigence
2.	Ian Goodfellow, Yoshua Bengio and Aaron Courville, "Dec	en Learning" MIT I	Press 2016
Z. Reference		cp Learning, with I	1035, 2010.
	Aurélien Géron, "Hands-On Machine Learning with Scikit-	Learn and TensorF	low" O'Reilly 2017
1.	Nikhil Ketkar, "Deep Learning with Python: A Hands-on Ir		
2			
2.	Christopher Bishop, "Pattern Recognition and Machine Lea		
3.	Palash Goyal, Sumit Pandey & Karan Jain, "Deep Learning		
5.	Creating Neural Networks withpython", 1st Edition, Apress	Media, New York,	2018.
4.	K. P. Murphy, Machine Learning: A Probabilistic Perspecti	ve, MIT Press, 2012	2
5.	C. M. Bishop, Pattern Recognition and Machine Learning,	Springer, 2006.	
E-Resourc	es		
1.	https://www.cin.ufpe.br/~tfl2/artificial-intelligence-modern-ap	proach.9780131038	059.25368.pdf
	http://dwa-bis.xpl.io/cgi-		
2.	bin/pdf.php?article=artificial%20intelligence%20third%20edit 9aa336a33fec5fc4e5f50940e98b	tion%20elaine%20ri	ch%20pdf&code=ff28
3.	http://users.isr.ist.utl.pt/~wurmd/Livros/school/Bishop%20-		
	%20Pattern%20Recognition%20And%20Machine%20Learnin	a/ a0 a/ a0g ·	

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	(Autonomous Instit	VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOME (Autonomous Institution, Affiliated to Anna University, Chennai) Elayampalayam, Tiruchengode – 637 205											
Programme	B.E.	Pre	ogramn	ne Code	103	Regula	ation	2019					
Department	ELECTRONICS AND C ENGINEERING	COMMUNI	CATIC	DN	Se	mester							
Course Code	Course Name	Perio L	ods Per T	Week P	Credit C	CA Ma	aximum ESE	Marks Total					
U19ECV63	Neural Networks and it Applications	100											
Course Objective	<ul> <li>The main objective of the course is to</li> <li>Understand the concepts of Neural Networks, Modeling of Brain, applicable algorithms, and related applications.</li> <li>Analyze the algorithms for implementing simple artificial neural networks and their applications.</li> <li>Understand the Adaptive Linear Combiner principles</li> <li>Learn various Propagation Network schemes.</li> <li>Select different Architectures of Neural Network &amp; Its Applications</li> </ul>												
Course Outcome	• Select different Architectures of Neural Network & Its Applications.         At the end of the course, the student should be able to,       Knowledge         CO1: Analyze the relation between Real Brains and simple Artificial Neural Network models.       K2         CO2: Analyze and understand back propagation and associative memory.       K2         CO3: Describe the main factors involved in achieving good learning and generalization performance in Neural Network systems.       K2         CO4: Identify the main implementation issues for common Neural Network K3 systems.       K3												
Pre- requisites	classification and regress							<u> </u>					

COs	CO / PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak COs Programme Outcomes (POs)													(3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak Mapping					
	PO 1	PO 1         PO 2         PO 3         PO 4         PO 5         PO 6         PO 7         PO 8         PO 9         PO         PO         PO           10         11         12									PSO 1	PSO 2	PSO 3						
CO1	3	3	2					2					3	2					
CO2	3	3	2	2				2		2			3		2				
CO3	3	3	2	2									3	2					
CO4	3	2	2	2				2		2			3		2				
CO5	3	2	2							2			3	2					

Direct

- 4. Continuous Assessment Test I, II & III
- 5. Assignment: Simulation using tool
- 6. End-Semester examinations

Indirect

2. Course - end survey									
Content of	the syllabus								
Unit – I	INTRODUCTION AND SIMPLE NEURALETWORK	Periods	9						
Elementary		rtificial Neur	al Network						
(ANN) – A	rchitecture, Biases and Thresholds, Hebb net, Perceptron, Adaline	and Madaline	2.						
Unit-II	BACK PROPOGATION AND ASSOCIATIVE MEMORY	Periods	9						
Back propagation Network- generalized Delta rule, Bidirectional Associative Memory, Hopefield Network-									
Application									
Unit – II		Periods	9						
Kohonen S	elf organising Map, Learning Vector Quantisation, Counter propag	gation Networ	k-Applications						
Unit - IV	ANALYSIS	Periods	9						
	d Features, training and learning in pattern recognition, Discrir		•						
<b>^</b>	cognition. Unsupervised learning- hierarchical clustering, par	titional cluste	ering. Neural pattern						
recognition	approach – perceptron model-Applications.		[						
Unit – V	SUPERVISED LEARNING USING PARAMETRIC AND NON PARAMETRICAPPROACH	Periods	9						
	lassifier, Non Parametric Density Estimation, Histograms, ker	nels, window	estimators, k-nearest						
neighbor cl	assifier, estimation of error rates-Applications.								
		otal Periods	45						
Text Book	5								
1.	Hagan, Demuth and Beale, —Neural Network Designl, Vika New Delhi, 2009.	s Publishing	House Pvt.Ltd.,						
2.	Freeman J.A., and Skapura B.M, — Neural Networks, Algorith Programming Techniques, Addison – Wesley, 2004.	ms, Application	ons and						
References									
1.	Robert Schalkoff, —Pattern Recognition, Statistical, Structural Wiley and Sons (Asia) Pvt. Ltd., Singapore, 2005.	and Neural Ap	oproaches",John						
2.	Laurene Fausett , Fundamentals of Neural Networks – Archite Applications, Prentice Hall, 1994.	ectures, Algor	ithms and						
3.	Duda R.O, Hart P.G, —Pattern classification and scene analysi	s∥, Wiley Editi	on, 2013.						
4. Earl Gose, Richard Johnson baugh, Steve Jost, —Pattern Recognition and Image Analysisl,Prentice Hall of India Pvt. Ltd., New Delhi, Reprint, 2017.									
<b>E-Resources</b>									
1. https://hagan.okstate.edu/NNDesign.pdf									
2. https://www.wiley.com/en-sg/exportProduct/pdf/9780471529743									
3. https://e.pdfpremiumfree.com/download/pattern_recognition_statistical_structural_and_neur al_approaches/									

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Program		B.E.					0	nme Co	ode	103	Regu	lation		20	19		
Departme	ent	ELEC'I ENGIN		ICS AN NG	ND CO.						Sen	nester					
Course Co	de		Cours	e Name	e			er Wee		redit	C		1	n Mark			
U19ECV	64 5	Soft Co	mnut	ing		L 3				C 3		40	ES1 60		Total 100		
Course Dbjective	1	The ma	Study Unders Know Gain t	ctive of about F stand de the issu he know fuel eff	UZZY sescent m es and a wledge	set theor nethods, acquisit inferen	ry, reas optimi ion of r ce syst	zation a easonin em and	nd rel g. adapt	ated alg	orithn work.	18.					
		A t the e				•						gintic	/11.	Kno	owledge		
		At the end of the course, the student should be able to, <b>CO1:</b> Understand the basics of FUZZY set theory reasoning and decision making													level		
	t	tools.													K2		
Course Dutcome		<b>CO2:</b> Acquire knowledge about descent methods, optimization and related algorithms.													K3		
accome		<b>CO3:</b> Understand the Artificial intelligence, issues and acquisition of reasoning.													K2		
			<b>04:</b> Analyze the knowledge of Neuro FUZZY modeling inference system and uptive network.												K4		
	(	C <b>O5:</b> Ca			Automobile fuel efficiency prediction and character										K4		
	I	recognit A strong algorith	g mathe	ematical	backgr	ound, P	rogram	ming sl	cill in	C, C++,	Profi	ciency	with				
	2	A strong algorith	g mathe m	rength of	<b>CO / P</b> f correla	О Марр	<b>bing</b> Strong,	2 – Mee				ciency	with CO/I Map PSOs	ping			
equisites	2	A strong algorith	g mathe m	rength of	<b>CO / P</b> f correla	<b>O Mapp</b> tion) 3-	<b>bing</b> Strong,	2 – Mee		1 - Weał	2 PO	РО	CO/I Map PSOs PSO	ping S PSO	PSO		
equisites	(3/2	A strong algorithm 2/1 india	g mathe m cates str	rength of	CO / PO f correla Program	O Mapp tion) 3-	oing Strong,	<u>2 – Mee</u> (POs)	lium, 1	1 - Weał	5		CO/J Map PSOs	ping	PSO 3		
Cos CO 1 CO 2	(3/2 PO 1 3 3	A strong algorithm 2/1 indic PO 2 3 3	g mathe m cates str PO 3 2 2	PO 4	CO / PO f correla Program	O Mapp tion) 3-	oing Strong,	2 – Mee (POs) PO 8 2	lium, 1	1 - Weak P PO 10 2	2 PO	РО	CO/J Map PSOs PSO 1 3 3	ping PSO 2			
Cos CO 1	(3/2 PO 1 3	A strong algorithm 2/1 indic PO 2 3	g mathe m cates str PO 3 2	rength of PO 4	CO / PO f correla Program	O Mapp tion) 3-	oing Strong,	2 – Mec (POs) PO 8	lium, 1	1 - Weal P P0 10	PO 11	РО	CO/I Map PSOs PSO 1 3	ping PSO 2	3		
Cos Cos CO 1 CO 2 CO 3	(3/2 PO1 3 3 3	A strong algorithm 2/1 indic PO 2 3 3 3 3	g mathe m cates str 2 2 2 2	PO 4	CO / PO f correla Program	O Mapp tion) 3-	oing Strong,	2 – Mee (POs) PO 8 2 2	lium, 1	1 - Weak P PO 10 2	PO 11	РО	CO/I Map PSO: PSO 1 3 3 3	<b>PSO</b> 2 2	3		
Cos Cos CO 1 CO 2 CO 3 CO 4 CO 5	(3// PO1 3 3 3 3 3 3	A strong algorithm 2/1 indic PO 2 3 3 3 2 2 2	g mathe m cates str 2 2 2 2 2 2 2 2 2 2 2	PO 4	CO / PO f correla Program	O Mapp tion) 3-	oing Strong,	2 – Mee (POs) PO 8 2 2	lium, 1	1 - Weak P PO 10 2 2 2	PO 11	РО	CO/I Map PSOs PSO 1 3 3 3 3 3	<b>PSO</b> 2 2	3		
cos           Cos           Co 1           Co 2           Co 3           Co 4           Co 5             Course Ass           Direct           1.         C           2.         A           3.         E	(3// PO1 3 3 3 3 3 3 Continu	A strong algorithm 2/1 india 2/1 india PO 2 3 3 3 2 2 2 2 ent Met	g mathe m cates str PO 3 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	rength of PO 4 2 2 2 1 2 1 2 1 2 1 1 1 1 1 1 1 1 1 1	CO / Po f correla Program PO 5	O Mapp tion) 3- me Out PO 6	oing Strong,	2 – Mee (POs) PO 8 2 2	lium, 1	1 - Weak P PO 10 2 2 2	PO 11	РО	CO/I Map PSOs PSO 1 3 3 3 3 3	<b>PSO</b> 2 2	3		
cos coas coas coa coa coa coa coa coa coa coa coa coa	(3/2 PO 1 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	A strong algorithm 2/1 indic PO 2 3 3 3 2 2 2 ent Met nous As ment: Si	g mathe m cates str PO 3 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	rength of PO 4 2 2 2 1 2 1 2 1 2 1 1 1 1 1 1 1 1 1 1	CO / Po f correla Program PO 5	O Mapp tion) 3- me Out PO 6	oing Strong,	2 – Mee (POs) PO 8 2 2	lium, 1	1 - Weak P PO 10 2 2 2	PO 11	РО	CO/I Map PSOs PSO 1 3 3 3 3 3	<b>PSO</b> 2 2	3		
Cos Cos CO 1 CO 2 CO 3 CO 4 CO 5 Course Ass Direct 1. C 2. A 3. E Indirect 1. C	(3/2 PO1 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	A strong algorithm 2/1 indic PO 2 3 3 3 2 2 2 ent Met nous As ment: Si mester of - end su	g mathe m cates str PO 3 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	rength of PO 4 2 2 2 1 2 1 2 1 2 1 1 1 1 1 1 1 1 1 1	CO / Po f correla Program PO 5	O Mapp tion) 3- me Out PO 6	oing Strong,	2 – Mee (POs) PO 8 2 2	lium, 1	1 - Weak P PO 10 2 2 2	PO 11	РО	CO/I Map PSOs PSO 1 3 3 3 3 3	<b>PSO</b> 2 2	3		
equisites Cos Co 1 CO 2 CO 3 CO 4 CO 5 Course Ass Direct 1. C 2. A 3. E Indirect 1. C Content of Unit – I	(3/2 PO 1 3 3 3 3 3 3 3 5 5 5 5 5 5 5 5 5 5 5 5 5	A strong algorithm 2/1 indic PO 2 3 3 3 2 2 ent Met nous As ment: Si mester of - end su yllabus	g mathe m cates str PO 3 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	rength of PO 4 2 2 2 2 2 2 1 2 1 2 1 2 1 2 1 2 1 2 1	CO / PO f correla Program PO 5	O Mapp tion) 3- me Out PO 6	bing Strong, comes PO 7	2 – Mec (POs) 2 2 2	lium, 1	1 - Weak P PO 10 2 2 2 2	PO 11 2 	PO 12	CO/I Map PSO: PSO 1 3 3 3 3 3 3	ping PSO 2 2 2 2 - - - - - - - - - - - - -			
CO 1 CO 2 CO 3 CO 4 CO 5 Course Ass Direct 1. C 2. A 3. E Indirect 1. C Content of	(3/2 PO 1 3 3 3 3 3 3 3 5 5 5 5 5 5 5 5 5 5 5 5 5	A strong algorithm 2/1 indic PO 2 3 3 3 2 2 ent Met nous As ment: Si mester of - end su yllabus	g mathe m cates str PO 3 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	rength of PO 4 2 2 2 2 2 2 1 2 1 2 1 2 1 2 1 2 1 2 1	CO / PO f correla Program PO 5	O Mapp tion) 3- me Out PO 6	bing Strong, comes PO 7	2 – Mec (POs) 2 2 2	lium, 1	1 - Weak	PO 11 2 	PO 12	CO/I Map PSO: PSO 1 3 3 3 3 3 3	ping PSO 2 2 2 2 - - - - - - - - - - - - -			

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theoretic Operations, Member Function Formulation and Parameterization, Fuzzy Rules and Fuzzy Reasoning, Extension Principle and Fuzzy Relations, Fuzzy If-Then Rules, Fuzzy Reasoning, Fuzzy Inference Systems, Mamdani Fuzzy Models, Sugeno Fuzzy Models, TsukamotoFuzzyModels, InputSpace Partitioning and Fuzzy Modeling. Unit - II **OPTIMIZATION** Periods 9 Derivative-based Optimization, Descent Methods, The Method of Steepest Descent, Classical Newton's Method, Step Size Determination, Derivative-free Optimization, Genetic Algorithms, Simulated Annealing, Random Search, Downhill Simplex Search. Unit – III **ARTIFICIAL INTELLIGENCE** Periods 9 Introduction, Knowledge Representation - Reasoning, Issues and Acquisition: Prepositional and Predicate Calculus Rule Based knowledge Representation Symbolic Reasoning Under Uncertainty, Basic knowledge Representation Issues Knowledge acquisition - Heuristic Search: Techniques for Heuristic search Heuristic Classification. Unit - IV **NEURO FUZZY MODELING** Periods 9 Adaptive Neuro-Fuzzy Inference Systems, Architecture, Hybrid Learning Algorithm, Learning Methods that Cross-fertilize ANFIS and RBFN, Coactive Neuro Fuzzy Modeling, Framework Neuron Functions for Adaptive Network, Neuro Fuzzy Spectrum. **APPLICATIONS OF COMPUTATIONAL** 9 Unit – V Periods **INTELLIGENCE** Printed Character Recognition, Inverse Kinematics Problems, Automobile Fuel Efficiency Prediction, Soft Computing for Color Recipe Prediction. **Total Periods** 45 **Text Books** S.R. Jang, C. T. Sun and E. Mizutani, "Neuro-Fuzzy and Soft Computing", PHI, 2004, Pearson 1. Education ,2012. N.P.Padhy, "Artificial Intelligence and Intelligent Systems", Oxford University Press, 2011. 2. References Elaine Rich & Kevin Knight, "Artificial Intelligence, Second Edition", Tata Mcgraw Hill Publishing 1. Comp., New Delhi,2006 Timothy J.Ross, "Fuzzy Logic with Engineering Applications", McGraw-Hill, 2011. 2. 3. S. Rajasekaran and G.A.V.Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithms", PHI, 2003. R.Eberhart, P. Simpson and R. Dobbins, "Computational Intelligence - PC Tools", AP, 4. Professional, Boston, 1996. Dr.S.N.Sivanandam and S.N.Deepa, "Principles of Soft Computing", Wiley India, 2007. 5. **E-Resources** 1. http://www.soukalfi.edu.sk/01\_NeuroFuzzyApproach.pdf 2. https://www.worldcat.org/title/artificial-intelligence-and-intelligent-systems/oclc/60836856 http://iauctb.ac.ir/Files/%D9%88%D8%A8%20%D8%B3%D8%A7%DB%8C%D8%AA%20%D8%A7 3. %D8%B3%D8%A7%D8%AA%DB%8C%D8%AF/fuzzy%20logic%20with%20engineering%20applicat

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## VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN

(Autonomous Institution, Affiliated to Anna University ,Chennai) Elayampalayam, Tiruchengode – 637 205



Programme	B.E.		Pro	gramm	e Code	103	Regulation		2019			
Department	ELECTRO ENGINEEF	NICS AND COMN RING	MUNIC	CATIO	N		Semester					
Course Code	Can	rse Name	Period	ls Per	Week	Credit	Max	timum I	Marks			
Course Code	Cou	rse manne	L	Т	Р	С	CA	ESE	Total			
U19ECV65	Computer V	ision	3	0	0	3	40	60	100			
Course Objective	Know the ma Understand t	The main objective of the course is to Know the major concepts of fundamentals of image Understand the preprocessing and post processing techniques. Understand the machine learning concepts and algorithms.										
a		f the course, the stu stand the major cor					uter vision and	I	Knowledge Level K2			
Course Outcomes		onstrate computer v d implementing alg			· •	0	<b>U V</b>		K3			
		knowledge in segme				perform ]	Patten analysis	s.	K4			
		stand the concepts of			<u> </u>				K3			
		nowledge on mach		ning a	lgorithi	ns			K3			
Pre- requisites	Basic knowl	edge on image and	pixels									

	CO / PO Mapping (3/2/1 indicates strength of correlation) <b>3-Strong, 2 – Medium, 1 - Weak</b>													CO/PSO Mapping			
COs	COs Programme Outcomes (POs)										PSOs						
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3		
CO 1	3	3	2										2	1			
CO 2	3	3	2										2	1			
CO 3	3	3	2										2	1			
CO 4	3	3	2										2	1			
CO 5	3	3	2										2	1			

**Course Assessment Methods** 

Direct		
1.Continu	ous Assessment Test I, II & III	
2.Assignn	nent	
3.End-Ser	nester examinations	
Indirect		
1. Course	- end survey	
Content of the	syllabus	
Unit – I	IMAGE PROCESSING FOUNDATIONS	Periods
Image process	ing techniques classical filtering operations thresholding t	achniques add

Image processing techniques - classical filtering operations - thresholding techniques - edge detection techniques - corner and interest point detection - mathematical morphology - texture.

# Unit – II IMAGE FORMATION AND PROCESSING Periods



9

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Overview	v and State-of-the-art, Fundamentals of Image Formation, Trans	formation: Ort	hogonal, Euclidean,
Affine a	nd Projective. Fourier Transform, Convolution and Filtering,	Image Enhanc	ement, Restoration,
Histogram	n Processing.		
Unit – I	II FEATURE EXTRACTION	Periods	9
Edges -	Canny, LOG, DOG; Line detectors (Hough Transform), Corner	s - Harris and	Hessian Affine,
Orientat	ion Histogram, SIFT, SURF, HOG, GLOH, Scale-Space Ai	nalysis- Image	Pyramids and
Gaussia	n derivative filters, Gabor Filters and DWT		
Unit – I	V IMAGE SEGMENTATION	Periods	9
Region	Growing, Edge Based approaches to segmentation, Graph-Cut, Me	ean-Shift, MRF	s, Texture
0	tation; Object detection.		
Unit – V		Periods	9
Clusteri	ng: K-Means, K-Medoids, Mixture of Gaussians, Classifica	tion: Discrim	inant Function.
	sed, Un-supervised, Semi-supervised; Classifiers: Bayes, KNN,		
•	on: PCA, LDA, ICA; Non-parametric methods.		2
		Total Periods	45
Text Book			
1.	Richard Szeliski, Computer Vision: Algorithms and Applications 2011	s, Springer-Ve	rlag London Limited
2.	Computer Vision: A Modern Approach, D. A. Forsyth, J. Ponce,	Pearson Educa	ation, 2003.
Reference			
1.	Richard Hartley and Andrew Zisserman, Multiple View Geometric Edition, Cambridge University Press, March 2004.	ry in Computer	Vision, Second
2.	Christopher Bishop,"pattern Recognition and Machine learning'	' springer,2007	1
3.	K. Fukunaga; Introduction to Statistical Pattern Recognition, Se Morgan Kaufmann, 1990	cond Edition, A	Academic Press,
4.	R.C. Gonzalez and R.E. Woods, Digital Image Processing, Addi	son- Wesley, 1	992
		•	
E-Resourc	es		
E-Resourc	https://www.academia.edu/1071085/SIFT_features_tracking_for_vi	deo_stabilizatio	on

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Depar	tment		CTRON INEER		ND CO	MMU	INICA	TION			Se	emeste	er			
Course	Code		Cou	rse Nan	ne		eriods L	Per We	eek P	Credit C		Ma CA	ximun E	n Mark SE	ts Total	
U19EC	CV66			D REA			3	0	0	3		40		50	100	
Cour Objec Cour Outco	tive	CO1: CO2: CO3: CO4:	<ul> <li>To know the internals of the hardware and software components involved in the development of AR/VR enabled applications</li> <li>To learn about the graphical processing units and their architectures</li> <li>To gain knowledge about AR/VR application development.</li> <li>To know the technologies involved in the development of AR/VR based applications</li> <li>At the end of the course, the student should be able to,</li> <li>CO1: Understand the basic concepts of AR and VR</li> <li>CO2: Understand the tools and technologies related to AR/VR</li> <li>CO3: Know the working principle of AR/VR related Sensor devices</li> <li>CO4: Design of various models using modeling techniques</li> <li>K3</li> </ul>													
equisit		2/1 indic	ates stre	ength of	<b>CO / PO</b> correlatio	on) <b>3-</b> S	trong,		dium,	1 - Wea	k		CO/I Map			
COs					Program			(POs)					PSOs	5		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	
CO 1	3	2	2	-	3	-	-	-	2	2	1	2	2	1	2	
CO 2	3	2	2	1	3	-	-	-	3	2	2	3	3	1	2	
	3	3	2	2	3	-	-	-	3	2	1	2	3	2	2	
CO 3	3	3	3	2	3	-	-	-	3	2	2	3	3	2	2	
CO 4		0	3	3	3	_	-	-	3	3	3	3	3	3	3	
	3 Assess	3 ment M	-	-	5		I									
CO 4 CO 5 Course A Direct 1.C 2.A 3.E Indirect	Assess Continu Assignn End-Sei	ment M	ethods essmen xamina	t Test I	. II & III											
CO 4 CO 5 Course A Direct 1.C 2.A 3.E Indirect	Continu Continu Assignn End-Sen ct Course	ment M lous Ass nent mester e e - end s	eessmen xamina urvey	t Test I								riods				

Introduction to Virtual Reality and Augmented Reality – Definition – Introduction to Trajectories and Hybrid Space-Three I's of Virtual Reality – Virtual Reality Vs 3D Computer Graphics – Benefits of Virtual Reality – Components of VR System – Introduction to AR-AR Technologies-Input Devices –3D Position Trackers – Types of Trackers – Navigation and Manipulation Interfaces – Gesture Interfaces – Types of Gesture Input Devices – Output Devices – Graphics Display – Human Visual System – Personal Graphics Displays – Large Volume Displays - Sound Displays - Human AuditorySystem. Unit – II **VR MODELING** 9 Periods Modeling – Geometric Modeling – Virtual Object Shape – Object Visual Appearance – Kinematics Modeling - Transformation Matrices - Object Position - Transformation Invariants - Object Hierarchies - Viewing the 3D World – Physical Modeling – Collision Detection – Surface Deformation – Force Computation – Force Smoothing and Mapping – Behavior Modeling – Model Management. Unit – III VR PROGRAMMING 9 Periods VR Programming – Toolkits and Scene Graphs – World Tool Kit – Java 3D – Comparison of World Tool Kit and Java 3D Unit – IV **APPLICATIONS** Periods 10 Human Factors in VR - Methodology and Terminology - VR Health and Safety Issues - VR and Society-Medical Applications of VR – Education, Arts and Entertainment – Military VR Applications – Emerging Applications of VR – VR Applications in Manufacturing – Applications of VR in Robotics – Information Visualization - VR in Business - VR in Entertainment - VR in Education. Unit – V AUGMENTED REALITY Periods 9 Introduction to Augmented Reality-Computer vision for AR-Interaction-Modelling and Annotation-Navigation-Wearable devices **Total Periods** 45 **Text Books** Charles Palmer, John Williamson, "Virtual Reality Blueprints: Create compelling VR 1. experiences for mobile", Packt Publisher, 2018 Dieter Schmalstieg, Tobias Hollerer, "Augmented Reality: Principles & Practice", Addison 2. Wesley, 2016 3. John Vince, "Introduction to Virtual Reality", Springer-Verlag, 2004. William R. Sherman, Alan B. Craig: Understanding Virtual Reality - Interface, Application, 4. Design", Morgan Kaufmann, 2003

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Progra	mme	B.E.					Progr	amme	e Code	103	Reg	gulatio	n	20	19		
Depart	ment		CTRON NEER		ND CC	OMMU	JNICA	TIO	N	Seme	ster						
Course (	Code		Cour	se Nan	ne	F	Periods L	Per V T	Veek P	Credit C		Ma CA		n Mark SE	as Total		
U19EC	V67	Optin	nization	n Tech	niques		$\begin{array}{c ccccccccccccccccccccccccccccccccccc$										
Cour: Object		The 1	<ul> <li>The main objective of the course is to</li> <li>Acquaint and familiarize with different types of optimization techni</li> <li>Interpret optimization problems,</li> <li>Implement computational techniques,</li> <li>Abstract mathematical results and proofs</li> </ul> At the end of the course, the student should be able to.											iques,			
		At the end of the course, the student should be able to, <b>CO1:</b> Infer the concepts of Evolutionary Computation													owledge el K2		
C			<b>CO1:</b> Infer the concepts of Evolutionary Computation <b>CO2:</b> Solve an optimization problem with GA														
Cour: Outcor		<b>CO3:</b> Apply the advanced GA operators for Machine learning, Image Processing													К3		
		CO4: Apply the concepts of PSO in optimization problems													K3		
		<b>CO5</b> : Apply the concepts of ACO and cuckoo search in engineering applications												K4			
Pre- requisite		2/1 indic	ates stre		CO / PC correlati			2 – M	[edium,	1 - Wea	ık		CO/I Map				
COs				-	Program			· · ·					PSOs	-	-		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO	8 PO	9 PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3		
CO 1	3	3	2	2	2							1	3	2			
CO 2 CO 3	3	3	2	2	2						_	1	3		2		
CO 4	3	3	2	22	2 2							1	3	2	2		
CO 5	3	3	2	2	2							1	3	2			
Course A	Ssessi	nent M	ethods														
2.A 3.E	ssignn nd-Ser				, II & III												
Indirec		e - end su	urvey														
Content	of the	syllabu	S														
Unit -						oducti						riods		9			
Footuros	of F	Evolutio	narv (	omnut	tation -	Advar	ntages	of F	Volutio	mary (	omnu	itation	- Δ <sub>1</sub>	nnlicat	ions of		

Unit – Il	Genetic Algorithms:	Periods	9
Introductio	n-Biological background- Conventional Optimizationand Searc	h Techniques	Advantages and
Limitations	of Genetic Algorithm-Terminologies and Operators of GA		
Unit – II	I Advanced GA	Periods	9
Advanced	Operators and Techniques in Genetic Algorithm-Classifi	cation of Ge	enetic Algorithm-
Application	of GA in Machine learning, Image Processing		
Unit – IV	7 Particle Swarm Optimization	Periods	10
PSO Algor	ithm - Accelerated PSO - Implementation - Convergence Analysis	s - Binary PSO	–Applications
Unit – V	Ant Colony Optimization and Cuckoo Search	Periods	9
ACO algor	ithm - CharacteristicsConvergence analysis - Implementation -	-Applications.	CuckooSearch :
Cuckoo Li	fe Style – flowchart – Algorithm		
	r	<b>Fotal Periods</b>	45
Text Book	S		
1.	Sivanandam S.N. & Deepa S.N., "Introduction to Genetic Algorithms	ithms", 1st Edi	tion,
1.	Springer, New York, 2013.		
2.	OmidBozorg & Haddad, "Advanced Optimization by Nature-In	spired Algorith	nms",
D.£	Springer, Singapore, 2018		
References	: SrikantaPatnaik, Xin-She Yang & Kazumi Nakamatsu, "Nature-J	nonino d Comm	uting and
1.	Optimization Theory and Applications", Springer, Switzerland	<b>1 1</b>	uting and
E-Resource		, <u> </u>	
1.	http://ftp.demec.ufpr.br/CFD/bibliografia/an_introduction_to_ge_and_engineers_coley.pdf	enetic_algorith	ms_for_scientists
2.	https://msulaiman.org/onewebmedia/Xin-She_Yang_AuthNat Inspired_Optimization_Algorithms.pdf	ure-	

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				nous Ir	stitutic	on, Affi	VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN (Autonomous Institution, Affiliated to Anna University, Chennai) Elayampalayam, Tiruchengode – 637 205         B.E.       Programme Code       103       Regulation									
Progra	mme	B.E.								103	Reg	gulation	n	202	19	
Depart	ment		CTRON NEER		ND CO							emeste				
Course	Code		Cour	se Nan	ne	F	Periods L	Per W	Veek P	Credit C		$\frac{Max}{CA}$	kimun E	Mark	s Total	
U19EC	V68	ETHI	CS AN	DAI			3	0	0	3		40		50	100	
Cour Object		• • •	Learn Study Study Study	n about y about y about y about	the Eth AI star social AI and	nical ini ndards a and eth l Ethics	hics in AI nitiatives in the field of artificial intelligenc and Regulations hical issues of Robot Ethics es- challenges and opportunities									
Course Outcom	es														3 2 2	
Pre-		of Autonomous andSemi-Autonomous Systems <b>CO5</b> : Learn about the societal issues in AI with National and International Strategies on AI -											-	l K4		
COs	(3/2 PO 1	PO 2		ngth of	CO / PO correlat Program PO 5	ion) <b>3-</b> 8	strong,				ak PO	РО	CO/H Map PSOs PSO	ping	PSO	
CO 1	101	102	103	104	105	100	107	100	, 10	10	11	12	1	2	3	
CO 1 CO 2	3	2	3	3	1	-	-	-	1	2	1	1	3	1	1	
CO 3	2	1	1	2	1	-	-	-	1	2	1	1	3	3	1	
CO 4	2	3	1	1	3	-	-	-		1	1	2	3	2	2	
CO 5	3	1	3	3	2 3	-	-	-	2	2	3	1 3	2	1	3	
		-	-	-	-							. –	-	2		
2.A	Continu	ous Ass	essmen		II & II	I										
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<b>Direct</b> 1.C 2.A 3.E <b>Indirec</b>	Continu Assignn Ind-Ser It Course of the	ous Ass nent nester e: - end si	essmen xamina urvey	tions	II & II							riods		9		

Definition	of morality and ethics in AI-Impact on society-Impact on human	n psychology-Ii	npact on the legal
system-Im	pact on the environment and the planet-Impact on trust		
Unit – I	I ETHICAL INITIATIVES IN AI	Periods	9
Internation	al ethical initiatives-Ethical harms and concerns-Case study:	healthcare rob	ots, Autonomous
Vehicles,	Warfare and weaponization		
Unit – Il	I AI STANDARDS AND REGULATION	Periods	9
Model Pro	ocess for Addressing Ethical Concerns During System Design	- Transparency	of Autonomous
Systems-D	ata Privacy Process- Algorithmic Bias Considerations - C	Intological Star	dard for Ethically
Driven Ro	botics and Automation Systems		
Unit – F	<b>ROBOETHICS: SOCIAL AND ETHICAL</b> <b>IMPLICATION OF ROBOTICS</b>	Periods	10
Robot-Rob	ooethics- Ethics and Morality- Moral Theories-Ethics in Science ar	nd Technology	- EthicalIssues in
an ICT So	ciety- Harmonization of Principles- Ethics and Professional Response	nsibility- Roboe	ethics Taxonomy
Unit – V	AI AND ETHICS- CHALLENGES AND OPPORTUNITIES	Periods	9
Applicatio	s - Opportunities- ethical issues in artificial intelligence- Societal n of Artificial Intelligence in Medicine- decision-making role in in al Strategies on AI.		0
	<u> </u>	Total Periods	45
Text Book			
1.	y. Eleanor Bird, Jasmin Fox-Skelly, Nicola Jenner, Ruth Larbey, Winfield ,"The ethics of artificial intelligence: Issues and ini Parliamentary Research Service Scientific Foresight Unit (STOA	tiatives", EPRS	S   European
2.	Patrick Lin, Keith Abney, George A Bekey," Robot Ethics: The Et Implications of Robotics", The MIT Press- January 2014		
REFER	ENCES:		
1	Towards a Code of Ethics for Artificial Intelligence (Artific	ial Intelligence	:
1.	Foundations, Theory, and Algorithms) by Paula Boddington, No	vember 2017	
2.	Mark Coeckelbergh," AI Ethics", The MIT Press Essential Know 2020	vledge series, A	pril
E-Resourc	Ces		
1.	https://sci-hub.mksa.top/10.1007/978-3-540-30301-5_65		
	https://www.scu.edu/ethics/all-about-ethics/artificial-intelligence-	-and-ethics-sixte	een-
2.	challenges-and-opportunities		
3.	https://www.weforum.org/agenda/2016/10/top-10-ethical-issues-i intelligence/	in-artificial-	
4.	https://sci-hub.mksa.top/10.1159/000492428		
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# VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN

(Autonomous Institution, Affiliated to Anna University, Chennai) Elayampalayam, Tiruchengode – 637 205



NOMEN ENPOWERNENT		Elayampalayam, Tiruchengode – 637 205												C STOSTARTS			
Program	ne ]	B.E.				P	rogram	me Coc	le	103	Reg	gulatio	on		2019		
Departme			RONIC		O COM	MUNI	CATIO	ON			Se	emeste	er				
Course Cod	e	(	Course	Name		Pe	eriods F	Per Wee	k C	redit		Ν	laxim	ım Ma	rks		
									P	С		CA	I	ESE	Total	-	
<b>U19ECV7</b>			Recogn				-	0	0	3		40		60	100		
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	At				the stuc					101 pu				Knov	wledge	leve	
Course	CO	<b>D1:</b> An	alyze t	he patte	ern reco	gnition	algorit	hms for	classif	ication	18.				K3		
Outcome			- •	-	ervised		-	-	-		sificat	tion			K4		
			•		epts of s		•		0						K2		
		J4: An	alyze t	he feati	ire extra	action a	and sele	ection te	chniqu						K3		
				1	1	1	. 1		C					K4			
Duc	C( rec	<b>D5:</b> An cognitio	alyze ti on		inced ne	eural ne	etwork	structur	es for p	attern					K4		
Pre- requisites	CC rec Sig	<b>D5:</b> An cognitio gnal & 1	alyze ti on Image I	Processi	ng CO / Po	O Mapp	oing						CO/I	PSO	K4	1	
requisites	CC rec Sig	<b>D5:</b> An cognitio gnal & 1	alyze ti on Image I	Processi ength of	ng CO / Po correlat	O Mapı ion) 3-8	oing Strong,	2 – Med			5		Map	ping	K4		
	(3/2	<b>D5:</b> An cognitio gnal & 7 /1 indic	alyze ti on Image I	Processi ength of	ng CO / Pe correlat Progran	O Mapp ion) 3-S	<b>bing</b> Strong,	<mark>2 – Med</mark> (POs)	ium, 1 ·	- Weak			Map PSOs	ping			
COs	(3/2 PO 1	D5: An cognitic gnal & 7 /1 indic	alyze ti on Image I ates stra PO 3	Processi ength of	ng CO / Po correlat	O Mapı ion) 3-8	oing Strong,	2 – Med			PO 11	PO 12	Map	ping	K4		
COs CO1	(3/2 PO 1 3	D5: An cognitic gnal & // /1 indic PO 2 3	alyze ti on Image I ates stree PO 3 2	Processi ength of PO 4	ng CO / Pe correlat Progran	O Mapp ion) 3-S	<b>bing</b> Strong,	<mark>2 – Med</mark> (POs)	ium, 1 ·	- Weak	PO		Map PSOs PSO	ping PSO	PSO		
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Overview of pattern recognition - Discriminant functions - Supervised learning - Parametric estimation - Maximum likelihood estimation - Bayesian parameter estimation - Perceptron algorithm - LMSE algorithm -Problems with Bayes approach - Pattern classification by distance functions – Minimum distance pattern classifier.



Unit - II	UNSUPERVISED CLASSIFICATION	Periods	9
-	unsupervised learning and classification - Clustering concept - C-means alg cedures - Graph theoretic approach to pattern clustering - Validity of cluster		cal
Unit – III	STRUCTURAL PATTERN RECOGNITION	Periods	9
	formal grammars - String generation as pattern description - Rec arsing - Stochastic grammars and applications.	ognition of synt	actic
Unit - IV	FEATURE EXTRACTION AND SELECTION	Periods	9
	nimization - Karhunen - Loeve transformation - Feature selection -Binary feature selection.	n through func	tions
Unit – V	RECENT ADVANCES	Periods	9
	rk structures for Pattern Recognition - Neural network based Pattern ass learning in neural Pattern Recognition	ociators -	
		Total Periods	15
<b>Text Books</b>			
1.	Robert J.Schalkoff, Pattern Recognition: Statistical, Structural and Neural	Approaches, John	l
	Wiley &Sons Inc., New York, 2007		
2.	Duda R.O., Hart.P.E., and Strok, Pattern Classification, second Edition W	iley, New York, 2	008.
References	1		
1.	Richard O Duda, Peter E Hart and David G Stork, —Pattern Classification 2010,	I, Wiley India, Nev	w Delhi.
2.	Narasimha Murty M and Susheela Devi V, Pattern Recognition: An Algo University Press, India. 2011.	orithmic Approach	.∥,
3.	sergios Theodoridis and Konstantinos Koutroumbas, Pattern Recognition Delhi.2011.	nl, Elsevier, New	
4.	Christopher M Bishop,  Pattern Recognition and Machine Learning , Spr.	inger, USA.2011.	
5.	Morton Nadier and Eric Smith P., Pattern Recognition Engineering, York, 1993	John Wiley & So	ons, New
E-Resources			
1.	https://onlinelibrary.wiley.com/doi/abs/10.1002/9780470050118.ecse302		
2.	https://ecorise.instructure.com/eportfolios/8609/JCV4/Read_FullPDF_Pattern_Solution_Manual	n_Classification_R_	_O_Duda
3.	https://www.worldcat.org/title/pattern-classification/oclc/41347061/editions?	lang=ko&editions	/iew_true

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	· - · -	<b>EKANANDHA COl</b> Autonomous Instituti Elayampa	on, Affi	iated t	o Anna	Univers	ity, Chennai)	EN	SO 3011-2015 CERTITIES 0 19556955
Programme	B.E.		Pro	gramm	e Code	103	Regulation		2019
Department	ELECTR	ONICS AND COM ERING	MUNIC	ATIO	N		Semester		
Course Code	C	ourse Name	Perio	ls Per	Week	Credit	Max	kimum	Marks
		Jurse Mame	L	Т	Р	С	CA	ESE	Total
U19ECV72	Medical E	lectronics	3	0	0	3	40	60	100
Course Objective	nation Gain and th Unde Ident of ele Unde	the methods of vari- nal/international poli- knowledge about the he methods of record erstand the use of va- tify the working of d ectrical safety in hosp rstand the working of for physical medici-	icies. e various ling and rious ass ifferent pitals. of units t	physic also th ist dev physic hat hel	ologica e methe ices use logical ps to re	l parame od of trat ed in the assist de store nor	ters both elect nsmitting these hospitals. vices and the r rmal functioning	rical an e param need and ng equij	d non electrical eters. d technique oment chniques.
	At the end	of the course, the stud	lent shou	ld be a	ble to				Knowledge level
	CO1: Able	e to Analyze the met	hods of	various	s record	ling biop	otentials		K4
Course Outcome		ity to comprehend a ntemporary world	nd appre	ciate t	he signi	ificance	and roles in th	ie	K3
		analyze working of hysiological assist de		care u	nits, he	eart rate,	pressure rate a	ind	K3
	CO4: Illu	strate the working ar	nd use of	X-ray	s and in	maging s	ystems		K2
	CO5: Rea normal fur	lize the recent trends	s in med	ical ins	strumen	itations t	hat helps to re	store	K2
Pre- requisites	-								

	(3/2	2/1 indi	cates str		CO / PO			2 – Med	ium, 1 -	Weak			CO/PSO Mapping		
COs					Program	nme Out	comes (	POs)					PSOs	5	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	3	3	2					2		2			3		2
CO 2	3	3	2	2				2				2	3	2	
CO 3	3	3	2	2				2		2			3	2	
CO 4	3	2	2	2						2		2	3	3	
CO 5	3	2	2										3		

Direct



	ontinuous Assessment Test I, II & III		
	ssignment: Simulation using tool nd-Semester examinations		
Indirect			
1. C	ourse - end survey		
Content of	the syllabus		
Unit – I	ELECTRO-PHYSIOLOGY AND BIO-POTENTIAL RECORDING	Periods	9
	n of Bioelectric signals, recording electrodes, electrodes for ECG,		croelectrodes, basic
recording s Unit - II	ystem, preamplifiers and biomedical recorders for ECG,EEG & El	MG. Periods	9
Unit - 11	PATIENT MONITORING SYSTEM	Periods	9
	ent of Heart rate-Measurement of pulse rate-Blood Pressure Measu measurement-Blood cell counters-Measurement of Blood PCO <sub>2</sub> -B		
Unit – II	I ASSIST DEVICES AND BIO-TELEMETRY	Periods	9
	netry-Cardiac Output Measurements-Cardiac Pacemakers and DC	Defibrillators-	Telemedicine
	art lung machine.		
Unit - IV	MODERN IMAGING SYYSTEM	Periods	9
Visualizati Systems.	on of X-rays-basic principles of MRI, diagnostic ultrasound, m	edical ultrasou	nd, Thermal Imaging
Unit – V	RECENT TRENDS IN MEDICAL INSTRUMENTATION	Periods	9
Patient Saf	ety- Laser applications in Bio-medical field- Cryogenic application	1 – Radiotheraj	by equipment.
Patient Saf		n – Radiotheraj F <b>otal Periods</b>	by equipment. 45
Patient Saf	s	<b>Fotal Periods</b>	45
		<b>Fotal Periods</b>	45
Text Book	s Khandpur, R.S., "Handbook of Biomedical Instrumentation", Ta	Total Periods ata McGraw H	45 ill Education (India)
Text Book	s Khandpur, R.S., "Handbook of Biomedical Instrumentation", Ta Private Limited, 3r <sup>d</sup> Edition, 2016. Leislie Cromwell, Fred J.Weibell, Erich A. Pfeiffer, "Biomedica Measurement", Prentice Hall of India, New Delhi, 2 <sup>nd</sup> Edition, 2	Fotal Periods ata McGraw H al Instrumentat 2015.	45 ill Education (India) ion and
<b>Text Book</b> 1. 2.	s Khandpur, R.S., "Handbook of Biomedical Instrumentation", Ta Private Limited, 3r <sup>d</sup> Edition, 2016. Leislie Cromwell, Fred J.Weibell, Erich A. Pfeiffer, "Biomedica Measurement", Prentice Hall of India, New Delhi, 2 <sup>nd</sup> Edition, 2	Fotal Periods ata McGraw H al Instrumentat 2015.	45 ill Education (India) ion and
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Text Book           1.           2.           References           1.           2.	s Khandpur, R.S., "Handbook of Biomedical Instrumentation", Ta Private Limited, 3r <sup>d</sup> Edition, 2016. Leislie Cromwell, Fred J.Weibell, Erich A. Pfeiffer, "Biomedica Measurement", Prentice Hall of India, New Delhi, 2 <sup>nd</sup> Edition, 2 s John G.Webster, "Medical Instrumentation Application and Des Joseph J. Carr and John M. Brown, "Introduction to Biome Pearson Education, 4th Edition, 2014. Digital Image Processing, S Jayaraman, S Esakkirajan T V	Fotal Periods ata McGraw H al Instrumentat 2015. sign" Wiley Inc edical Equipm /eerakumar, N	45 ill Education (India) ion and dia, 4 <sup>th</sup> Edition, 2015. nent Technology",
Text Book           1.           2.           References           1.           2.           3.	<ul> <li>s</li> <li>Khandpur, R.S., "Handbook of Biomedical Instrumentation", Ta Private Limited, 3r<sup>d</sup> Edition, 2016.</li> <li>Leislie Cromwell, Fred J.Weibell, Erich A. Pfeiffer, "Biomedica Measurement", Prentice Hall of India, New Delhi, 2<sup>nd</sup> Edition, 2</li> <li>John G.Webster, "Medical Instrumentation Application and Des Joseph J. Carr and John M. Brown, "Introduction to Biome Pearson Education, 4th Edition, 2014.</li> <li>Digital Image Processing , S Jayaraman, S Esakkirajan T V 2010.</li> </ul>	Fotal Periods ata McGraw H al Instrumentat 2015. sign" Wiley Inc edical Equipm Veerakumar, N	45 ill Education (India) ion and dia, 4 <sup>th</sup> Edition, 2015. nent Technology", Mc Graw-Hill,
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	neras, Opto-mechanical Scanners, Push-broom Cameras, M		
	wave EOS: Passive microwave sensors, Active microwav		
Radars, Groun	d Penetrating Radars- Principles of Satellite Motion: Types	of orbits, Orb	oit perturbations,
Space craft Ele	ements and GNSS.		-
Unit – III	Data Reception and Processing	Periods	9
	Data formats, Data acquisition and onboard data handling, Da		
	Radiometric and Geometric rectifications, Referencing Sche		0
	s Output media, Data Analysis and Quality Assessment, S	pecial process	ing, digital and
visual interpre			
Unit – IV	Applications of EOS in Earth Resources Management		9
	d Soils, Forestry, Geology, Land Cover - Land use Mapping,		
Glaciers, Urba	n studies, Coastal zone management and marine fisheries, De	sertification, A	rchaeology.
Unit – V	EOS Image Classification and Spatial Data Modeling	and <sub>Periods</sub>	9
	Management		
	upervised and unsupervised classification concepts and method		
	eographic information systems – Spatial data types, Data pre	paration and m	anagement, GIS
working enviro	onment, Spatial data infrastructure.		
	,	<b>Fotal Periods</b>	45
Text Books		~	
1.	George Joseph & Jeganathan C., "Fundamentals of Remote	e Sensing", 3rc	l Edition,
	Universities Press (India) Pvt. Ltd., Hyderabad, 2018.	A 17 7.	
2.	Thomas M. Lillesand, Ralph W. Kiefer, "Remote Sensing	And Image Int	erpretation", 7th
D	Edition, John Wiley, New Delhi, 2015		
References			<b>5</b> .1. <b>3</b> 7.11.1
1.	Campbell J.B. & Randolph H. Wayne, "Introduction to Ren	note sensing", 3	5th Edition,
	Guilford Press, USA, 2011.		
<b>E-Resources</b>			
1.	http://www.geoservis.ftn.uns.ac.rs/downloads/ISP/1999-fun	damentals-of-1	remote-
1.	sensing.pdf		
2.	https://www.geokniga.org/bookfiles/geokniga-remote-sensit	ng-and-image-	interpretation.pdf
3.	https://ncert.nic.in/textbook/pdf/kegy307.pdf		

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Programme	B.E.		Prog	ramm	e Code	103	Regulation		2019
Department	ELECTR ENGINE	ONICS AND COMM ERING	IUNICAT	TION			Semester		
Course Code	С	ourse Name	Periods			Credit		kimum N	1
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		lyze the concepts of a							K3
	CO4: App	ly the basic knowledg	ge of electr	onics	in vehi	cular arcl	hitecture.		K2
	<b>CO5:</b> Asse automotive	es the most suitable ne e systems.	etworking	topolo	ogies fo	or a new g	generation		K4
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CO3	2		3	3									3	3	
CO4	2							2					2	2	
CO5	3	2	2									2	2		

Direct

- 1. Continuous Assessment Test I, II & III
- 2. Assignment: Simulation using tool
- 3. End-Semester examinations

Indirect

2. Course - end survey

Content of the syllabus



Unit -		Periods	8
	ics Fundamentals: Semiconductor Devices, Transistors-FET, Digita		
	ircuits (Combinatorial), Sensor types: Engine-speed sensors, Hal		
	sion control, High-pressure sensors, Temperature sensors, Accel	erator-pedal se	ensors, Steering-angle
sensors. Unit -	II ALTOMOTIVE SYSTEM A DOUTEOTUDE	Periods	10
	II AUTOMOTIVE SYSTEM ARCHITECTURE v, Vehicle system architecture, Electronic control unit: Operating		
	nodules in the control unit. Basic principles of networking: Network		
	e model, Control mechanisms. Automotive networking: Cross-syst		
	Classification of bus systems, Applications in the vehicle, coupling of		1
Unit –	III ELECTRONIC TRANSMISSION CONTROL	Periods	9
	Braking System (ABS): System overview, Requirements placed on		
	trol loop, Typical control cycles. Traction Control System (TCS): Tas		
	control system (TCS), Typical control situations, Electronic Stability	Program (ESP)	: Requirements, Tasks
and meth Unit -	iod of operation.       IV     AUTOMOTIVE INSTRUMENTATION	Periods	9
	ic Diesel Control (EDC): System overview, Common-rail system		,
	controlled EDC systems, Data exchange with other systems, Seri		
	Vehicle security systems: Acoustic signaling devices, Central locking		
systems.			8.9
Unit –	- V AUTOMOTIVE NETWORKING	Periods	9
	ems: CAN Bus, High/Low speed CAN, network nodes, Topology		
•	ransmission agent and bus coupling, Bluetooth: overview, application		technology, frequency
hopping	method, modulation method, piconet, scatternet, Bluetooth architectur		
11 0	method, modulation method, preoner, seaterner, Didetooth arenneetur		45
	A	e. Total Periods	45
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CO 2	1	1	-	2	2	2	-	-	-	3	3	3	2	2	1
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CO 3		-	1	-	2	2	-	-	-	2	3	5	2	$\frac{2}{2}$	1
CO 3 CO 4	1	_	- 1				-	-		-	5	1	1	2	1
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Program	ning, Data Management with Hadoop		
Unit – Il	I PROTOCOLS AND CLOUD	Periods	9
Needof	protocols; Types of Protocols, Wi-Fi, Wi-Fi direct, Zigbee, Z w	vave, BACnet,	BLE, Modbus,
SPI, I2	C, IIoT protocols -COAP, MQTT, 6LoWPAN, LWM2M, A	MPQ IIoT cl	oud platforms:
Overvie	w of COTS cloud platforms, Predix, PTC Thing Worx, Micros	oft Azure etc.	Data analytics,
cloud se	rvices, Business models: SaaS, PaaS, IaaS.		
Unit – I		Periods	9
	al IoT: Security and Fog Computing - Cloud Computing in IIoT, F	og Computing i	in IIoT,
Security		1 1	
Unit – V		Periods	9
	al IOT- Application Domains: Oil, chemical and pharmaceutical in	• • •	
in Indus	tries, Real case studies: Milk Processing and Packaging Industries,	Manufacturing	g Industries
	,	<b>Fotal Periods</b>	45
Text Book	S		
1.	"Industrial Internet of Things: Cyber manufacturing Systems" by	v Sabina Jeschk	e, Christian
1.	Brecher, Houbing Song, Danda B. Rawat (Springer), 2017		
2.	Industry 4.0: The Industrial Internet of Things", by Alasdair Gilc	hrist (Apress),	2017
Reference			
1.	Hands-On Industrial Internet of Things: Create a powerful Indust	trial IoT by Gia	como Veneri,
1.	Antonio Capasso, Packt, 2018.		
2.	The Internet of Things: Key Applications and Protocols, Olivi	er Hersent, Da	vid Boswarthick,
2.	Omar Elloumi,2ndEdition, Willy Publications 2017		
E-Resourc	es		
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	https://download.e-bookshelf.de/download/0007/6832/86/L-G-0007	085280-001475	1014.pdf

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Programme	B.E.		Pro	gramm	e Code	103	Regulation	20	19
Department	ELECTRONIC ENGINEERING	S AND COMMUNI( G	CATIO	N		S	Semester		
Course Code	Cours	se Name		ls Per		Credit		ım Mark	
	Court	je i valle	L	Т	Р	С	CA	ESE	Total
U19ECV76	Digital Video Pr	ocessing ve of the course is to	3	0	0	3	40	60	100
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		course, the student sh			-	1 . 1	<u> </u>	level	leuge
		te the difference betw al videos are acquired magery.						ŀ	K2
Course Outcome	and compensation		•					ŀ	K3
		o processing techniq in order to perform h				ent, segn	nentation for	ŀ	K3
	CO4: Learn fund	amentals of video co	mpressi	on tecl	nniques	and their	applications	ŀ	Κ4
		well as apply these to propose solutions for			olve rea	ıl-world v	rideo	ŀ	K3
Pre-requisites	-								

	(3/2/1	indicat	tes strei			<b>O Map</b> tion) 3-		, 2 – M	edium,	1 - W	eak		CO/PS	O Mapp	oing
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CO3	2		3	3									3	3	
CO4	2							2					2	2	
CO5	3	2	2									2	2		

### Direct

- 4. Continuous Assessment Test I, II & III
- 5. Assignment: Simulation using tool
- 6. End-Semester examinations

Indirect

2. Course - end survey

# Content of the syllabus



U	Unit – I DIGITAL VIDEO FORMATION	Periods	9	
	duction to digital video and digital video			nalog
	us Digital, Analog to Digital, Digital Video Standards- Video a			
	ors, Video sampling and interpolation- Interlaced and Progres		ng- Video	fil
	ats- Storage devices, NVR, DVR- Different types of Video Cameras, IP Camera Jnit - II MOTION ANALYSIS	Periods	9	
	on Detection – Hypothesis testing with Fixed/Adaptive thresholding Motion Est			hes-
	k matching approaches- Motion compensation for videos		used upproue	105
U	nit – III VIDEO ENHANCEMENT:	Periods	8	
	o artifacts – Spatio-temporal noise filtering- Order statistics filtering, Blotch det			
-	Unit - IV   GUARANTEED SERVICE MODEL	Periods	9	
	e change detection- Motion segmentation- Video shot boundary detection-	· Motion track	ang-contour l	base
	ting-Feature based trackingJnit - VVIDEO COMPRESSION TECHNIQUES:	Periods	10	
	· · ·			1.00
	frame coding-MPEG-1,MPEG-2 and MPEG-4video compression standards – H.264	Low bit rate a	approaches- F	1.20
		Total Period	ds 45	
Text	Books	1000110110		
1.	Yao.Wang, Jom Ostermann, & Ya-Oin Zhang, "Video Processing & Commun (ISBN 0-13-017547-1)	nications", Pren	ntice Hall, 200	2.
2.	A. Murat Tekalp, "Digital Video Processing, Pearson Education", Prentice Ha (ISBN-10: 0-13-399100-8)	all, 2015.		
	A. Murat Tekalp, "Digital Video Processing, Pearson Education", Prentice Ha (ISBN-10: 0-13-399100-8) prences	ıll, 2015.		
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Former Signature of BOS Chairman ECE

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	Markov Models: Markov Processes, HMMs – Evaluation, Optimal	1	-
	Baum-Welch Parameter Re-estimation, Implementation issues.	i State Sequence	e = v herbr
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speech units; A	ocabulary Continuous Speech Recognition: Architecture of a la recognition system – acoustics and language models – n-grams, pplications and present status.	-	
Unit – V	7 SPEECH SYNTHESIS	Periods	9
Text-to-	Speech Synthesis: Concatenative and waveform synthesis methods	s, sub-word uni	its for TTS,
Intelligi	bility and naturalness - role of prosody, Applications and present s		
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Text Book	S I		
1.	Thomas F Quatieri, "Discrete-Time Speech Signal Pro Practice", Pearson Education, 2012.	ocessing – 1	Principles and
2.	L.R.Rabiner, R.W.Schafer, "Digital Processing Of Speech Sign Edition, 2009.	als", Pearson E	Education 4 <sup>th</sup>
3.	Lawrence Rabiner and Biing-Hwang Juang, "Fundamentals of S Education, 2003.	Speech Recogn	iition", Pearson
Reference	S		
1.	Steven W. Smith, "The Scientist and Engineer's Guide to Digita California Technical Publishing, 1997.	al Signal Proce	essing",
2.	Daniel Jurafsky and James H Martin, "Speech and Language Pr Natural Language Processing, Computational Linguistics, and S Education, 2002.	e	
3.	Frederick Jelinek, "Statistical Methods of Speech Recognition".	, MIT Press, 19	997.
4.	Claudio Becchetti and Lucio Prina Ricotti, "Speech Recognition 1999.	•	
5.	Ben Gold and Nelson Morgan, "Speech and Audio Signal Proce Perception of Speech and Music", Wiley- India Edition, 2006.	essing, Process	ing and
E-Resourc	es		
1.	https://research.iaun.ac.ir/pd/mahmoodian/pdfs/UploadFile_2643	3.pdf	
2.	http://mu.ac.in/wp-content/uploads/2014/04/SPEECH-RECOGN	ITION.pdf	
3.	https://doc.lagout.org/science/0_Computer%20Science/9_Others		Signal%20Proces

Former Signature of BOS Chairman ECE

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	<b>CO1:</b> Ret their function	call the structure of c	ell, physiolo	ogy of dif	ferent b	viological	systems and		K2
Course Outcome	CO2: II	lustrate the types of e	electrodes ar	id measur	ements	of biolo	gical		K3
	CO3: Expination Exponential CO3: Expination Expine CO3: Expine CO3	plain the working of systems.	diagnostic ii	nstrument	s, thera	apeutic in	struments and		K4
	CO4: An	alyze the different m	ethods of m	easureme	nts of b	oiological	parameters.		K3
		mpare the different to	echniques of	measure	ment.				K4

	(3/2	2/1 indic	cates str	ength of	CO / PO	tion) $\overline{3}$ -	Strong, 2		lium, 1 -	Weak			CO/I Map	ping	
COs					Program	nme Out	comes (	POs)					PSOs	5	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	2	2									2	2		
CO2	2	3	2	2									2	2	
CO3	2		3	3									3	3	
CO4	2							2					2	2	
CO5	3	2	2									2	2		

Direct

- 1. Continuous Assessment Test I, II & III
- 2. Assignment: Simulation using tool
- **3.** End-Semester examinations

Indirect

3. Course - end survey

Unit – I	ELECTRO PHYSIOLOGY	Periods	8
	Structure - Electrical, Mechanical and Chemical Activities - Action ar		,
	em - CNS - PNS - Neurons - Axons- Synapse - Propagation of Electric	e e	e
•	o Pulmonary System- Physiology of Heart, Lung, Kidney.	eur impuises e	along the riter to board
Unit - II	BIO POTENTIAL ELECTRODES AND TRANSDUCERS	Periods	8
Design-of Me	dical Instruments - Components of Biomedical Instrument-System - El	ectrodes: Mici	ro Electrodes, Needle
e e	urface Electrodes -Instrumentation amplifier - Biomedical Measurement		
Isolation Amp	blifier, Preamplifier, Current Amplifier, Chopper Amplifier.		
Unit – III	INSTRUMENTS USED FOR DIAGNOSIS	Periods	10
ECG, Einthov	ren Triangle, Leads, Electrodes, Vector Cardiograph, Measurement of C	Cardiac Output	t, EEG, EMG,
Plethysmogra	phy, Blood Flow Measurements, Holter Monitor- Respiratory Rate Mea	asurement - O	ximeter, Bone Density
Measurement	, Patient Monitoring System, ICCU.		
Unit - IV	MODERN IMAGING SYSTEM	Periods	10
Ultrasonic D	Diagnosis, Ultrasonic Scanning, Isotopes in Medical Diagnosis- Pa	ace Makers,	Defibrillators, Dopple
Monitor(colou	ır), Medical imaging-X-ray generation, DXA, Radiographic &	Fluoroscopic	Techniques - Imag
	omputer Aided Tomography, PET, SPECT- Laser Applications-Echoc	-	
	omputer Anded Tomography, TET, STEET Easer Applications Lenoe	alulography-C	21 Dean Quantative an
	MRI/ NMR-Endoscopy.	ardiography-C	
		Periods	9
Quantitative-M Unit – V	MRI/ NMR-Endoscopy.	Periods	9
Quantitative-M Unit – V Dialysers -	MRI/ NMR-Endoscopy.           RECENT TRENDS AND INSTRUMENTS FOR THERAPY	Periods ources of Elec	9 etric Hazards and Safet
Quantitative-M Unit – V Dialysers - Techniques.	MRI/ NMR-Endoscopy.           RECENT TRENDS AND INSTRUMENTS FOR THERAPY           • Surgical Diathermy - Electro Anaesthetic and Surgical Techniques. Surgical Diathermy - Electro Anaesthetic and Surgical Techniques.	Periods ources of Elec	9 etric Hazards and Safet
Quantitative-M Unit – V Dialysers - Techniques.	MRI/ NMR-Endoscopy. RECENT TRENDS AND INSTRUMENTS FOR THERAPY Surgical Diathermy - Electro Anaesthetic and Surgical Techniques. So Single Channel Telemetry, Multi channel Telemetry, Implantab , Telemedicine Applications.	Periods ources of Elec	9 etric Hazards and Safet
Quantitative-M Unit – V Dialysers - Techniques.	MRI/ NMR-Endoscopy. RECENT TRENDS AND INSTRUMENTS FOR THERAPY Surgical Diathermy - Electro Anaesthetic and Surgical Techniques. So Single Channel Telemetry, Multi channel Telemetry, Implantab , Telemedicine Applications.	Periods ources of Elec le Telemetry	<b>9</b> etric Hazards and Safet , Wireless Telemetry
Quantitative-M Unit – V Dialysers - Techniques. Telemedicine. Text Books	MRI/ NMR-Endoscopy. RECENT TRENDS AND INSTRUMENTS FOR THERAPY Surgical Diathermy - Electro Anaesthetic and Surgical Techniques. So Single Channel Telemetry, Multi channel Telemetry, Implantab , Telemedicine Applications.	Periods ources of Elec le Telemetry <b>Fotal Periods</b>	9 etric Hazards and Safet , Wireless Telemetry 45
Quantitative-N Unit – V Dialysers - Techniques. Telemedicine, Text Books 1. K	MRI/ NMR-Endoscopy. RECENT TRENDS AND INSTRUMENTS FOR THERAPY Surgical Diathermy - Electro Anaesthetic and Surgical Techniques. So Single Channel Telemetry, Multi channel Telemetry, Implantab , Telemedicine Applications.	Periods ources of Elec le Telemetry Fotal Periods	9 etric Hazards and Safet , Wireless Telemetry 45
Quantitative-M Unit – V Dialysers - Techniques. Telemedicine, Text Books 1. K 2. A	MRI/ NMR-Endoscopy.           RECENT TRENDS AND INSTRUMENTS FOR THERAPY           Surgical Diathermy - Electro Anaesthetic and Surgical Techniques. So           Single Channel Telemetry, Multi channel Telemetry, Implantab           Telemedicine Applications.           Table           handpur, "Handbook of Biomedical Instrumentation" 2nd Edition, Tata	Periods ources of Elec le Telemetry Fotal Periods	9 etric Hazards and Safet , Wireless Telemetry 45
Quantitative-M Unit – V Dialysers - Techniques. Telemedicine. Text Books 1. K 2. A References	MRI/ NMR-Endoscopy.           RECENT TRENDS AND INSTRUMENTS FOR THERAPY           Surgical Diathermy - Electro Anaesthetic and Surgical Techniques. So           Single Channel Telemetry, Multi channel Telemetry, Implantab           Telemedicine Applications.           Table           handpur, "Handbook of Biomedical Instrumentation" 2nd Edition, Tata	Periods ources of Elec le Telemetry Fotal Periods McGraw Hil Reprint 2009.	9 etric Hazards and Safet , Wireless Telemetry 45 1, 2003.
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Quantitative-N         Unit – V         Dialysers -         Techniques.         Telemedicine.         Text Books         1.       K         2.       A         References       1.         1.       L         2.       Jo         3.       Jo         4.       To         5.       G	MRI/ NMR-Endoscopy.           RECENT TRENDS AND INSTRUMENTS FOR THERAPY           Surgical Diathermy - Electro Anaesthetic and Surgical Techniques. Sergical Channel Telemetry, Multi channel Telemetry, Implantab, Telemedicine Applications.           T           handpur, "Handbook of Biomedical Instrumentation" 2nd Edition, Tata           rumugam M., "Biomedical Instrumentation", Anuradha Publications, R           eslie Cromwell, —Biomedical Instrumentation and Measurementl, Prentohn G.Webster, —Medical Instrumentation Application and Designl, 3r           oseph J.Carr and John M.Brown, —Introduction to Biomedical Equipmons, New York, 2004.           ompkins W.J. and Webster J.G., "Design of Microcomputer Based Measurements"	Periods ources of Elec le Telemetry Fotal Periods a McGraw Hill Reprint 2009. Intice Hall of In rd Edition, Will ent Technolog	9 etric Hazards and Safet , Wireless Telemetry 45 1, 2003. ndia, New Delhi, 2007. ley India Edition, 2007 gyl, John Wiley and entation", Prentice Hal
Quantitative-N Unit – V Dialysers - Techniques. Telemedicine. Text Books 1. K 2. A References 1. L 2. Jo 3. Jo 4. To 5. G E-Resources	MRI/ NMR-Endoscopy.           RECENT TRENDS AND INSTRUMENTS FOR THERAPY           Surgical Diathermy - Electro Anaesthetic and Surgical Techniques. Sergical Channel Telemetry, Multi channel Telemetry, Implantab, Telemedicine Applications.           T           handpur, "Handbook of Biomedical Instrumentation" 2nd Edition, Tata           rumugam M., "Biomedical Instrumentation", Anuradha Publications, R           eslie Cromwell, —Biomedical Instrumentation and Measurementl, Prentohn G.Webster, —Medical Instrumentation Application and Designl, 3r           oseph J.Carr and John M.Brown, —Introduction to Biomedical Equipmons, New York, 2004.           ompkins W.J. and Webster J.G., "Design of Microcomputer Based Measurements"	Periods ources of Elec le Telemetry Fotal Periods A McGraw Hil Reprint 2009. Intice Hall of In rd Edition, Wil ent Technolog edical Instrume ntation" 3rd E	9 etric Hazards and Safet , Wireless Telemetry 45 1, 2003. ndia, New Delhi, 2007. ley India Edition, 2007 gyl, John Wiley and entation", Prentice Hal Edition, Wiley, 1989.
Quantitative-N         Unit – V         Dialysers -         Techniques.         Telemedicine.         Text Books         1.       K         2.       A         References       1.         1.       L         2.       Jo         3.       Jo         5.       G         E-Resources       1.         1.       h	MRI/ NMR-Endoscopy.           RECENT TRENDS AND INSTRUMENTS FOR THERAPY           • Surgical Diathermy - Electro Anaesthetic and Surgical Techniques. So Single Channel Telemetry, Multi channel Telemetry, Implantab, Telemedicine Applications.           • Telemedicine Applications.           • handpur, "Handbook of Biomedical Instrumentation" 2nd Edition, Tata rumugam M., "Biomedical Instrumentation", Anuradha Publications, Reslie Cromwell, —Biomedical Instrumentation and Measurement, Prerohn G.Webster, —Medical Instrumentation Application and Design, 3r oseph J.Carr and John M.Brown, —Introduction to Biomedical Equipmons, New York, 2004.           • ompkins W.J. and Webster J.G., "Design of Microcomputer Based Measurements", Prerior of Applied Biomedical Instrumentation	Periods ources of Elec le Telemetry Fotal Periods A McGraw Hil Reprint 2009. Intice Hall of In rd Edition, Wil ent Technolog edical Instrume ntation" 3rd E	9 ctric Hazards and Safet , Wireless Telemetry 45 1, 2003. ndia, New Delhi, 2007. ley India Edition, 2007 gyl, John Wiley and entation", Prentice Hal Edition, Wiley, 1989.
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Former Signature of BOS Chairman ECE

		/IVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN       (Autonomous Institution, Affiliated to Anna University, Chennai)         Elayampalayam, Tiruchengode – 637 205         B.E.       Programme Code       103       Regulation											
Programme	B.E.		2019										
Department	ELECTRONICS AND COMMUNICATION								V				
Course Code	C	ourse Name	Periods	Per V	Veek	Credit	Max	kimum M	larks				
Course Coue	C	ourse manie	L	Т	Р	С	CA	ESE	Total				
U19ECOE3	Automot	ive Electronics	OE	3	0	0	40	60	100				
Course Objective	De     Ur     Ur     At the end	splain the characterist evelop the concepts of iderstand the basic kn iderstand the fundamentals	of automoti nowledge c entals of an ident shoul	ve ac of elec utomo ld be	tuators etronics otive ne able to,	in mode in vehic tworking	rn vehicles ular architectu g in new gener	ation vel	owledge				
Course Outcome	CO2: Ana	lyze the functionaliti	es of autor	notiv	e senso	rs.			K3				
	CO3: Ana	lyze the concepts of	automotive	e actu	ators in	n modern	vehicles.		K3				
	CO4: App	bly the basic knowled	ge of elect	ronic	s in veh	nicular ar	chitecture.		K2				
	<b>CO5:</b> Ass automotive	es the most suitable n e systems.	etworking	topo	logies f	for a new	generation		K4				
Pre- requisites	-							•					

COs	(3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak												Map	CO/PSO Mapping PSOs		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	
CO1	3	2	2									2	2			
CO2	2	3	2	2									2	2		
CO3	2		3	3									3	3		
CO4	2							2					2	2		
CO5	3	2	2									2	2			

## Direct

- 4. Continuous Assessment Test I, II & III
- Assignment: Simulation using tool
   End-Semester examinations

## Indirect

4. Course - end survey

# Content of the syllabus



Unit – I		Periods	8
	s Fundamentals: Semiconductor Devices, Transistors-FET, Digita		
•	cuits (Combinatorial), Sensor types: Engine-speed sensors, Hall	•	
	on control, High-pressure sensors, Temperature sensors, Accele	erator-pedal se	ensors, Steering-angle
sensors.			10
Unit - I		Periods	10
	Vehicle system architecture, Electronic control unit: Operating c		
÷	dules in the control unit. Basic principles of networking: Network t		
	model, Control mechanisms. Automotive networking: Cross-syste		Requirements for bus
	Stassification of bus systems, Applications in the vehicle, coupling of ELECTRONIC TRANSMISSION CONTROL		
Unit – Il		Periods	9
Antilock E	Braking System (ABS): System overview, Requirements placed on	ABS, Dynami	ics of a braked wheel,
ABS contr	ol loop, Typical control cycles. Traction Control System (TCS): T	asks, Function	description, Structure
of traction	control system (TCS), Typical control situations, Electronic Stab	ility Program	(ESP): Requirements,
	method of operation.	1	
Unit - I	<b>V</b> AUTOMOTIVE INSTRUMENTATION	Periods	9
	e Diesel Control (EDC): System overview, Common-rail system f	· ·	,
	ntrolled EDC systems, Data exchange with other systems, Seria		
	Vehicle security systems: Acoustic signaling devices, Central	locking system	m, Locking systems,
Biometric			
Unit – V		Periods	9
	ns: CAN Bus, High/Low speed CAN, network nodes, Topology,		
-	ansmission agent and bus coupling, Bluetooth: overview, app		smission technology,
frequency	hopping method, modulation method, piconet, scatternet, Bluetooth		
		<b>Total Periods</b>	45
Text Book	-		
3.	Konrad Reif -Automotive Mechatronics_ Automotive Networking		ility Systems,
	Electronics- Springer Vieweg © Springer Fachmedien Wiesbader		
4.	Najamuz Zaman (auth.)-Automotive Electronics Design Fundame	ntals-Springer	International
Defenence	Publishing (2015).		
Reference	s Robert Bosch GmbH, Bosch Automotive Electrics and Automotiv	a Flootropica	Systems and
6.	Components, Networking and Hybrid Drive-Springer Vieweg (20		systems and
7		,	(1000)
7.	William Ribbens-Understanding Automotive Electronics, Fifth Ed	lition-Newnes	(1998)
8.	W.H.Crouse ,Automobile Electrical Equipment, McGraw-Hill, 19	96.	
9.	P.L.Kholi, Automotive Electrical Equipment, Tata McGraw-Hill,	1995.	
10.	BOSCH Automotive Handbook", Robert Bosche, 2011		
E-Resourc	es		
4.	https://download.e-bookshelf.de/download/0003/9285/11/L-G-00039	28511-0013264	4716.pdf
5.	http://www.engineering108.com/Data/Engineering/Automobile/Unde Electronics.pdf	erstanding-Auto	omotive-

Former Signature of BOS Chairman ECE

	VIVEKANA		ISO 9001:2015						
	(Autono	mous Institution, A Elayampalaya				•	Chennai)	TÜVRM	FIED IN 910546705
Programme	B.E.		2019						
Department		NICS AND COM		-	ne Code	103	Regulation Semester		VI
Course Code	Cour	aximum N	Marks						
Course Code	Cou	rse Name	L	Т	Р	С	CA	ESE	Total
U19ECOE4	Satellite Cor	nmunication	3	0	0	3	40	60	100
Course Objective	<ul> <li>Introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, nationa policies with a futuristic vision along with socio-economic impact and issue</li> <li>Enable the student to understand the necessity for satellite based communicate essential elements involved and the transmission methodologies.</li> <li>Enable the student to understand the different interferences and attenuation mathematications to the advances in satellite based navigation, GPS and the application scenarios.</li> </ul>								
Objective	<ul> <li>Ena affe</li> <li>Exp app</li> <li>Stu</li> </ul>	ble the student to use the student to use the satellite loose the student to lication scenarios.	understa ink desi the adva ations c	and the gn ances i of satel	differen n satelli lite com	nt interfe te based municat	erences and attended and attended and attended a		e different
Objective	<ul> <li>Ena affe</li> <li>Exp app</li> <li>Stu</li> <li>At the end of</li> <li>CO1: Demonstration the concepts</li> </ul>	ble the student to use the student to use the student to lication scenarios. ady different applic the course, the student the basic prused in a Satellite	indersta ink desi the adva ations c dent sho inciple o Commu	nd the gn ances i of satel ould be of satel nicatio	differen n satelli <u>lite com</u> e able to llite con on syste	nt interfe te based <u>municat</u> , nmunica m.	erences and attend attend attended and attended attende	PS and th	e different Knowledge Level K5
Course Outcomes	<ul> <li>Ena affe</li> <li>Exp app</li> <li>Stu</li> <li>At the end of</li> <li>CO1: Demonthe concepts</li> <li>CO2: Enumed downlink system</li> <li>CO3: Classi</li> </ul>	ble the student to use the student to use the student to lication scenarios. Indy different application scenarios, the course, the student to state the basic provides the segment of the	indersta ink desi the adva ations o dent sho inciple o <u>Commu</u> f satelli	nd the gn ances i of satel ould be of satel nicatic te and	differen n satelli <u>lite com</u> e able to llite con on syste analyze	nt interfe te based municat o, nmunica m. the para	erences and attend attended and attended attende	PS and th	e different Knowledge Level
Course	<ul> <li>Ena affe</li> <li>Exp app</li> <li>Stu</li> <li>At the end of</li> <li>CO1: Demon the concepts</li> <li>CO2: Enume downlink sys</li> <li>CO3: Classi communicati</li> <li>CO4: Under knowledge at</li> </ul>	ble the student to use the student to the set of the student to a lication scenarios. ady different application application scenarios and the aspects by the student to a stellite of the course, the student application app	indersta ink desi the adva ations c dent sho inciple o Commu f satelli fferent a	nd the gn ances i of satel ould be of satel nicatio te and access	differen n satelli <u>lite com</u> e able to <u>llite con</u> on syste analyze techniqu e links a	nt interfe te based municat y nmunica m. the para ues in fre nd Earth	erences and attention and under tion and under tion and under tion expace a space a Station and C	PS and th stand nk and	knowledge Level K5 K3
Course	<ul> <li>Ena affe</li> <li>Exp app</li> <li>Stu</li> <li>At the end of</li> <li>CO1: Demon the concepts</li> <li>CO2: Enume downlink sys</li> <li>CO3: Classi communicati</li> <li>CO4: Under knowledge ai communicati</li> </ul>	ble the student to use the student to use the student to a lication scenarios. Indy different applic the course, the student to a lication scenarios. Indy different applic the course, the student applic the course, the student applic the course of the course of the course of the segment of the course of the course of the course of the course of the segment of th	indersta ink desi the adva ations c dent she inciple o Commu of satelli fferent a pehind S and und	nd the gn ances i of satel ould be of satel nication te and access datellite	differen n satelli <u>lite com</u> e able to llite con on syste analyze techniqu e links a 1 the net	nt interfe te based municat , nmunica m. the para ues in fre nd Earth working	erences and attention and under the space of	PS and th stand nk and	k different Knowledge Level K5 K3 K4

	(3/2)	/1 indic	ates stre		CO / PO correlat			2 – Med	lium, 1	- Weal	ς.		CO/I Map		
COs					Program	nme Out	comes (	(POs)	,				PSOs		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	3	3	2							2			3		2
CO 2	3	3	2	2			2						3		
CO 3	3	3	2	2						2			3	2	
CO 4	3	2	2	2			2							2	
CO 5	3	2	2											2	1
ourse Ass	essmen	t Meth	ods												

Direct

1.Continuous Assessment Test I, II & III

2.Assignment

3.End-Semester examinations

Indirect



1. Co	ourse - end survey		
Contont of	the syllabus		
Unit – I		Periods	9
Kepler's The geo s	Laws, orbital elements, orbital perturbations, station keeping,–apoge tationary orbits- Look Angle Determination- Limits of visibility –ec it outage-Launching orbits	ee and perigee	e heights, inclined orbits.
Unit – I	I SPACE SEGMENT AND SATELLITE LINK DESIGN	Periods	9
subsysten Transmis	on-Power supply, Attitude and Orbit control, Thermal control and ns. Telemetry, Tracking and command. Satellite uplink and do sion Losses, link power budget equation, System noise, C/N calculat	ownlink Ana	
Unit – II	on and interference, inter-satellite links. I SATELLITE ACCESS	Periods	9
downlin downlin TDMA, spreadin <b>Unit – I</b> Earth St network	tion, single access, preassigned FDMA, demand assigned FD k analysis, TDMA-basic equipment in TDMA system, preassigned k analysis for digital transmission, comparison of uplink power satellite-switched TDMA.CDMA-DSS, code signal ,acquisiti g and dispreading, CDMA throughput. <b>EARTH SEGMENT AND SATELLITE IN NETWORKS</b> ation- Introduction, TVRO, MATV, CATV, Transmit and Recei s-introduction, bandwidth, asynchronous transfer mode, ATM over hancing TCP over satellite channels using standard mechanism, rec	and demand a requirements ion and trac Periods ve earth stati er satellite, sa	ssigned TDMA, for FDMA and cking, spectrum 9 ons. Satellite in atellite links and
connecti Unit – V	ons.	Periods	9
correction	lers capacity, bit rates for digital television, MPEG compressi n, the home indoor and outdoor unit, downlink analysis, HDTV, mobile services, INTELSAT Series, INSAT, VSAT, Radarsat, Gl	Video freque	ency bandwidth,
satemics.	T	otal Periods	45
Text Book			1
1.	Dennis Roddy, "Satellite Communication", McGraw Hill Interna	tional, 4 <sup>th</sup> Edi	ition, 2010.
2.	Timothy Pratt, Charles W. Bostian, "Satellite Communications", 2009.	John Wiley &	& Sons, 2 <sup>nd</sup> Edition,
Reference	S		
1.	Wilbur L. Pritchard, Hendri G. Suyderhoud, Robert A. Nelson, 'S Engineering', Prentice Hall/Pearson, 3 <sup>rd</sup> Edition, 2007.	Satellite Com	munication Systems
2.	N. Agarwal, "Design of Geosynchronous Space Craft", Prentice		
3.	Bruce R. Elbert, "The Satellite Communication Applications", H London, 1997.		
4.	M. O. Kolawole, "Satellite Communication Engineering", Marce	el Dekker, Inc	. NY,2 <sup>nd</sup> Edition ,2013.
5.	M. Richharia, "Satellite Systems for Personal Applications", John	n Wiley, 2010	).
E-Resourc	es		
1.	https://www.srecwarangal.ac.in/ec downloads/IV_II%20satellite_communications_by_dennis_roddy4		
2.	https://www.scribd.com/doc/105119756/Solutions-Manual-for-Satedition-Timothy-Pratt-Charles-Bostian-Jeremy-Allnutt	tellite-Comm	unications-Second-
3.	https://www.gettextbooks.com/author/M_Richharia		

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Programme	B.E.	2019								
Department	ELECTRO ENGINEE	VI								
Course Code	Co	num Mar ESE	ks Total							
U19ECOE5	VLSI Des Applicati	sign and its ons	OE	3	0	0	40	60	100	
Course Objective	al • E • I in • 1 • <i>A</i> s	Design DSP archited gorithm. nable students to de Learn high-level alg mplementation and Equip students to de Address issues relate tyles.	esign VI orithms power o esign VI ed to hiş	LSI sys that re consum LSI sys gh perf	etems w educe th option. stems w	ith high e numbe ith low J e VLSI a	speed. er of multipliers power.	s, area of 1ch as pip	pelining	
	CO1: Deve	of the course, the steelop efficient DSP are erstand the data pat	algorith	ns suit	able for	· VLSI iı	•	s. K	nowledge evel 3 2	
Course Outcomes		relop scheduling an			•		<b>^</b>	K	.3	
		ign the digital syste	-			_	_		[3 [5	
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	PO 1														
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CO 3	3	3	2	2				2					3	2	
CO 4	3	2	2	2									3	2	
CO 5	3	2	2										3		2
Course A	Assessn	nent M	ethods												
Direct															

1.Cor	ntinuous Assessment Test I, II & III		
2.Ass	ignment		
	I-Semester examinations		
Indirect			
1. Course	e - end survey		
1. 6000050			
Content of	the syllabus		
Unit –	I APPLICATION SPECIFIC ARCHITECTURE	Periods	9
Applicati	on specific architectures for DSP applications; Systolic arrays (a	utomated mappin	g procedures);
DSP proc	essors; Multi-core architectures.		
Unit – I	II DATA PATH DESIGN AND OPTIMIZATION	Periods	9
A brief re	eview of data path components (fast adders and multipliers); pipe	elining and parall	lel processing of
digital filt	ters (non-recursive and recursive).		
Unit – I	II HIGH LEVEL SYNTHESIS	Periods	9
Schedul	ing and allocation algorithms (list-based and force-directed sched	luling, ILP).	
Unit – I	V LOW POWER DESIGN OF DIGITAL SYSTEMS	Periods	9
Optimiz	ations at the system-level, algorithm level and architecture level;	case studies.	
Unit – Y	V MEMORY DESIGN TECHNIQUES	Periods	9
Memory	design for embedded systems, design issues for battery powered	l systems, reliabl	e computing,
Network	k-on-Chip architectures, 3D architectures.		
		<b>Total Periods</b>	45
Text Book	ís l		
1.	Vijay K. Madisetti, "VLSI Digital Signal Processors: An Intro and Design Synthesis", IEEE Press. 1995. (Reprint 2012).	duction to Rapid	Proto- typing
2.	S. Y. Kung, "VLSI Array Processors", Prentice Hall. 1988.		
Reference			
1.	K. K. Parhi, "VLSI Digital Signal Processing Systems. Design 2014	n and Implementa	ation", Wiley.
2.	A. Raghunathan, N. K. Jha and S. Dey, "High-Level Power A Academic Publishers, 1988(Reprint 2012).	nalysis and Optin	mization", Kluwer
3.	Y. Tsividis, "Mixed Analog Digital VLSI Devices and Technology Scientific", New Jersey, 2002	ology (An introdu	uction), World
4.	Lars Wanhammer, DSP Integrated Circuits, 1999 Academic p	ress. New York	
5.	Gary Yeap, Practical Low Power Digital VLSI Design, Kluwe		
E-Resourc		,	
1.	https://www.worldcat.org/title/vlsi-array-processors/oclc/1640	5063	
2.	http://www.gbv.de/dms/ilmenau/toc/249310074.PDF	-	
3.	https://www.worldcat.org/title/practical-low-power-digital-vlsi design/oclc/807875581?referer=di&ht=edition	-	

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Course	Code		Cou	rse Na	me		Periods	Fer V	Veek P	C	redit C		Ma CA	ximun	n Mark SE	
U19EC	COE6	Digi	tal Ima	ige Pro	cessing		L 3	0	P 0		3	40			50	Total 100
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Indirec	t Course	- end s	urvey													27
					Signat	Z: ture o				CE						21

Unit –	I DIGITAL IMAGE FUNDAMENTALS	Periods	9
	of digital image processing systems, steps in image processing, E		al perception,
brightnes	s, contrast, hue, saturation, Mach band effect, image sampling and	quantization,	relationship
between	bixels, mathematical tools used in image processing. 2D sampling,	sampling theo	orem, aliasing
and Moir	e patterns.		
Unit – I	I IMAGE TRANSFORMS	Periods	9
2D transf	orms - DFT, DCT, DST, Walsh, Hadamard, Slant and Haar wavel	et transforms.	
Unit – I	II IMAGE ENHANCEMENT AND RESTORATION	Periods	9
Intensity	transformations, histogram processing, smoothing spatial filt	ers, sharpenin	g spatial filters.
Image r	estoration: Degradation/ restoration process, noise models, noise p	probability dist	ributions, spatial
filtering	mean filters, order statistics filters. Estimating the degradati	on function, l	nverse filtering,
Wiener	iltering, constrained least squares filtering.		
Unit – I	V IMAGE SEGMENTATION AND REPRESENT	Periods	9
Point, li	he and edge detection, edge linking and boundary detection, thresh	olding – globa	l, multiple and
	multivariable thresholding, region growing, region splitting and n	0000	
-	tation: Boundary following, chain codes, polygonal approximation	ns, signatures,	boundary
•	s and skeletons.	T	
Unit –	V IMAGE COMPRESSION	Periods	9
MPEG.		Total Periods	45
Text Book	s		1
1.	Rafael C. Gonzalez, Richard E. Woods, Steven L. Eddins, "Dig Prentice Hall, 3 <sup>rd</sup> Edition, 2008.	gital Image Pro	cessing", Pearson
2.	S. Annadurai and R. Shanmugalakshmi, "Fundamentals of Dig Education, 2007.	ital Image Proc	cessing", Pearson
Reference			
1.	Anil K- Jain- 'Fundamentals of Digital Image Processing'- Pea		Hall of India- 2012
2.	William K. Pratt, "Digital Image Processing", John Wiley, Nev		
3.	Digital Image Processing, S Jayaraman, S Esakkirajan T V 2010.	/eerakumar, N	Mc Graw-Hill,
4.	Digital Image Processing, K.William Pratt, John Wiley, 19	997.	
5.	Image Processing Theory, Algorithm and Architectures, N 1995.	M.A.Sid Ahm	ed,McGraw-Hill,
E-Resourc	es		
1.	http://web.ipac.caltech.edu/staff/fmasci/home/astro_refs/Digital_	_Image_Proces	sing_2ndEd.pdf
2.	https://www.cis.rit.edu/class/simg361/Notes_11222010.pdf		
3.	http://ultra.sdk.free.fr/docs/DxO/Fundamentals%20of%20Digita	1%20Image%2	0Processing.pdf
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	vaveforms – phase deviation and modulation index – free Frequency analysis of angle modulated waves – Band ves.		•
Unit – II	DIGITAL MODULATION TECHNIQUES	Periods	9
consideration	The term of te		
Unit – III	DATA COMMUNICATION	Periods	9
–Data Commu	ication: History of Data Communication – Standards Organi nication Circuits – Data Communication Codes – Error Detec cation Hardware – serial and parallel interfaces.		
Unit – IV	PULSE COMMUNICATION	Periods	9
	nication: Pulse Amplitude Modulation (PAM) – Pulse Time M CM) – Comparison of various Pulse Communication System		<i>,</i>
Unit – V	MULTI-USER RADIO COMMUNICATION	Periods	9
	ellite Communication – Bluetooth.	Fotal Periods	45
Text Books	Wayne Tomasi, "Advanced Electronic Communication Sy	vstems", Pearso	n Education, 6 <sup>th</sup>
2.	Edition 2009. Simon Haykin, "Communication Systems", John Wiley &	Sons 1 <sup>th</sup> Editio	an 2007
References	Sinon Haykin, Communication Systems , John Wiley &	50115, 4 Eurito	, 2007.
1.	Rappaport T.S, "Wireless Communications: Principles and Education, 2 <sup>nd</sup> Edition ,2010.	l Practice", Pea	rson
2.	Martin S.Roden, "Analog and Digital Communication Sys Edition ,2009.	tem", Prentice	Hall of India, 3 <sup>rd</sup>
3.	B.Sklar, "Digital Communication Fundamentals and Appl 2 <sup>nd</sup> Edition. Reprint2018.	ications", Pears	on Education,
3. E-Resources	B.Sklar, "Digital Communication Fundamentals and Appl 2 <sup>nd</sup> Edition, Reprint2018.	ications", Pears	on Education,
	2 <sup>nd</sup> Edition, Reprint2018. https://gradeup-question- images.grdp.co/liveData/f/2017/12/Advanced_Electronic_C 53501.pdf-86.pdf	Communication	s_Systems_01304
E-Resources	2 <sup>nd</sup> Edition, Reprint2018. https://gradeup-question- images.grdp.co/liveData/f/2017/12/Advanced_Electronic_C	Communication	s_Systems_01304

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	VI (Aut	TÜVRheinlin CERTIFIED									
Programme	B.E.		Pro	gramm	e Code	103	Regulation		2019		
Department		<b>TRONICS AND CO</b> EERING	MMUN	ICATI	ION		Semester		VII		
Course Code		Course Name	Perio	Periods Per W		Credit	Max	imum M	arks		
Course Code			L	Т	Р	С	CA	ESE	Total		
<b>U19ECOE8</b>	Wirele Netwo	ess Sensor rks	3	0	0	3	40	60	100		
Course Objective	<ul> <li>The main objective of the course is to</li> <li>Learn Sensor Network fundamentals.</li> <li>Understand the different routing protocols.</li> <li>Have an in-depth knowledge on sensor network architecture and design issues</li> <li>Understand the transport layer and security issues possible in Sensor networks</li> <li>Have an exposure to mote programming platforms and tools.</li> </ul>										
	At the e	Kno	Knowledge level								
		xplain the concepts, is sensor networks	network	archite	ectures a	and appli	cations of		K2		
Course Outcome		viscuss the Challeng AC, Routing, time						ls	K3		
	CO3: S	imulate sensor netwo	rk proto	cols in	the Tir	y OS en	vironment		K3		
	<b>CO4:</b> D	esign and implement	wireles	s senso	or netwo	orks.			K4		
	CO5: A areas.	1	K4								
Pre-requisites	-										

COs	CO / PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak COs Programme Outcomes (POs)												CO/PSO Mapping PSOs			
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	
CO1	3	2	2									2	2			
CO2	2	3	2	2									2	2		
CO3	2		3	3									3	3		
CO4	2							2					2	2		
CO5	3	2	2									2	2			

Direct

- 4. Continuous Assessment Test I, II & III
- 5. Assignment: Simulation using tool
- 6. End-Semester examinations

Indirect

2. Course - end survey

content of the	syllabus		
Unit – I	<b>OVERVIEW OF WIRELESS SENSOR NETWORKS</b>	Periods	9
The vision of	Ambient Intelligence – Application Examples – Types	of Applicatio	ons – Challenges for
	sor Networks - Comparison of Mobile ad hoc networks	and wireles	s sensor networks –
	hnologies for Wireless Sensor Networks.		
Unit - II	ARCHITECTURES	Periods	9
OperatingSys	Architecture – Hardware Components – Energy Co tems and Execution Environments – Network Architectu Goals and Figures of Merit – Gateway Concepts		
Unit – III	NETWORKING SENSORS	Periods	9
- Low Duty Wakeup Radi Routing Prote	er and Transceiver Design Considerations – MAC Protoco Cycle Protocols and Wakeup Concepts – S-MAC – The o Concepts – Address and Name Management – Ass pools – Energy – Efficient Routing, Geographic Routing.	he Mediation signment of	Device Protocol – MAC Addresses –
Unit - IV	INFRASTRUCTURE ESTABLISHMENT	Periods	9
	ntrol – Clustering – Time Synchronization – Localization		
Unit – V	SENSOR NETWORK PLATFORMS AND TOOLS	Periods	9
level Simulato	rs – State-centric programming.	Fotal Periods	45
Text Books			
	olger Karl, Andreas willig, —Protocol and Architecture for Willey publication,2015	ireless Sensor	NetworksI, John
2. F	iey publication,2015		
<i>μ</i> . Γ	eiHu ,Xiaojun Cao , "Wireless Sensor Networks , Principles a	nd Practice CR	C Press ,2010
References	eiHu ,Xiaojun Cao , "Wireless Sensor Networks , Principles an		
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References 1. Ka Pr	eiHu ,Xiaojun Cao , " Wireless Sensor Networks , Principles an Izem Sohraby, Daniel Minoli, & Taieb Znati, "Wireless Sensor	Networks-Te	chnology,
References1.Ka Pr2.Ian 3	eiHu ,Xiaojun Cao , "Wireless Sensor Networks , Principles an azem Sohraby, Daniel Minoli, & Taieb Znati, "Wireless Sensor otocols and Applications", John Wiley, 2015.	ohn Wiley &	chnology, Sons USA 2010.
References1.Ka Pr2.Ian3.Fe El $4$ W	ilu ,Xiaojun Cao , "Wireless Sensor Networks , Principles an azem Sohraby, Daniel Minoli, & Taieb Znati, "Wireless Sensor otocols and Applications", John Wiley, 2015. A Akyildiz , Mehmet Can Vuran "Wireless Sensor Networks" J ng Zhao, Leonidas Guibas, Wireless Sensor Networks: an info sevier publication, 2004. altenegusDargie, Christian Poellabauer ,"Fundamentals of Wir	Networks-Te ohn Wiley & rmation proces	chnology, Sons USA 2010. ssing approach,
References1.Ka Pr2.Ian3.Fe EI4.W Pr	eiHu ,Xiaojun Cao , "Wireless Sensor Networks , Principles an azem Sohraby, Daniel Minoli, & Taieb Znati, "Wireless Sensor otocols and Applications", John Wiley, 2015. A Akyildiz , Mehmet Can Vuran "Wireless Sensor Networks" J ng Zhao, Leonidas Guibas, Wireless Sensor Networks: an info sevier publication, 2004.	Networks-Te ohn Wiley & rmation proces	chnology, Sons USA 2010. ssing approach,
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U19EC	OE9		B Desig pricatio				3	0	0		3	40	)	6	0	100
Cour Objec		• • Anal	<ul> <li>Study of basics of PCBs and design of analog, digital, microwave circuits etc</li> <li>Study about layout design and planning, packaging and checking rules.</li> <li>Study about designing of special circuits such as fast pulse circuits, high frequency circuits, and power electronics circuits.</li> <li>Explicate about the aspects behind soldering, assembly and re-working techniques. nalyze quality, reliability and environmental concerns in PCB designing industry.</li> <li>t the end of the course, the student should be able to,</li> </ul>													
	CourseCO1: Relate the different concepts used in electronics system designK1CO2: Identify basic PCB design rules, layout and checklist parameters.K2CO3: Estimate the aspects behind PCB soldering and quality control.K5CO4: Determine every aspects of system design like soldering. Testing, control quality, safety aspects and re-working techniques.K3												3 2 5			
Pre-requ	isites			-	now the lse circu					10g, t	ingitui	, 1161	neque			
COs	(3/2/	1 indica	ates stre	ngth of	<b>CO / PO</b> correlation Programm	on) <b>3-8</b>	strong			m, 1 ·	- Wea	k		CO/PS Mapp PSOs		
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CO 2	3	3	2	2				2			2			3		2
CO 3 CO 4	3 3	3	2	2 2				2			2			-	2	
CO 4 CO 5	3	2 2	2 2	2				2			2			3	2	2
Course A	Assessm	ent M	ethods											-		
2.A 3.Er <b>Indirec</b> 1. (	ssignme nd-Sem t Course -	ent ester es - end su	xaminat urvey		, 11 & 111											
Content	of the s	yllabu	S													
Unit	- I		BASI	CS OF	PRINT	ED C	IRCU	IT B	OAR	DS		Per	riods		Ģ	)

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Circuit Boards Electronic Con	rinted circuit boards-Classification of Printed Circuit Boards- Challenges in Modern PCB Design and Manufacture-PCBs apponents-Variable Capacitors and Resistors –Linear Integrate we Mount Devices.	with Embedde	d Components-
Unit – II	LAYOUT PLANNING AND DESIGN	Periods	9
Reading drawing	ng and diagrams-General PCB Design Considerations-Mecha gn considerations, conductor patterns, component placement	anical Design (	Considerations-
cooling require	ments and packaging density, layout design ,layout design cl	hecklist.	
Unit – III	DESIGN CONSIDERATIONS FOR SPECIAL CIRCUITS	Periods	9
circuits, Desig	for Analog circuits, Design rules for Digital circuits, De gn rules for Fast pulse circuits, Design rules for PCBs for M lectronic circuits, High density interconnect structures,	icrowave circu	uits, Design rules
Unit – IV	SOLDERING, ASSEMBLY AND RE-WORKIN TECHNIQUE	Periods	9
assembly proc	roduction , theory, variables, materials, brazing. Soldering to cess, solder paste for SMDS, Mass soldering, quality control , re-work and repair of PCBs and repairing surface mounted	of solder joints	•
Unit – V	QUALITY, RELIABILITY AND ENVIRONMENT CONCERNS IN PCB INDUSTRY	AL Periods	9
Pollution cont	ance, testing of quality control, quality control methods, testi- trol in PCB industry, polluting agents, recovery techniques, r and toxic chemicals in PCB fabrications, lead free soldering.	-	• •
		Total Periods	45
Text Books			
1.	R.S.Khandpur, "Printed Circuit Boards", Tata Mcgraw-H limited, New Delhi, 1 <sup>st</sup> Edition ,2009.	ill publishing o	company
2.	Bosshart,W.C, "printed circuit boards", Tata Mcgraw- Hil NewDelhi,2014	ll publishing co	ompany limited,
References			
1.	Ross,M.W. and Leonida,G. "General Principles of Design World,2005.	-	
2.	Purdie. D,"Repairing/Modifing Surface Mount PCBs", El-		
3.	Jon Varteresian, "Fabricating Printed Circuit Boards", Else		
4.	Charles Hamilton, "A Guide to Printed Circuit Board Desi	•	Science, 2013.
5.	Winstanely, A., "The Soldering and Desoldering Guide".In www.epemag.wimborne.co.uk.	ternet Notes,	
E-Resources			
1.	https://books.google.co.in/books?id=cIwiBAAAQBAJ&pg hart,W.C,+%E2%80%9Cprinted+circuit+boards%E2%80% +Hill+publishing+company+limited,+New+Delhi,2014		
2.	https://www.google.co.in/books/edition/Printed_Circuit_Bogbpv=1&dq=R.S.Khandpur,+%E2%80%9C+Printed+Circu		
3.	http://bibliotecadigital.usbcali.edu.co/bitstream/10819/6149 _Ayala_2018.pdf	9/1/Tarjetas_Ci	ircuitos_Ruteadora

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Depa	rtment		RONICS AND COMMU EERING	JNICATI	ON			Se	mester				
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Course	Code		Course Manie	L	Т	Р	С	CA	A ESE Total				
U19MC	CSY3	NUME	NUMERICAL ABILITY         3         0         0         -         100								100		
Content o	of the sy	llabus											
Unit -	Unit – I NUMBER SYSTEM									ls	6		
Number F	Propertie	es – HCF	– LCM - Square root – Cu	be root –	Simpl	ificati	on – A	verages.					
Unit -	· II		DIRECT PROPOR	FIONAL	PRO	BLEN	1S		Period	ls	8		
Percentag	ge - Prof	it & Loss	Ratio & Proportions - I	Mixture &	z Alleg	gation	s - Prol	blem on A	ges				
Unit –	III		INDIRECT PROPOR	RTIONAI	TIONAL PROBLEMS						8		
Time & W	Vork – F	Pipes & C	Sisterns - Time, Speed & D	istance –	Boats	& Str	eams –	Races &	Games o	of Ski	lls		
Unit -	IV		BANKER'S	PROBL	EMS				Period	ls	4		
Simple In	terest –	Compour	nd Interest – Logarithms –	Partnersh	ip - D	iscour	nts.						
Unit –	- V		MISCELLANE	OUS PRO	OBLE	MS			Period	ls	4		
Mensurati	ion: Are	a & perir	neter – Volume & Surface	Area – G	eomet	ry-Tri	gonon	-					
								Tot	al Perio	ds	30		
Text Boo													
1.	Dinesh	Khattar-	The Pearson guide to Qua	ntitative A	Aptituc	le for	Comp	etitive Exa	minatio	ns 3 <sup>rd</sup>	edition.		
Reference	65												
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Programme	B.E./ B.Tech.	Pre	ogramme	Code	1	03	Reg	gulatio	on <b>2019</b>		
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Course Code	Course	e Name	Periods Per Week (				lit	Ma	aximum Marks		rks
Course Code	Course	Inallie	L	Т	Р	C	(	CA	ESE		Fotal
U19MCSY4	Verbal Ability		3	0	0	-		100	-	- 100	
Content of the sy	llabus										
Unit – I		TEN	ISES						Period	ls	6
	s of tenses and its										
	uture perfect, pres			t perfe	ect co	ntinuo	ous, fu	iture p	erfect	cont	inuous
with more examp	nples) - Direct and Indirect Speech – Voices.										
Unit - II		ARTI	CLES						Period	ls	6

**Purpose of Articles: Indefinite Article:** If you want to say about ANY item, you should use the articles A / An. A : A European, A One Eyed beggar, A University, A Useful Website. Name of professions, Expression of quantity, To make a Proper noun a Common noun, With certain numbers, used before the word 'Half' when it follows a whole number. **Exceptions: Choosing A or An** There are a few exceptions to the general rule of using a before words that start with consonants and an before words that begin with vowels. The first letter of the word honor, for example, is a consonant, but it's unpronounced. In spite of its spelling, the word honor begins with a vowel sound. Therefore, we use an. **Example.** 

#### The Definite Article:

Where to use the Definite Article -A specific item, a particular person or thing, Before superlative forms, Before double comparatives, Before musical instruments, Before rank or title, Before name of the political parties, armed forces, physical positions, Before a Proper noun when used as a Common noun, Before some adjectives to make them nouns, Before Ordinal numbers, Before the names of Oceans, Seas, Rivers, Canals, Deserts, Groups of Mountains and Groups of Islands, Before the names of the Things, which are unique in nature, Before the names of Planets and Satellites, Before Holy Books, Before the names of News Papers, Before the names of some countries, measuring expressions beginning with by. **Omission of articles**:

Before Plural countable noun, Before proper noun, Before languages, a single item of uncountable noun, Before name of the meals except adjective usage, Double expressions – with wife and fork, with hat and folk, from top to bottom, With the names of meals such as Breakfast, Before predicative nouns denoting a unique position, After type of / kind of / sort of / post of / title of / rank of / articles are not used. Ex. He is not that sort of man, Articles are not used with material nouns, After di-transitive verb articles should not be used except when it is used as mono transitive verb, Before the names of meals no article should be used in a general way except in particular causes.

## **Repetition of the articles**

1. When two or more adjectives qualify the same noun, the article is used before the first adjective only; but when they qualify different nouns, expressed or understood, the article is used before each adjective.

#### PREPOSITIONS

- a. Prepositions Of Time-On, In, At, Since, For, Ago, During, Before, After, Until, Till, To/Past, From/To, By
- b. Prepositions Of Place- In, At, On, Off, By, Beside, Under, Over, Below, Above, Up And Down, Ago
- c. Prepositions Of Directions/ Movements Across, Through, To, Into, Out Of, Onto, Towards, From
- d. Other Prepositions- Of, By , About, For, With
- e. Prepositions Usage with Its Context

Unit – III

### SENTENCE CORRECTION

Periods

## SENTENCE CORRECTION

a) In each of the following sentences, four options are given. You are required to identify the best



6

way of writing the sentence in the context of the correct usage of standard written English. While doing so, you have to ensure the message being conveyed remains the same in all the cases. b) For each of the following questions, a part or the whole of the original sentence has been underlined. You have to find the best way of writing the underlined part of the sentence. c) In the following questions, you have to identify the correct sentence/s. For each of the following questions, find the sentence/s that are correct. d) In each of the following questions, one or more of the sentences is/are incorrect. You have to identify the incorrect sentence/s. SENTENCE IMPROVEMENT a. Subject-Verb Agreement b. Parallelism c. Redundancy: The error of repeating the same thing. d. Modifier e. Comparisons RULE: (a) When comparative degree is used with than, make sure that we exclude the thing compared from the rest of class of things by using the f. Confusing words i) Few and Less ii) Few and A few iii) Little and A Little A little tact would have saved the situation(some tact). Lay and Lie Lay, laid Unit - IV SENTENCE COMPLETION Periods 6 SENTENCE COMPLETION: Purpose and usage of proper words. SPOTTING ERRORS: a. Errors on conjunctions b. Errors on 'if' clauses c. Errors on adverbs d. Errors on adjectives e. Errors on prepositions f. Errors on determiners g. Errors on verbs h. Errors on nouns i. Errors on modifiers j. Errors on degrees of comparison k. Errors on subject-verb agreement 1. Errors on infinitives m. Errors on pronouns n. Errors on tenses o. Redundancy errors p. Errors on articles Error on complex sentences q. Unit – V VOCABULARY Periods 6 Synonyms: Root Based Word, Suffix Based Word. Antonyms - Contextual Vocabulary - Verbal Analogy **Total Periods** 30 **Text Books** Objective General English by SP Bakshi – Arihant Publication 1. References 1. A modern Approach to verbal and non-verbal reasoning by R.S. Agarwal Word power made easy by Norman Lewis 2.



	(Autonomous	VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN (Autonomous Institution, Affiliated to Anna University ,Chennai) Elayampalayam, Tiruchengode – 637 205											
Programme	B.E./ B.Tech.	Pre	ogramme	Code	e 1	03	Re	egulatio	n	201	9		
Department	ELECTRONICS ENGINEERING	AND COMMU	NICATI	ON				Semeste	er				
Course Code	Course	Name	Periods L	Per V T	Veek P	Credi C	it	Ma CA	ximum ESE		ks otal		
U19MCTY5	Logical Reasonin	g	3	0	0	-		100	-	1	00		
Content of the sy	llabus												
Unit – I		VERBAL R	EASONI	NG					Period	ls	6		
Word coding ar Information Arra Choosing the A Classification(Ch Choosing the od Alpha-Numeric s	ing(Letter Coding, ad Numeral coding, ngement Coding), Analogues pair, C oosing the odd wo d number and odd sequence, Letter wo	g, Substitution ( Analogy (Direct hoosing the sir ords, Choosing th pair of numbers ord problems, Ru	Coding, t and Sin nilar wo ne odd p ), Alphab	Crypt nple A rd, 1 air of et Te	t codi Analog Numbe f word est(Ari	ng – gy, Cor er An ls, Cho rangem	cry mple alog oosi	pt addi eting th gy, Alp ng the accord	ition, s le Anal phabet odd le ling to	ubtra ogues Ana tter g dictio	action, s pair, logy), group, onary,		
given word, By u Unit - II	nscrambling words) SITTIN	) NG ARRANGEN	/IENT &	SEN	ISE TI	EST			Period	ls	6		
	ment (Arrangemer						ircle	e cuija					
Test (Number Te	Detection, Displacer est, Ranking Test, T Family Based proble	Time Sequence Te	est), Puzz	les (l	Based					on p	lacing		
											6		
the pattern, Misc no's, Based on a subtraction of sc Letter Series (Al (Jumbled up desc and Notations-	tter Series[(Numb cellaneous pattern o addition / subtractio juares of natural nu phabet Series, Cont criptions, Relation p Problem of solvir lusions), Logical on	of the series ( Bas on of prime num umbers, Based or inuous pattern of puzzles, Coded Re ng by substitution	sed on ad bers, Mu addition series)], elations), on, Inter	ditio ltiplio n / su <b>Inse</b> <b>Cloc</b> chang	n / sub cation Ibtract <b>rting t</b> <b>k and</b> ging s	otractic and D ion of the mis calend signs a	on o Divis cub ssin lar and	of conse sion, Ba bes of n <b>g chars</b> (Mather numbe	ecutive ased on atural a <b>acter</b> , <i>A</i> matical ers, De	odd / addi numb Age, I oper rivin	/ even ition / bers) , <b>Blood</b> rations g the		
Unit - IV	LOGIC	AL AND ANAL	YTICAI	RE	ASON	ING			Period	ls	6		
Logical venn d Miscellaneous, C Assumptions, St	iagrams (Universa Geometrical Figure atement and Conc Yruth of the Statem	al positive, Univ s on Venn Diag <b>lusions, Stateme</b>	versal Negrams), 1 ent and A iency.	egativ E <b>ligil</b> rgun	ve, Uı bility nents,	niversa test, S Stater	Syll	ogisms,	ive or , <b>State</b>	Neg ment of A	gative, t <b>and</b>		
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chart, Mixed cha Value updating fl	(Shifting, Arranging rt), Cube(no of side ow chart), <b>Quantita</b>	ed painted, Full c	ube, cutti	ng cu	ıbe), F	low cl	hart	t (Desci e reason	ription	flow nary	chart,		
Text Books1.How to	crack Test of Reas	oning- Iai kishan	and Pron	n kieł	1an 9	rihant	թու	lication	<u>ו</u>				
References		~								ontio	n		
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Departr	nent	ELECTRONICS AND COMMUNICATION ENGINEERING					2	Semest	er	VI		
				ods Per Week		Cre	Credit N		aximum Marks		arks	
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U19MCT	Y6	PERSONALITY DEVELOPMENT	3	0	0	-	-	100	00 - 100		100	
Content of the syllabus												
Unit – I	Unit – I NUMERICAL ABILITY							Periods 8				
Number Properties – Time & Work – Pipes & Cisterns - Time, Speed & Distance – Rat						– Ratio						
Mixtures & Alligations – Averages – Percentages – Profit & Loss – Simple & Compound Interest – Problems												
on Ages – Partnership – Mensuration – Geometry - Miscellaneous												
Unit - II		LOGICAL REASONING							Perio	ods	8	
Coding Decoding - Blood Relations - Direction Sense Test - Seating Arrangement - Number Series								eries –				
Syllogisms	– Venn Diag	rams – Statements – Data Int	erpretati	on – D	ata S	uffic	iency	v – Clo	cks &	Cale	ndars -	
Miscellaneo	ous											
Unit – II	Ι	SOFT SKILLS & VERBAL ABILITY							Periods		8	
	paration – M	ock GD – Interview Etiquett	e – Mocl	k Interv	view -	- Rea	ading	, Comp	orehens	sion -	- Essay	
Writing												
<b>TT 1</b> ( <b>TT</b>	7			TECHNICAL SKILLS I							0	
Unit - IV						0	-		Perio		8	
Recap of C	– Variables	& Datatypes – Console IO	Operation		perato	ors &	z Exp	oressio			-	
Recap of C Statements -	– Variables – Working wi	& Datatypes – Console IO ( th Functions – Working with	Operation Arrays	ns – O	perato	ors &	z Exp	pression	ns – C	ontro	ol Flow	
Recap of C Statements - Unit – V	– Variables – Working wi	& Datatypes – Console IO ( th Functions – Working with <b>TECHNICA</b> )	Dperation Arrays L <b>SKILI</b>	ns – O L <b>S II</b>	-				ns – C Perio	ontro	ol Flow 8	
Recap of C Statements - <b>Unit – V</b> Pointers – S	– Variables – Working wi 7 String Handli	& Datatypes – Console IO ( ith Functions – Working with TECHNICA) ng – Structures & Unions –	Dperation Arrays L <b>SKILI</b> File Har	ns – O L <b>S II</b> ndling	– Pre	Proc	cesso	r Direc	ns – C Perio	ontro	ol Flow 8	
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