Sharnbasva University, Kalaburag Scheme of Teaching and Examination 2019-2020 Outcome Based Education(OBE) and Choice Based Credit System (CBCS) (Effective from the academic year 2019-2020)												
I SEMSTER M.Tech : Digital Communication & Networking												
Sl. Course Code Course Title Examination											dits	
				Teaching Paper Sett	L	Т	Р	Duration in hours	CIE Marks	SEE Marks	Total Marks	Cre
1	HCC-I	19LDN11	Advanced Digital Communication		3			3	50	50	100	03
2	HCC-II	19LDN12	Optical Networks		3			3	50	50	100	03
3	CEC-I	19LXX13X	Core Elective Course-I		3			3	50	50	100	03
4	CEC-II	19LXX14X	Core Elective Course-II		3			3	50	50	100	03
5	SCC-I	19RM15	Research Methodology and IPR		2			3	50	50	100	02
6	LAB-I	19LDNL16	Advanced Communication Lab				4	3	50	50	100	02
7	LAB-II	19LDNL17	Network Simulation Lab – I				4	3	50	50	100	02
8	PW-I	19LDN18	Project –I				4	3	50	50	100	02
9	AC –I	19AD1X	Audit – 1		1			3	50	50	100	NCM C*
Total				1	15	-	12	27	450	450	900	20

NCMC* : Non Credit Mandatory Course

Core Electiv	ve Course-I	Core Elective Course-II						
19LDN131	Wireless & Mobile Networks	19LDE141	Advanced Engineering Mathematics					
19LVE132	VLSI Design For Signal	19LDE142	Pattern Recognition and Machine					
	Processing		Learning					
19LDN133	Advances In Image Processing	19LDN143	Wireless Security					

Audit Course – I	
19AD11/21	English for Research Paper Writing
19AD12/22	Disaster Management
19AD13/23	Sanskrit for Technical Management
19AD14/24	Value Education
19AD15/25	Constitution of India
19AD16/26	Pedagogy Studies
19AD17/27	Stress Management
19AD18/28	Personality Development through Life Enlightenment Skills

	Sharnbasva University, Kalaburagi Scheme											
of Teaching and Examination 2019-20												
	Outcome Based Education(OBE) and Choice Based Credit System (CBCS)											
	(Effective from the academic year 2019-20)											
	1	II SEMS	TER M.Tech : Digital Co	ommunica	tion	& I	Netw	orking	5			
SI.	SI. Connected a Connected at the first section of t				ninat	ination						
INO				Teaching Paper Sett	L	Т	Р	Duration in hours	CIE Marks	SEE Marks	Total Marks	Cre
1	HCC-III	19LDN21	Advanced DSP		3	-	-	3	50	50	100	03
2	HCC-IV	19LDE22	Error Control Coding		3	-	-	3	50	50	100	03
3	CEC-III	19LXX23X	Core Elective Course- III		3	-	-	3	50	50	100	03
4	CEC-IV	19LXX24X	Core Elective Course- IV		3	-	-	3	50	50	100	03
5	LAB-III	19LDNL25	Advanced DSP Lab				4	3	50	50	100	02
6	LAB-IV	19LDNL26	Network Simulation Lab – II				4	3	50	50	100	02
7	PW-I	19LDN27	Project-II				4	3	50	50	100	02
8	AC-II	19AD2X	Audit – 2		1			3	50	50	100	NCM C*
	Total 13 - 12 24 400 800 18											

NCMC* : Non Credit Mandatory Course

Core Electi	ve Course-III	Core Electi	ve Course-IV
19LDN231	RF And Microwave Circuit Design	19LDN241	MIMO Systems
19LDN232	Advanced Computer Network	19LDN242	Antenna Theory & Design
19LDN233	Wireless Sensor Networks	19LDN243	IOT and its Applications

Audit Course – II	
19AD11/21	English for Research Paper Writing
19AD12/22	Disaster Management
19AD13/23	Sanskrit for Technical Management
19AD14/24	Value Education
19AD15/25	Constitution of India
19AD16/26	Pedagogy Studies
19AD17/27	Stress Management
19AD18/28	Personality Development through Life Enlightenment Skills

	Sharnbasva University, Kalaburagi Scheme of Teaching and Examination 2019-20 Outcome Based Education(OBE) and Choice Based Credit System (CBCS) (Effective from the academic year 2019-20)											
Sl. No	III SEMSTER M.Tech : Digital Communication & Networking Sl. No Course Code Course Title Sind Delta Sing De								Credits			
1	CEC- V	19LXX31 X	Core Elective Corse- V		3	-	-	3	50	50	► ≥ 100	03
2	OEC-I	19LOE32 X	Open Elective Cousce-I		3	-	-	3	50	50	100	03
3	PW-I	19LDN33	Project-III		-	-	4	3	50	50	100	08
	Total 06 - 4 09 150 150 300 14											

Core Elective Corse –V						
19LDN311	Cognitive Radio Networks.					
19LVE312	CMOS RF Circuits Design					
19LVE313 Advanced Embedded System						

Open Electi	Open Elective Course – I					
19LOE321	Bussiness Analytics					
19LOE322	Industrial safety					
19LOE323	Operation Research					
19LOE324	Cost Management of Engineering Projects					
19LOE325	Composite Materials					
19LOE326	Waste to Energy					

	Sharnbasva University, Kalaburagi											
Scheme of Teaching and Examination 2019-20												
	Outcome Based Education(OBE) and Choice Based Credit System (CBCS)											
Effective from the academic year 2019-20)												
	IV SEMSTER M.Tech : Digital Communication & Networking											
Sl.	Sl. Course Code					I eaching Hours/we	ek	F	xami	natior	1	dits
110	D Course Code Course T			Teachin & Paner	L	Т	Р	Duration in hours	CIE Marks	SEE Marks	Total Marks	Cre
1	PW-IV	19LDN41	Project -IV (Final Desertion and Publication)		-	-	20	3	50	50	100	12
2	PW-V	19LDN42	Internship		-	-	40	3	100	200	300	04
Total					-	-	60	06	150	250	400	16

Note: Internship comprises following sub components:

- 1. Presentation on Internship (after 8 weeks from the date of commencement) (CIE) for 25 marks.
 - 2. Evaluation of Internship Report (CIE) for 25 marks.

Viva-voce on Internship (SEE) for 50 marks.

Project evaluation: valuation shall be taken up at the end of the IVth semester (SEE)

- a) Internal examiner shall carry out the evaluation for 100 marks
- b) External examiner shall carry out evaluation for 100 marks
- c) The average of marks allotted by the internal and external examiner shall be the final marks of the project evaluation.
- d) Viva-voce examination of the project work shall be conducted jointly by internal and external examiner for 100 marks

DV	<u>'ANCED DIGITAI</u>	L COMMUNI	CATION			
[As pe	r Choice Based Credit	System (CBCS) S	Scheme]			
	SEMEST	ER-I				
Subject Code	19LDN11	CIE Marks	50			
Number of Lecture	03	SEE Marks	50			
Hour/Week						
Total Number of	40	Exam Hours	03			
Lecture Hours						
	CREDIT	<u>S-03</u>				
Course Objectives: S	tudents shall be a	ble to				
1. Understand	different modulati	ion, demodula	tion and			
equalization	techniques and u	se them to ana	$\frac{1}{2}$	error		
performanc	e of digital modula	ation technique	es in pres	sence of		
AWGN noi	se.			-1		
2. Analyze and	d demonstrate the	model of discr	rete time	channel		
	the model of discre	ete time chann	iel by equ	lanzer.		
3. Apply varie	bus types of equality	zers used for c	channel m	nodeling		
and adjustin	g the filter coeffic	ients		,•		
4. Develop the	e concept of Spread	a Spectrum Co	ommunica	ations over		
wideband C	nanneis.					
Modules		r	Teaching	Revised		
1110uules		1	Hours	Bloom's		
				Taxonomy		
				(RBT)		
				L ovol		
Module -1						
Module -1 Signal Represen	tation:Bandpass a	and Lowpass (08 Hours	Li,L2,L3		
Module -1 Signal Represent signal representation	tation:Bandpass a	and Lowpass (esentation of	08 Hours	L1,L2,L3		
Module -1 Signal Represent signal representation band pass random	tation:Bandpass a ion, Lowpass repro n process. [Text	and Lowpass (esentation of 1,Chapter 2:	08 Hours	L1,L2,L3		
Module -1 Signal Represent signal representation band pass random 2.1, and 2.9 only]	tation:Bandpass a ion, Lowpass repro n process. [Text	and Lowpass (esentation of 1,Chapter 2:	08 Hours	L1,L2,L3		
Module -1 Signal Represent signal representation band pass random 2.1, and 2.9 only] Modulation: Reference	tation:Bandpass a ion, Lowpass repro n process. [Text epresentation of	and Lowpass (esentation of 1,Chapter 2: digitally	08 Hours	L1,L2,L3		
Module -1 Signal Represent signal representation band pass random 2.1, and 2.9 only] Modulation: Re- modulated Signals	tation:Bandpass a ion, Lowpass repro n process. [Text epresentation of "Modulation Scher	and Lowpass (esentation of 1,Chapter 2: digitally mes without	08 Hours	L1,L2,L3		
Module -1 Signal Represent signal representation band pass random 2.1, and 2.9 only] Modulation: Ro modulated Signals memory(Band Lir	tation:Bandpass a ion, Lowpass repro n process. [Text epresentation of ,Modulation Schen nited Schemes PA	and Lowpass (esentation of 1,Chapter 2: digitally nes without AM, BPSK,	08 Hours	L1,L2,L3		
Module -1 Signal Represent signal representation band pass random 2.1, and 2.9 only] Modulation: Re- modulated Signals memory(Band Lin QPSK, MPSK, MO	tation:Bandpass a ion, Lowpass repro- n process. [Text epresentation of Modulation Scher nited Schemes PA QAM,Power Limit	and Lowpass (esentation of 1,Chapter 2: digitally nes without AM, BPSK, ed Schemes	08 Hours	L1,L2,L3		
Module -1 Signal Represent signal representation band pass random 2.1, and 2.9 only] Modulation: Re- modulated Signals memory(Band Lin QPSK, MPSK, MC FSK,MFSK,DPSK	tation:Bandpass a ion, Lowpass repro- n process. [Text epresentation of Modulation Scher nited Schemes PA QAM,Power Limit ,DQPSK),modulation	and Lowpass (esentation of 1,Chapter 2: digitally nes without AM, BPSK, ed Schemes	08 Hours	L1,L2,L3		
Module -1 Signal Represent signal representation band pass random 2.1, and 2.9 only] Modulation: Re- modulated Signals memory(Band Lin QPSK, MPSK, MC FSK,MFSK,DPSK with memory (Band Carter)	tation:Bandpass a ion, Lowpass repro- n process. [Text epresentation of Modulation Scher nited Schemes PA QAM,Power Limit ,DQPSK),modulation	and Lowpass (esentation of 1,Chapter 2: digitally nes without AM, BPSK, ed Schemes onschemes nd CP Full	08 Hours	L1,L2,L3		
Module -1 Signal Represent signal representation band pass random 2.1, and 2.9 only] Modulation: Re- modulated Signals memory(Band Lir QPSK, MPSK, MC FSK,MFSK,DPSK with memory (Band Treatment of MS)	tation:Bandpass a ion, Lowpass repro- n process. [Text epresentation of "Modulation Scher nited Schemes PA QAM,Power Limit "DQPSK),modulati ssics of CPFSK a K),PSD of linearly	and Lowpass (esentation of 1,Chapter 2: digitally mes without AM, BPSK, ed Schemes onschemes nd CP Full Modulated	08 Hours	L1,L2,L3		
Module -1 Signal Represent signal representation band pass random 2.1, and 2.9 only] Modulation: Ro- modulated Signals memory(Band Lin QPSK, MPSK, MC FSK,MFSK,DPSK with memory (Band Treatment of MS) Signal.(Section 3.4	tation:Bandpass a ion, Lowpass repro- n process. [Text epresentation of ,Modulation Scher nited Schemes PA QAM,Power Limit ,DQPSK),modulati sics of CPFSK a K),PSD of linearly 4.2) [Text 1 Char	and Lowpass (esentation of 1,Chapter 2: digitally mes without AM, BPSK, ed Schemes onschemes nd CP Full Modulated pter 3: 3.1,	08 Hours	L1,L2,L3		
Module -1 Signal Represent signal representation band pass random 2.1, and 2.9 only] Modulation: Re- modulated Signals memory(Band Lin QPSK, MPSK, MC FSK,MFSK,DPSK with memory (Band Treatment of MS) Signal.(Section 3.4 3.2 and 3.3]	tation:Bandpass a ion, Lowpass repro- n process. [Text epresentation of Modulation Scher nited Schemes PA QAM,Power Limit ,DQPSK),modulati sics of CPFSK a K),PSD of linearly 4.2) [Text 1 Cha	and Lowpass (esentation of 1,Chapter 2: digitally nes without AM, BPSK, ed Schemes onschemes nd CP Full Modulated pter 3: 3.1,	08 Hours	L1,L2,L3		
Module -1 Signal Represent signal representation band pass random 2.1, and 2.9 only] Modulation: Re- modulated Signals memory(Band Lin QPSK, MPSK, MC FSK,MFSK,DPSK with memory (Band Treatment of MS) Signal.(Section 3.4 3.2 and 3.3] Module -2	tation:Bandpass a ion, Lowpass repro- n process. [Text epresentation of ,Modulation Scher nited Schemes PA QAM,Power Limit ,DQPSK),modulati sics of CPFSK a K),PSD of linearly 4.2) [Text 1 Char	and Lowpass (esentation of 1,Chapter 2: digitally mes without AM, BPSK, ed Schemes onschemes nd CP Full Modulated pter 3: 3.1,	08 Hours	L1,L2,L3		
Module -1 Signal Represent signal representation band pass random 2.1, and 2.9 only] Modulation: Re- modulated Signals memory(Band Lin QPSK, MPSK, MO FSK,MFSK,DPSK with memory (Band Treatment of MS) Signal.(Section 3.4 3.2 and 3.3] Module -2 Demodulation:Ve	tation:Bandpass a ion, Lowpass repre- n process. [Text epresentation of ,Modulation Schen nited Schemes PA QAM,Power Limit ,DQPSK),modulati sics of CPFSK a K),PSD of linearly 4.2) [Text 1 Char ector Channel,Vec	and Lowpass (esentation of 1,Chapter 2: digitally nes without AM, BPSK, ed Schemes onschemes nd CP Full Modulated pter 3: 3.1,	08 Hours 08 Hours	L1,L2,L3		
Module -1 Signal Represent signal representation band pass random 2.1, and 2.9 only] Modulation: Re- modulated Signals memory(Band Lin QPSK, MPSK, MC FSK,MFSK,DPSK with memory (Band Treatment of MS) Signal.(Section 3.4 3.2 and 3.3] Module -2 Demodulation: Ver AWGN, Perform	tation:Bandpass a ion, Lowpass repro- n process. [Text epresentation of "Modulation Scher nited Schemes PA QAM,Power Limit "DQPSK),modulati sics of CPFSK a K),PSD of linearly 4.2) [Text 1 Char ector Channel,Vec	and Lowpass (esentation of 1,Chapter 2: digitally mes without AM, BPSK, ed Schemes onschemes nd CP Full Modulated pter 3: 3.1, tor Channel Optimum	08 Hours 08 Hours	L1,L2,L3		
Module -1 Signal Represent signal representation band pass random 2.1, and 2.9 only] Modulation: Ro- modulated Signals memory(Band Lin QPSK, MPSK, MC FSK,MFSK,DPSK with memory (Band Treatment of MS) Signal.(Section 3.4 3.2 and 3.3] Module -2 Demodulation: Ver AWGN, Perform Coherent Detection	tation:Bandpass a ion, Lowpass repro- n process. [Text epresentation of ,Modulation Scher nited Schemes PA QAM,Power Limit ,DQPSK),modulati sics of CPFSK a K),PSD of linearly 4.2) [Text 1 Char ector Channel,Vec nance parameters, on for power 1	and Lowpass (esentation of 1,Chapter 2: digitally nes without AM, BPSK, ed Schemes onschemes nd CP Full Modulated pter 3: 3.1, tor Channel Optimum imited and	08 Hours 08 Hours	L1,L2,L3		
Module -1 Signal Represent signal representation band pass random 2.1, and 2.9 only] Modulation: Re- modulated Signals memory(Band Lin QPSK, MPSK, MC FSK,MFSK,DPSK with memory (Band Treatment of MS) Signal.(Section 3.4 3.2 and 3.3] Module -2 Demodulation: Ver AWGN, Perform Coherent Detection Bandlimited sch	tation:Bandpass a ion, Lowpass repro- n process. [Text epresentation of Modulation Schen nited Schemes PA QAM,Power Limit ,DQPSK),modulati sics of CPFSK a K),PSD of linearly 4.2) [Text 1 Char ector Channel,Vec nance parameters, on for power 1 nemes, Optimal	and Lowpass (esentation of 1,Chapter 2: digitally nes without AM, BPSK, ed Schemes onschemes nd CP Full Modulated pter 3: 3.1, tor Channel Optimum imited and Coherent	08 Hours 08 Hours	L1,L2,L3		
Module -1 Signal Represent signal representation band pass random 2.1, and 2.9 only] Modulation: Re- modulated Signals memory(Band Lin QPSK, MPSK, MG FSK,MFSK,DPSK with memory (Band Treatment of MS) Signal.(Section 3.4 3.2 and 3.3] Module -2 Demodulation: Ver AWGN, Perform Coherent Detection Bandlimited schedet	tation:Bandpass a ion, Lowpass repro- n process. [Text epresentation of Modulation Scher nited Schemes PA QAM,Power Limit ,DQPSK),modulation sics of CPFSK a K),PSD of linearly 4.2) [Text 1 Char ector Channel,Vec nance parameters, on for power 1 nemes, Optimal emes with memor	and Lowpass (esentation of 1,Chapter 2: digitally mes without AM, BPSK, ed Schemes onschemes nd CP Full Modulated pter 3: 3.1, tor Channel (Optimum imited and Coherent ry, Optimal	08 Hours 08 Hours	L1,L2,L3		
Module -1 Signal Represent signal representation band pass random 2.1, and 2.9 only] Modulation: Re- modulated Signals memory(Band Lin QPSK, MPSK, MC FSK,MFSK,DPSK with memory (Band Treatment of MS) Signal.(Section 3.4 3.2 and 3.3] Module -2 Demodulation: Ver AWGN, Perform Coherent Detection Bandlimited sched detection for sched Non Coherent detaged	tation:Bandpass a ion, Lowpass repro- n process. [Text epresentation of ,Modulation Schen nited Schemes PA QAM,Power Limit ,DQPSK),modulati sics of CPFSK a K),PSD of linearly 4.2) [Text 1 Char ector Channel,Vec nance parameters, on for power 1 nemes, Optimal emes with memor etection for schen	and Lowpass (esentation of 1,Chapter 2: digitally mes without AM, BPSK, ed Schemes onschemes nd CP Full Modulated pter 3: 3.1, tor Channel Optimum imited and Coherent cy, Optimal nes without	08 Hours 08 Hours	L1,L2,L3		
Module -1 Signal Represent signal representation band pass random 2.1, and 2.9 only] Modulation: Re- modulated Signals memory(Band Lin QPSK, MPSK, MC FSK,MFSK,DPSK with memory (Band Treatment of MS) Signal.(Section 3.4 3.2 and 3.3] Module -2 Demodulation: Ver AWGN, Perform Coherent Detection Bandlimited sche detection for sche Non Coherent detection and with memory	tation:Bandpass a ion, Lowpass repre- n process. [Text epresentation of Modulation Schen nited Schemes PA QAM,Power Limit ,DQPSK),modulati sics of CPFSK a K),PSD of linearly 4.2) [Text 1 Char ector Channel,Vec nance parameters, on for power 1 nemes, Optimal emes with memore tection for schem ry (FSK, DPSK, tection schemes	and Lowpass (esentation of 1,Chapter 2: digitally mes without AM, BPSK, ed Schemes onschemes nd CP Full Modulated pter 3: 3.1, tor Channel Optimum imited and Coherent cy, Optimal nes without DQPSK),	08 Hours 08 Hours	L1,L2,L3		

[Text 1, Chapter 4: 4.1, 4.2 4.2.2, 4.3, 4.4,		
4.5.1, 4.5.2, 4.5.5 and 4.0		
Bandlimited Channels: Bandlimited channel	08 Hours	L1L2L3
characterization signalling through band		11,112,115
limited linear filter channels. Sinc. RC.		
Duobinary and Modified Duobinary signaling		
schemes, Optimum receiver for channel with		
ISI and AWGN.		
Linear Equalizers: Zero forcing Equalizer,		
MSE and MMSE, Baseband and Passband		
Linear Equalizers. Performance of ZFE and		
MSE.(Excluding 9.4-3, 9.4-4)[Text 1, Chapter		
9: 9.1, 9.2 - 9.2.1, 9.2.2, 9.2.3, 9.3-9.3.1, 9.3.2		
and 9.4]		
Module -4	00 TT	
Non-Linear Equalizers: Decision feedback	08 Hours	L1, L2
equalization, Predictive DFE, Performance of		
DFE.[Text 1, Chapter 9: 9.5: 9.5-1 only]		
Adaptive equalization: Adaptive linear		
equalizer, adaptive decision feedback equalizer,		
Adaptive Fractionally spaced Equalizer (Tap		
Leakage Algorithm), Adaptive equalization of		
Trellis coded signals. [Text1Chapter10:10.1,		
10.1-1,10.1-2,10.1-3,10.1-6,10.1-7,10.2,10.3		
Module-5	00 II	
Spread spectrum signals for digital	08 Hours	L1,L2,L3
digital accounting system Direct account		
digital communication system, Direct sequence		
spread spectrum signals, some applications of		
DS spread spectrum signals, generation of PN		
sequences, Frequency hopped spread spectrum		
signals, Time nopping 55, Synchronization of		
$[T_{avt} 1] Chapter 12, 12, 1, 12, 2 (avenue 12, 2, 1)$		
[1ext 1, Chapter 12: 12.1, 12.2 (except 12.2-1), 12.2-2, 12.2-5, 12.3, 12.4, 12.5]		
Course outcomes: After going through this course the	he student	will be
able to:		
1. Explain the concept of low pass and Band	pass signal	S
representations at the Transmitter, the proc	cess of Det	ection
and Estimation at the receiver in the prese	nce of AW	'GN
only.		
2. Evaluate Receiver performance for various	s types of s	single
carrier symbol modulations through ideal	and AWG	N Non-
bandlimited and bandlimited channels.		
3. Design single carrier equalizers for various	s symbol	
modulation schemes and detection method	ls for defin	ed
channel models, and compute parameters	to meet de	sired rate

and performance requirements.

- 4. Design and Evaluate Non band limited and Non power limited spread
- 5. spectrum systems for communications in a Jamming environment, multiuser situation and low power intercept environment.

Text Books:

1. John G. Proakis, MasoudSalehi, "Digital Communications ",5e, Pearson Education(2014), ISBN:978-9332535893, PEARSON, 2010.

Reference Books:

- 1. Bernard Sklar, "Digital Communications: Fundamentals and Applications: Fundamentals & Applications ", 2e, Pearson Education (2009), ISBN:978-8131720929.
- 2. Simon Haykin,"Digital Communications Systems",1e,Wiley (2014), ISBN:978-8126542314.

	OPTICAL NI	ETWORKING				
[As	[As per Choice Based Credit System (CBCS) Scheme]					
Sala at Cala	SEME:	STER-I		50		
Subject Code	19LDN12	CIE Marks		50		
Hour/Wook	03	SEE Marks		50		
Number of Lecture	40	Evon Hours		03		
Hours	40	Examinouis		05		
	CREDITS-03					
Course Objectives: 7	This course will enable	students to:				
 Course Objectives: This course will enable students to: To learn the basic elements of optical fiber transmission link, fiber modes configurations and structures. Static and dynamic network topology design. To learn the fiber optical network components, variety of networking aspects, FDDI, SONET/SDH and operational principles WDM . Identify the methods to increase the capacity of a network through wavelength routing. 					fiber modes tking aspects, h wavelength	
Modules			Teach	ing	Revised	
			Hours	5	Bloom's Taxonomy (RBT) Level	
Module -1				•		
SONET/SDH: optic routing and forward Storage Area Network	al transport network ing, multiprotocol lal ss.	t, Ethernet,IP, bel Switching,	08 Ho	ours	L1,L2	
Module -2						
WDM network elements: optical line terminals and amplifiers, optical add/drop multiplexers, OADM architectures, reconfigurable OADM, optical cross connects.Network management functions, optical layer services and Interfacing.08 HoursL1,L2						
Module -3						
Performance and management, optical s Network Survivabil	fault management, safety. ity: protection in SC	Configuration	08 Ho	ours	L1,L2, L3	
client layer.						
Module-4	washawaa WDM wate	wante da si sur	00 TT-			
LTD and RWA proble	ems, dimensioning wav	elength	08 H0	ours	L1, L2, L3	
Module-5					1	
Statistical dimensionin	ng models.Access netw	orks: Optical	08 H a	ours	L1.L2. L3	
time division multiple processing, buffering, Introduction to PON.	xing, synchronization, burst switching, test be	header. ds,			,,	

Course outcomes: After studying this course, students will be able to:

- 1. Gain Knowledge on fundamentals of optical network.
- 2. Explore optical network architectures ranging from optical access networks to backbone optical transport networks.
- 3. Choose approaches and methodologies of optical network for design effective optimization;
- 4. Apply Techniques of optical network survivability.
 - Gain knowledge on Problem solving skills and critical thinking in the discipline of optical networks.

Text Book:

- 1. C.Siva Ram Murthy and Mohan Guruswamy, "WDM Optical Networks: Concepts, Designs And Algorithms", Prentice Hall of India, 2002.
- 2. Optical Networks by Rajeev Ramaswamy, Kumar N Sivarajan, Galen H Sasaki, Elsevier Publication 3 rd Edition, 2009.

Reference Books:

1) Uyless Black, Optical Networks-Third generation transport system: Pearson 2013

	WIRELESS & MO	BILE NETWO	ORKS		
[As p	er Choice Based Cred	it System (CBC	CS) Sch	eme]	
	SEME	STER-I			
Subject Code	19LDN131	CIE Marks		50	
Number Lecture	03	SEE Marks		50	
Hour/Week					
Number of Lecture	40	Exam Hours		03	
Hours					
CREDITS-03					
Course Objectives:	This course will enabl	e students to:			
1. Concepts and	Protocols provides	an explanation	on th	ne wirel	ess network
concepts, arch	itectures, protocols, ar	nd applications.			
2. It covers the v	wireless networks such	h as wireless bo	ody are	a netwo	rk (WBAN),
wireless local	area networks (WLAN	ls),			
3. wireless metro	opolitan area network	as (WMANs), v	wireless	s wide a	rea network
(WWAN), with	reless sensor network	s, wireless veh	icle net	works,	and research
challenges in v	wireless networks.				
4. Addresses the	e design issues and	explores vario	us eme	erging p	rotocols for
wireless netwo	orks				
5. Develop an aw	areness towards the n	etwork control	and trat	ffic man	agement
Modules			Teach	ing	Revised
			Hours	5	Bloom's
					Taxonom
					y(RBT)
					Level
Module -1					
Module-1 : Review	of fundamentals of w	rireless	08 Ho	urs	L1, L2
communication and	Networks:				
Wireless commu	nicati on channel	specifications,			
Wireless communication	ation systems, Wirel	ess networks,			
Switching technolo	ogy, Communication	n problems,			
Wireless network iss	ues and standards.				
Module -2					
Wireless body are	a networks: Proper	ties, Network	08 Ho	urs	L2,L3
architectures, Compo	onents, Technologies, I	Design issues,			
Protocols and applica	ations.	-			
Wireless personal	area networks:	Architectures,			
Components, Require	ements, Technologies	and protocols,			
Bluetooth and Zigbee	e.	-			
Module -3					
Wireless LANs:	Network compone	ents, design	08 Ho	urs	L1, L2, L3
requirements, Arch	itectures, IEEE-802.	11x, WLAN			
protocols, 802.11p and applications.					
Module -4					
WMANs, IEEE-80	2.16: Architectures,	Components,	08 Ho	urs	L1,L2, L3,
WiMax mobility s	upport, Broadband i	networks and			L4
applications, WWA	Ns, cellular netwo	rks, Satellite			
Network, Application	ns.				
/ ••					

Wireless ad-hoc networks: Mobile ad-hoc networks:	08 Hours	L2, L3
Features, Architecture, protocol (MACA ,MACAW,		
PCM,AODV,DSR,DSDV), Applications, Technologies,		
wireless Sensor network : Architecture, protocols (EAR,		
Routing protocols, LEACH, directed Diffusion),		
Technologies, Applications.		
Mesh networks: Architecture, Routing protocols,		
Technologies, Applications. VANETs: Architecture,		
characteristics, Technologies, Applications.		
Course outcomes After studying this course, students wil	l be able to	
1. Develop an understanding on the basic and advanc	ed principles of	Wireless
Communications and Mobile Networks.		
2. The unit addresses the issues of wireless communi	cations and mot	oile
networks in physical, link and network layers. The	wireless channe	els will be
explained with existing mitigation techniques.		
3. Multi-user communication systems will also be stu	died with an en	nphasis on
the broadcast nature of wireless communications.		
4. Mobile networks modelling, design and optimisation	on will be cover	ed, as well
as existing and future mobile networks standard		
Text Book:		
1. S. S. Manvi, and M. S. Kakkasageri, "Wireless and	Mobile networ	k concepts
and Protocols", Wiley, 1st edition, 2010.		Ĩ
2. P. Kaveh, Krishnamurthy, "Principles of Wireless	network: A unif	ied
approach", PHI, 2006.		
Reference Books:		
1 Iti Saha Mitra "Wireless communication and netw	ork: 3G and Re	vond"
McGraw Hill 2009	ork. 50 and De	<i>y</i> ona ,
2 Ivan Stoimenovic "Handbook of Wireless network	s and Mobile C	omputing"
Wiley 2009		omputing,
3 P Nicopolitidis M S Obaidat et al "Wireless Ne	tworks" Wilev	2009
	, who y	,_007.

	VLSI DESIGN FO	R SIGNAL	PROCES	SIN	<u>G</u>
[As p	er Choice Based Cred	lit System (O	CBCS) Sch	neme]	
	SEMES	STER-I			
Subject Code	19LVE132	CIE Marks		50	
Number of Lecture	03	SEE Marks	3	50	
Hour/Week					
Total Number of	40	Exam Hou	rs	03	
Lecture Hours					
	CRED	ITS-03			
Course Objectives: This course will enable students to:					
1. Learn several high-level architectural transformations that can be used to					
design familie	es of architectures for a	a given algo	rithm.		
2. Deal with high	h-level algorithm trans	sformations	such as str	engtl	n reduction,
look-ahead an	id relaxed look-ahead.				
Modules			Teaching	3	Revised
			Hours		Bloom's
					Taxonomy
					(RBT) Level
Module -1					
Introduction to I	DSP Systems: Typ	oical DSP	08 Hours	5	L1,L2,L3,
Algorithms, DSP A	pplication Demands a	and Scaled			
CMOS Technologi	es, Representations	of DSP			
Algorithms.		•			
Iteration Bounds: L	Jata flow graph Repre	esentations,			
loop bound and Iterat	ion bound.				
Module -2	A 1 f	<u></u>	00 TT	-	
Iteration Bounds:	Algorithms for	Computing	08 Hours	S	L1,L2,L3,
flow groups	ation bound of mult	I rate data			
Dinclining and Dar	allal Dragging , pir	alining of			
Fipenning and Par	aner Processing: pip	Dinalining Of			
ord perallel processi	parallel processing,	Fipenning			
Modulo 3	ig for low power.				
Timing: Definition	and Properties Solvir	a Systems	08 Hour	0	121314
of Inequalities Definition	and Flopenties, Solvin	ig Systems		5	1.2,1.3,1.4
Unfolding An Algo	writhm for Unfolding	Properties			
of Unfolding Critica	l nath Unfolding and	Retiming			
Application of Unfold	ding	i Retilling,			
Systolic Architectur	re Design: systolic at	rav design			
Methodology, FIR sy	stolic array.	ing acoign			
Module -4					
Systolic Architect	ure Design: Sele	ection of	08 Hours	5	L1. L2.L3
Scheduling Vector, N	Matrix-Matrix Multipl	ication and			, ,
2D systolic Array De	sign, Systolic				
Design for space repr	resentation containing	Delays.			
Fast convolution: C	ook-Toom Algorithm,	Winograd			
Algorithm, Iterated	convolution, cyclic c	onvolution			
Design of fast convol	ution Algorithm by In	spection.			

Module-5		
Pipelined and Parallel Recursive and Adaptive	08 Hours	L1,L2, L3
Filter: Pipeline Interleaving in Digital Filter, first		
order IIR digital Filter, Higher order IIR digital Filter,		
parallel processing for IIR filter, Combined		
pipelining and parallel processing for IIR Filter, Low		
power IIR Filter Design Using Pipelining and parallel		
processing, pipelined adaptive digital filter.		
Course outcomes: After studying this course, students	will be able to:	
1. Illustrate the use of various DSP algorithms and	addresses the	r representation
using block diagrams, signal flow graphs and d	ta-flow graphs	1 /1
2. Use pipelining and parallel processing in des	ign of high-sp	eed /low-power
applications Apply unfolding in the design of perellel erebit	atura	
5. Apply unfolding in the design of parallel archite 4. Evaluate the use of look abead techniques in pr	rallel and pipel	ined IIP Digital
4. Evaluate the use of look-anead techniques in pa	iraner and piper	incu IIK Digitai
5 Develop an algorithm or architecture or circuit	lesign for DSP	applications
3. Develop in argonalin of architecture of chedia		applications
Text Books:		
1. Keshab K.Parthi, "VLSI Digital Signal Process	ng systems, De	sign and
implementation ", Wiley 1999.		
Reference Books:		
1. Mohammed Isamail and Terri Fiez, "Analog	VLSI Signal a	and Information
Processing ", Mc Graw-Hill, 1994.		
2. S.Y. Kung, H.J. White House, T. Kailath,	" VLSI and	Modern Signal
Processing ", Prentice Hall, 1985.		
3. Jose E. France, Yannis Tsividis, "Design of A	Analog - Digita	1 VLSI Circuits
1 Lors Werkerman DSD Integrated Circuit	, Frencice Hall,	1994. Desas Series in
4. Lars wannammar, —DSP Integrated Circuit	si, Academic	rress Series in
Engineering, 1st Edition.		

	ADVANCES IN IMA	GE PROCESS	ING		
[As per Choice Based Credit System (CBCS) Scheme]					
	SEMES	TER-I	50		
Subject Code	19LDN133	CIE Marks	50		
Number Lecture	03	SEE Marks	50		
Hour/Week	40	F H			
Number of Lecture	40	Exam Hours	03		
Hours					
	CREDI	<u>TS-03</u>			
Course Objectives:	This course will enabl	e students to:	.1	· · · · · · · · · · · · · · · · · · ·	
1. To gain fund	amental knowledge if	n understanding	the represent	ntation of the	
digital image	and its properties			1, 1	
2. To equip stud	tents with some pre-p	rocessing techni	ques require	ed to enhance	
the image for	further analysis purpo	ose.	1		
3. To enable s	tudents to select the	region of inter	rest in the	image using	
segmentation	techniques.	ha imaga haad	l an ita alba	ma and adaa	
4. To enable st	udents to represent t	ne image based	i on its sna	ipe and edge	
To anohio at	adapt to describe the	abiaata progent i	n the image	hazad on ita	
5. To enable su	d structure	objects present i	n the image	e based on its	
properties and			Tasahing	Derriged	
Modules			Lours	Revised Dicom's	
			nouis	Diouin S Toxonomy	
				$(\mathbf{D}\mathbf{P}\mathbf{T})$	
Modulo 1				Level	
The image its repr	contations and prop	artics. Imago	00 Llours	T 1	
representations a f	esemations and propo	digitization			
Digital image proper	ties Color images	uigitization,			
Module 2	ties, color intages.				
Imaga Dra pro	anging Dival	brightnass	00 Lloung	1112	
transformations geo	metric transformation	brightness		L1,L2	
processing		is, iocai pie-			
Modulo 2					
Nouule -5	Thresholding	Edge based	00 Lloung	I 1 I2I2	
segmentation F	in esholung,	Luge-Daseu	00 110015	L1,L2,L3	
relevation Border tr	acing Hough transfor	mailing, Euge			
based segmentation.	– Region merging Re	gion splitting			
Splitting and mergin	a Watershed segment	ation Region			
growing post-proces	sing	ation, Region			
Module -4	, <u>,</u>				
Shane representation	tion and descript	ion · Region	08 Hours	111213	
identification: Conto	our based shape repre	sentation and		11, 12,15	
description Chain	codes. Simple geon	netric border			
representation For	rier transforms of	boundaries			
Boundary description	n using segment seque	ences Bspline			
representation: Regi	on-based shape repre	sentation and			
description Simple	scalar region descripto	ors. Moments.			

Convex hull.		
Module-5		
Mathematical Morphology: Basic morphological	08 Hours	L1,L2,L3
concepts, Four morphological principles, Binary dilation		
and erosion, Skeletons and object marking,		
Morphological segmentations and watersheds.		

Course Outcomes: After studying this course, students will be able to:

- **1.** Understand the representation of the digital image and its properties
- **2.** Apply pre-processing techniques required to enhance the image for its further analysis.
- **3.** Use segmentation techniques to select the region of interest in the image for analysis
- 4. Represent the image based on its shape and edge information.
- 5. Describe the objects present in the image based on its properties and structure.
- **6.** Use morphological operations to simplify images, and quantify and preserve the main shape characteristics of the objects.

Text Book:

1. Milan Sonka, Vaclav Hlavac, Roger Boyle, "Image Processing, Analysis, and Machine Vision", Cengage Learning, 2013, ISBN: 978-81-315-1883-0

Reference Book:

1. Geoff Doughertry, Digital Image Processing for Medical Applications, Cambridge university Press, 2010

2. S.Jayaraman, S Esakkirajan, T.Veerakumar, Digital Image Processing, Tata Mc Graw Hill, 2011

AD	VANCED ENGINEE	RING MATH	EMAT	TICS	
[As p	er Choice Based Cred	lit System (CBO	CS) Sch	neme]	
	SEME	STER-I			
Subject Code	19LDE141	CIE Marks		50	
Number Lecture	03	SEE Marks		50	
Hour/Week					
Number of Lecture	40	Exam Hours		03	
Hours					
	CRED	DITS-03			
Course Objectives:	This course will enabl	le students to:			
1. To learn princ	ciples of advanced eng	gineering mathe	ematics	through	linear
algebra and c	alculus of variations.	-		-	
2. Understand v	ector spaces, basis, lin	ear transformation	tions.		
3. To understand	d probability theory ar	nd random proc	ess that	serve as	s an essential
tool for applie	cations of electronics a	and communica	tion en	gineerin	g sciences.
Modules			Teach	ning	RBT Level
			Hours	s	
Module -1					
Linear Algebra-I :	Introduction to vect	or spaces and	08 H d	ours	L1. L2
sub-spaces, definition	ns, illustrative exampl	les and simple			,
problems. Linearly i	ndependent and dependent	ndent vectors-			
definition and proble	ems. Basis vectors. d	imension of a			
vector space. Lir	near transformations	- definition.			
properties and pro	oblems. Rank- Nul	lity theorem			
(without proof). Mat	trix form of linear tra	insformations-			
Illustrative examples	. Gaussian Elimination	n			
Module -2			1		
Linear Algebra-II:	Computation of eige	en values and	08 H a	ours	L1.L2. L3
eigen vectors of	real symmetric ma	trices-Given's			,,
method. Orthogona	l vectors and ortho	ogonal bases.			
Gram-Schmidt or	thogonalization pr	ocess. OR			
decomposition. sing	vular value decomp	osition. least			
squar Approximation	s. Diagonalization Me	ethod.			
Module -3					
Calculus of Variati	ions: Concept of fun	ctional-Eulers	08 Hc	nirs	L1.L2
equation Functional	dependent on first an	d higher order	00 110	ais	
derivatives Function	al on several depend	lent variables			
Isoperimetric proble	ms-variation problems	s with moving			
boundaries	ins variation problem				
Module -4					
Probability Theor	v: Review of basi	c probability	08 H	nirs	L1. L2. L
theory Definitions of	of random variables a	nd probability	00 110	uis	L1, L2,L
distributions probab	vility mass and dens	ity functions			
expectation moment	ts central momente	characteristic			
functions probability	generating and mom	ent generating			
functions-illustration	s Poisson Gaussian	and Frlang			
distributions	5. i Olosolli, Odussiai	i and Litang			
Module-5			1		
Inint Probability	Distributions. Da	finition and	08 H	urs	111213
some rrobability		and and		MI 0	لاستو سندو مد سد

properties of CDF, PDF, PMF, conditional distributions.	
Expectation, covariance and correlation. Independent	
random variables. Random process- Classification,	
stationary and ergodic random process. Auto correlation	
function-properties, Gaussian random process, Poission	
process, Binomial process.	

Course Outcomes: After studying this course, students will be able to:

- 1. Understand vector spaces, basis, linear transformations and the process of obtaining matrix of linear transformations arising in magnification and rotation of images.
- 2. Apply the technique of singular value decomposition for data compression, least square approximation in solving inconsistent linear systems.
- 3. Utilize the concepts of functional and their variations in the applications of communication systems, decision theory, synthesis and optimization of digital circuits.
- 4. Learn the idea of random variables (discrete/continuous) and probability distributions in analyzing the probability models arising in control systems and system communications.
- 5. Analyze random process through parameter-dependent variables in various random processes.

Text Book:

- **1.** David C.Lay, Steven R.Lay and J.J.McDonald: "LinearAlgebra and its Applications", 5 th Edition, Pearson Education Ltd., 2015
- 2. Elsgolts, L.:"Differential Equations and Calculus of Variations", MIR Publications, 3rd Edition, 1977.
- 3. T.Veerarajan: "Probability, Statistics and Random Process", 3rd Edition, Tata Mc-Graw Hill Co., 2016.

Reference Book:

- 1. Gilbert Strang: Introduction to Linear Algebra, 5thEdition, Wellesley-Cambridge Press., 2016
- 2. Richard Bronson: "Schaum's Outlines of Theory and Problems of Matrix Operations", McGraw-Hill, 1988.
- 3. Scott L.Miller, DonaldG.Childers: "Probability and Random Process with application to Signal Processing", Elsevier Academic Press, 2nd Edition, 2013.

PATTER	N RECOGNITION	AND MACHI	NE LE	ARNIN	G
[As per Choice Based Credit System (CBCS) Scheme] SEMESTER-I					
Subject Code	19LDE142	CIE Marks		50	
Number Lecture	03	SEE Marks		50	
Hour/Week					
Number of Lecture	40	Exam Hours		03	
Hours					
	CRED	ITS-03			
Course Objectives:	The objective of the co	ourse is to discu	isses		
1. Main and mo	odern concepts for mo	odel selection a	and par	ameter	estimation in
recognition, o	lecision making and st	atistical learnin	ig prob	lems.	
2. Special empl	nasis will be given to	o regression, c	lassific	ation, re	gularization,
feature select	ion and density estima	tion in supervis	sed mo	de of lea	rning.
Modules			Teach	ning	Revised
			Hour	S	Bloom's
					1 axonom
					y(KD1) Lovol
Module -1					Level
Introduction · Proba	bility Theory Model 9	Selection The	08 H	iirs	L1 L2
Curse of Dimension	ality. Decision Theory	Information	00 110	Juis	L1, L2
Theory Distribution	ons: Binary and	Multinomial			
Variables, The Gaus	sian Distribution, The	e Exponential			
Family, Nonparamet	ric Methods.	1			
Module -2					
Supervised Learni	ng Linear Regress	ion Models:	08 Ho	ours	L1,L2
Linear Basis Func	tion Models, The	BiasVariance			
Decomposition, Bay	esian Linear Regress	ion, Bayesian			
Model Comparison	Classification&Linear	Discriminant			
Analysis: Discrim	inant Functions,	Probabilistic			
Generative Models, 1	Probabilistic Discrimir	native Mode			
Module -3			[Γ
Supervised Learnin	ng Kernels: Dual Re	presentations,	08 H o	ours	L1, L2
Constructing Kernel	s, Radial Basis Funct	tion Network,			
Gaussian Processe	s Support Vector	Machines:			
Maximum Margin	Classifiers, Releva	ance Vector			
Machines Neural Networks: Feed-forward Network,					
Modulo 4	nor back propagation	••			
Unsupervised Lear	ming: Mixture Mod	els. K-means	08 H	urs	1213
Clustering Mixtu	res of Gaussians	Maximum	00 110	Juis	12, 15
likelihood EM for G	aussian mixtures. Alte	ernative View			
of EM.					
Dimensionality R	eduction: Principal	Component			
Analysis, Factor/Co	omponent Analysis,	Probabilistic			
PCA, Kernel PCA, N	Ionlinear Latent Varia	ble Models.			
Module -5					

Probabilistic Graphical Models: Bayesian Networks,	08 Hours	L2, L3		
Conditional Independence, Markov Random Fields,				
Inference in Graphical Models, Markov Model, Hidden				
Markov Models.				
Course outcomes: At the end of this course, students will	be able to			
1. Identify areas where Pattern Recognition and Machine Learning can offer a solution.				
2. Describe the strength and limitations of some techniques used in computational Machine Learning for classification, regression and density estimation problems.				
3. Describe and model data.				
4. Solve problems in Regression and Classification.				
Text Book:				
1. Pattern Recognition and Machine Learning. Christophe	er Bishop. Sprin	ger, 2006		

	WIRELESS	SECURITY				
[As per Choice Based Credit System (CBCS) Scheme]						
	SEMES	STER- I				
Subject Code	19LDN143	CIE Marks		50		
Number of Lecture	03	SEE Marks		50		
Hour/Week						
Total Number of	40	Exam Hours		03		
Lecture Hours						
CREDITS-03						
Course Objectives:	Course Objectives: This course will enable students to:					
1. Study the sy	ystem security issues	in wireless s	ystems	, includ	ing satellite,	
terrestrial mi	crowave, military tac	ctical communi	ications	s, and p	ublic safety,	
cellular and v	vireless LAN networks	5.				
2. Security top	ics include confident	iality/privacy,	integri	ity, avai	lability, and	
control of fra	audulent usage of net	works. Issues a	address	ed inclu	de jamming,	
interception a	and means to avoid the	m.				
3. Understand t	he various ways in wh	nich wireless ne	etworks	s can be	attacked and	
tradeoffs in p	rotecting networks.					
4. Understand of	of underlying system	applications a	nd pot	ential se	curity issues	
early in the d	esign process.					
Modules			Teach	ning	Revised	
			Hours	S	Bloom's	
					Taxonomy	
					(RBT)	
					Level	
Module -1	ang Threader Ductostin	a the Meene	00 II.		111212	
introduction: wirel	Drotooting Drivoov	g the Means	Vð H Ú	ours	L1,L2,L3	
Sofety Understandin	Wireless Ford	, Promoting				
Bassonable Degrees	g where so role	casts, and				
Reasonable Degrees	Collular Notworks	y issues and				
Technologies	. Cellular Networks	and Dearer				
Madula 2						
Module -2	a and mulnarabilitia	a. Talanhana	00 II.		111212	
System Vulnerabiliti	a unintentional Inter	s: Telephone	VO H U	ours	L1,L2,L3	
Dhono Vulnerabilit	ios Issue of Prive	Sotollito				
Communications: (les, issue of Filva	vstom Wido				
Area Augmentation	Sustam Satallita	Sourch and				
Rescue Communic	ations: Voice Video	and Data				
Satellite Internet Es	attolis. Voice, Video	cial Imaging				
Landsat SPOT	ath Sensing. Commer	ciai imaging,				
Module -3						
European Remote	Sensing: IKONOS	S. Computer	08 Ho	mrs	L1.L2.L3	
crime. Security of	Information System	s. Balancing			, , C	
Information Techn	ology Information	Vulnerability				
Importance of Info	ormation Lock-and-K	ev Analogy				
Classical Cryptanal	vsis. Digital Cryptop	raphy. Brute				
Force Attacks	,, <u>2.9</u> Cryptog	,				
Module -4						

Wireless Attacks: Standard Attacks. Advanced Attacks. 08 Hours L1. L2.L3				
Two Limits of Encryption Block versus stream Ciphers				
The Stream Cipher Synchronization Problem Non-				
Keved Message Digests SHA-1 in the Encryption				
Mode HORNET Entrony Accumulator Description				
Sync nad and Data Encryption Key Advanced				
Encryption Standard Key Management-Generation and				
Distribution of Keys				
Module_5				
Wireless Security protocols: The Wireless Local Area 08 Hours 111213				
Network (WI AN) Wireless Application Protocol				
(WAP) Wireless Transport I over Security Bluetooth				
(wAF), whereas interpole Layer Security Bluetooth.				
Lourse outcomes: After studying this course, students will be able to:				
1. Address wireless security issues and Economic tradeons.				
2. Analyze Air-ground-interface and vulnerabilities.				
3. Apply digital cryptography in wireless transmission.				
4. List the Limits of Encryption Block and stream Ciphers.				
5. Describe various wireless security protocols.				
Text Books:				
1. Nichols and Lekkas "Wireless Security – Models, Threats, and Solutions," by,				
McGraw-Hill, 2002.				
2. Jon Edney and William A. Arbaugh. "Real 802.11 Security: Wi-Fi Protected				
Access and 802.11i", Addison-Wesley Professional, 2003				
Reference Books:				
1. Andrew Vladimirov, Konstantin V. Gavrilenko, and Andrei A. Mikhailovsky.				
"Wi-Foo: The Secrets of Wireless Hacking", Addison-Wesley Professional,				
2004.				
2. Johnny Cache and Vincent Liu "Hacking Exposed Wireless", McGraw Hill				
Companies, 2007.				

RESEARCH METHODOLOGY AND IPR				
[As	[As per Choice Based Credit System (CBCS) Scheme]			
	SEME	STER-I		
Subject Code19RM15CIE Marks50				
Number Lecture	02	SEE Marks	50	
Hour/Week				
Number of Lecture	30	Exam Hours	03	
Hours				
CREDITS-02				

Course objectives:

- 1. To give an overview of the research methodology and explain the technique of defining a research problem
- 2. To explain the functions of the literature review in research.
- 3. To explain carrying out a literature search, its review, developing theoretical and conceptual frameworks and writing a review.
- 4. To explain various research designs and their characteristics.
- 5. To explain the details of sampling designs, and also different methods of data collections.
- 6. To explain the art of interpretation and the art of writing research reports.
- 7. To explain various forms of the intellectual property, its relevance and business impact in the changing global business environment.
- 8. To discuss leading International Instruments concerning Intellectual Property Rights.

Kigino.		
Modules	Teaching	Revised
	Hours	Bloom's
		Taxonomy
		(RBT) Level
Module -1		
Research Methodology: Introduction, Meaning of	06 Hours	L1,L2
Research, Objectives of Research, Motivation in		
Research, Types of Research, Research Approaches,		
Significance of Research, Research Methods versus		
Methodology, Research and Scientific Method,		
Importance of Knowing How Research is Done, Research		
Process, Criteria of Good Research, and Problems		
Encountered by Researchers in India.		
Module -2		
Defining the Research Problem: Research Problem,	06 Hours	L1,L2
Selecting the Problem, Necessity of Defining the		
Problem, Technique Involved in Defining a Problem, An		
Illustration.		
Reviewing the literature: Place of the literature review		
in research, Bringing clarity and focus to your research		
problem, Improving research methodology, Broadening		
knowledge base in research area, Enabling contextual		
findings, How to review the literature, searching the		
existing literature, reviewing the selected literature,		
Developing a theoretical framework, Developing a		

conceptual framework, Writing about the literature		
Module -3		
 Research Design: Meaning of Research Design, Need for Research Design, Features of a Good Design, Important Concepts Relating to Research Design, Different Research Designs, Basic Principles of Experimental Designs, Important Experimental Designs. Design of Sample Surveys: Introduction, Sample Design, Sampling and Non-sampling Errors, Sample Survey versus Census Survey, Types of Sampling Designs. 	06 Hours	L1,L2, L3
Module-4		
 Data Collection: Experimental and Surveys, Collection of Primary Data, Collection of Secondary Data, Selection of Appropriate Method for Data Collection, Case Study Method. Interpretation and Report Writing: Meaning of Interpretation, Technique of Interpretation, Precaution in Interpretation, Significance of Report Writing, Different Steps in Writing Report, Layout of the Research Report, Types of Reports, Oral Presentation, Mechanics of Writing a Research Report, Precautions for Writing Research Reports. 	06 Hours	L1, L2, L3
Module-5		
Intellectual Property: The Concept, Intellectual Property System in India, Development of TRIPS Complied Regime in India, Patents Act, 1970, Trade Mark Act, 1999, The Designs Act, 2000, The Geographical Indications of Goods (Registration and Protection) Act1999, Copyright Act,1957, The Protection of Plant Varieties and Farmers' Rights Act, 2001, The Semi- Conductor Integrated Circuits Layout Design Act, 2000, Trade Secrets, Utility Models, IPR and Biodiversity, The Convention on Biological Diversity (CBD) 1992, Competing Rationales for Protection of IPRs, Leading International Instruments Concerning IPR, World Intellectual Property Organisation (WIPO), WIPO and WTO, Paris Convention for the Protection of Industrial Property, National Treatment, Right of Priority, Common Rules, Patents, Marks, Industrial Designs, Trade Names, Indications of Source, Unfair Competition, Patent Cooperation Treaty (PCT), Advantages of PCT Filing, Berne Convention for the Protection of Protection, Trade Related Aspects of Intellectual Property Rights(TRIPS) Agreement, Covered under TRIPS Agreement, Features of the Agreement, Protection of	06 Hours	L1,L2, L3

Intellectual Property under TRIPS, Copyright and	
Related Rights, Trademarks, Geographical indications,	
Industrial Designs, Patents, Patentable Subject Matter,	
Rights Conferred, Exceptions, Term of protection,	
Conditions on Patent Applicants, Process Patents, Other	
Use without Authorization of the Right Holder,	
Layout-Designs of Integrated Circuits, Protection of	
Undisclosed Information, Enforcement of Intellectual	
Property Rights, UNSECO.	

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

- 1. Discuss research methodology and the technique of defining a research problem
- 2. Explain the functions of the literature review in research, carrying out a literature search, developing theoretical and conceptual frameworks and writing a review.
- 3. Explain various research designs and their characteristics.
- 4. Explain the art of interpretation and the art of writing research reports

Text Books:

- **1.** Research Methodology: Methods and Techniques C.R. Kothari, Gaurav Garg New Age International 4th Edition, 2018.
- **2.** Research Methodology a step-by- Research Methodology a step-by- Ranjit Kumar, SAGE PublicationsLtd, 3rd Edition, 2011.
- **3.** Study Material (For the topic Intellectual Property under module 5) Professional Programme Intellectual Property Rights, Law and Practice, The Institute of Company Secretaries of India, Statutory Body Under an Act of Parliament, September 2013.

Reference Books:

- 1) Research Methods: the concise knowledge base Trochim ,Atomic Dog Publishing 2005
- 2) Conducting Research Literature Reviews: From the Internet to Paper, Fink A Sage Publications 2009

ADVANCED COMMUNICATION LAB					
[As per	[As per Choice Based Credit System (CBCS) Scheme]				
_	SEMESTE	ĒR-I			
Subject Code	19LDNL16 CIE Marks 50				
Number Lab practice	01Hr Tutorial	SEE Marks	50		
Hour/Week	(Instructions) +				
	02				
	HoursLaboratory				
Exam Hours 03					
CREDITS-02					

Course Objectives: This course will enable students to:

- 1. Radiation pattern of antennas.
- 2. Determining gain and directivity of a given antenna.
- 3. Working of Klystron source.
- 4. S-parameters of some microwave passive devices.

Laboratory Experiments

Following Experiments to be done using MATLAB / SCILAB / OCTAVE or equivalent:

- 1. Matlab/C implementation of to obtain the radiation pattern of an antenna.
- 2. Study of radiation pattern of different antennas.
- 3. Determine the directivity and gains of Horn/ Yagi/ dipole/Parabolic antennas.
- 4. Impedance measurements of Horn/Yagi/dipole/Parabolic antennas.
- 5. Study of radiation pattern of E & H plane horns.
- 6. Significance of Pocklington's integral equation.
- 7. Study of digital modulation techniques.
- 8. Conduct an experiment for Voice and data multiplexing using optical fiber.
- 9. Determination of the modes transit time, electronic timing range and sensitivity of Klystron source.
- 10. Determination of VI characteristics of GUNN diode, and measurement of guide wave length, frequency, and VSWR.
- 11. Determination of coupling coefficient and insertion loss of directional couplers.
- 12. Generation of pseudo-random sequence and its properties.

Course outcomes: After studying this course, students will be able to:

- 1. Plot the radiation pattern of some antennas using matlab and wave guide setup
- 2. Obtain the S-parameters of Magic tee and directional couplers.
- 3. Test the IC CD4051 for modulation techniques.
- 4. Study multiplexing techniques using OFC kit...

Reference Book

1 . John G. Proakis, Masoud Salehi, "Digital Communications", McGraw Hill, 5th Edition, 2008.

	NETWORK SIN	IULATION LAB - I		
[As	[As per Choice Based Credit System (CBCS) scheme]			
	SEME	ESTER – I		
Laboratory code	19LDNL17	CIE Marks	50	
Number Lecture	01Hr Tutorial	SEE Marks	50	
Hour/Week	(Instructions) +			
	02			
	HoursLaboratory	Even Herre	02	
	CPE	DITS 02	03	
Course Objective	CKL s. This laboratory	course enables students	to get practical	
experience on the		course enables students	to get practical	
1 To get some	e exposure to one of th	e most useful tools in Net	work research and	
developmen	it.		i on rescaren and	
2. Understand	and design network to	pology using NS2.		
3. Understand	and design wireless an	nd wired network using N	S2.	
4. Understand	the scenario and study	the performance of vario	us network	
protocols th	rough simulation.			
5. Understand	the concept of Routin	g algorithm using Distance	e vector algorithm.	
C. Understand	the basic concents of	avalia and an and avalain 1	· ···· ····lia	
6. Understand	check works	cyclic codes, and explain I	now cyclic	
redundancy	check works			
Part – A · Experim	ents to be done using	Network Simulators		
1 Demonstra	ate Concepts of fundat	nental Network		
Topology -	Star. Bus. Ring.	nontal i (ot work	L1. L2. L3	
2. Implementation of High Level Data Link Control		,,		
3. To create s	cenario and study the	performance of network		
with CSM	A / CA protocol and co	ompare with CSMA/CD		
protocols.		•		
4. Implement	ation of distance vector	or routing algorithm.		
5. Implement	tation of Link state rou	ting algorithm.		
6. Implement	ting a wireless sensor	network.		
7. Simulate a	Mobile Adhoc Netwo	ork.		
8. Implement	t Transport Control Pr	otocol in Sensor		
Network.				
Dout D. Frunoutur	anta ta ha dana usina			
Part – B: Experim	ents to be done using	g using C/C++ or	L2, L3	
		Omnent		
9. Write a pro	ogram for error detecti	ng code using CRC.		
10. Write a pro	gram for a HLDC fra	me to perform the		
following.	i) Bit stuffing ii) Char	acter stuffing.		
11. Implement window.	ation of Stop and Wai	t Protcol and sliding		

12. Implementation and study of Goback-N and selective
repeat protocols.
ourse outcomes: On the completion of this laboratory course, the students will be
le to:
1. Learn the basic idea about open source network simulator NS2 and how to
download, install and work with NS2 using TCL programming.
2. Understand the performance of network with CSMA/CA protocol and
CSMA/CD protocol
3. Understand the basic concepts Mobile Adhoc Network.
4. Students get exposure to the real implementation of the computer network
scenarios.
5. Understand the basic concepts of link layer properties including error-

Reference Books:

detection.

1. S. S. Manvi, and M. S. Kakkasageri, "Wireless and Mobile network concepts and Protocols", Wiley, 1st edition, 2010.

	ADVAN	CED DSP			
[As]	[As per Choice Based Credit System (CBCS) Scheme]				
	SEMES	STER-II			
Subject Code	19LDN21	CIE Marks		50	
Number of Lecture	03	SEE Marks		50	
Hour/Week					
Total Number of	40	Exam Hours		03	
Lecture Hours					
	CRED	DITS-03			
Course Objectives:	This course will enabl	e students to:			
1. Understand	Multirate digital signa	I processing pr	inciples	s and its	applications.
2. Estimate the	e various spectral com	ponents present	in the	received	signal using
2 Design and	ectral estimation metho	ods such as Para	ametric	and No	nparametric.
5. Design and	implement an optimur	n adaptive mile	r using	LMS an	u RLS
algorithms.	the concents and math	amatical ran	antotio	ne of W	avalat
4. Understand	the concepts and math	lematical repres	sentatio		avelet
transforms.					
Modules			Teach	ning	Revised
Woulds			Hour	5	Bloom's
			nour	5	Taxonomy
					(RBT)
					Level
Module -1					20101
Multirate Digital Signal Processing: Introduction,			08 H o	ours	L1,L2,L3
decimation by a factor 'D', Interpolation by a factor 'I',					<i>, ,</i>
sampling rate conversion by a factor 'I/D',					
Implementation of sa	ampling rate conversion	on, Multistage			
implementation o	f sampling rate	conversion,			
Applications of mult	irate signal processing	, Digital filter			
banks, two channel	quadrature mirror filt	ter banks, M-			
channel QMF bank.	(Text 1)				
Module -2					
Linear prediction	and Optimum Lin	near Filters:	08 H o	ours	L1,L2,L3
Random signals, (Correlation Functions	and Power			
Spectra, Innovation	s Representation of	a Stationary			
Random Process.	Forward and Back	ward Linear			
Prediction. Solution of the Normal Equations The					
Levinson-Durbin Algorithm. Properties of the Linear					
Module 2					
Module - 5					
Adaptive filters:	Applications of ada	iptive filters,	U8 H 0	ours	L1,L2,L3
Adaptive channel	equalization,, Au	aptive noise			
cancellation, Linear Predictive coding of Speech					
algorithm Properties	of I MS algorithm A	daptive direct			
form filters DI S also	or Livio algoriumi. A Iorithm (Tovt 1)				
Modulo _1	, (1 CAL 1).				

Power Spectrum Estimation: Power Spectrum Estimation: Non parametric Methods for Power Spectrum Estimation - Bartlett Method, Welch Method, Blackman and Tukey Methods. Parametric Methods for Power Spectrum Estimation: Relationship between the auto correlation and the model parameters, Yule and Walker methods for the AR Model Parameters, Burg Method for the AR Model parameters. Unconstrained	08 Hours	L1, L2,L3	
least-squares method for the AR Model parameters, Sequential estimation methods for the AR Model parameters, ARMA Model for Power Spectrum Estimation. (Text 1)			
Module-5			
 Wavelet Transforms: The Age of Wavelets, The origin of Wavelets, Wavelets and other reality transforms, History of wavelets, Wavelets of the future. Continuous Wavelet and Short Time Fourier Transform: Wavelet Transform, Mathematical preliminaries, Properties of wavelets. Discrete Wavelet Transform: Haar scaling functions, Haar wavelet function, Daubechies Wavelets. (Chapters 1, 3 & 4 of Text 2) Course outcomes: After studying this course, students with 1. Design adaptive filters for a given application 2. Design multirate DSP Systems 	08 Hours ill be able to:	L1,L2,L3	
 Design multirate DSP Systems Implement adaptive signal processing algorithm Design active networks Understand advanced signal processing techniques, including multi-rate processing and time-frequency analysis techniques 			
 Text Books: "Digital Signal Processing, Principles, Algorithms and Applications", John G.Proakis, Dimitris G.Manolakis, Fourth edition, Pearson-2007. Insight into Wavelets- from Theory to Practice", K.P Soman, Ramachandran, Resmi- PHI Third Edition-2010. 			
 Reference Books: "Modern Digital signal processing", Robert. O. Cristi, Cengage Publishers, India, 2003. "Digital signal processing: A Practitioner's approach", E.C. Ifeachor, and B. W. Jarvis, , Second Edition, Pearson Education, India, 2002, Reprint. "Wavelet Transforms, Introduction to Theory and applications", Raghuveer. M. Rao, Ajit S.Bopardikar, Pearson Education, Asia, 2000. 			

ERROR CONTROL CODIN	[<u>G</u>			
[As per Choice Based Credit System (CB	CS) Sch	eme]		
SEMESTER-II				
Subject Code19LDE22CIE Marks		50		
Number of Lecture03SEE Marks		50		
Hour/Week				
Total Number of40Exam Hours		03		
Lecture Hours				
CREDITS-03				
Course Objectives: This course will enable students to:				
1. Understand the concept of the Entropy, informat	ion rate	and cap	pacity for the	
Discrete memoryless channel.				
2. Apply modern algebra and probability theory for t	he codin	ıg.		
3. Compare Block codes such as Linear Block C	odes, C	yclic co	odes etc and	
Convolutional codes.				
4. Detect and correct errors for different data of	commun	ication	and storage	
systems.				
5. Implement different Block code encoders and dec	oders.			
6. Analyze and implement convolutional encoders an		lers.	1 1' C	
7. Analyze and apply soft and hard Viterbi a	algorithn	n for	decoding of	
convolutional codes.				
Modulos	Tooch	ing	Dovisod	
Modules	Hours	ing	Revised Ploom's	
	nours		DIOOIII S Toxonomy	
			(DRT)	
			(KDI) Lovol	
Module 1			Level	
Information theory: Introduction Entropy Source	08 Hor	IFC	111213	
coding theorem discrete memoryless channel Mutual	00 110	115	11,12,13	
Information Channel Capacity Channel coding				
theorem (Chap 5 of Text 1) Introduction to algebra:				
Groups Fields binary field arithmetic Construction of				
Galois Fields $GE(2m)$ and its properties (Only				
statements of theorems without proof. Computation				
using Galois filed GE $(2m)$ arithmetic Vector spaces				
and Matrices (Chan 2 of Text 2)				
Module -2				
Linear block codes: Generator and parity check	08 Ho	irs	L1L2L3	
matrices Encoding circuits Syndrome and error		41 5	11,112,115	
detection Minimum distance considerations Error				
detecting and error correcting capabilities. Standard				
array and syndrome decoding. Single Parity Check				
Codes(SPC).Repetition codes. Self dual codes.				
Hamming codes. Reed Muller codes. Product codes and				
Interleaved codes. (Chap. 3 of Text 2)				
Module -3				
Cyclic codes: Introduction, Generator and parity check	08 Ho	urs	L1,L2	
polynomials, Encoding of cyclic codes. Syndrome			,	
computing and error detection, Decoding of cyclic				

	1		
codes, Error trapping Decoding, Cyclic hamming codes,			
Shortened cyclic codes.(Chap. 4 of Text 2).			
Module -4			
BCH Codes: Binary primitive BCH codes, Decoding procedures, Implementation of Galois field arithmetic, Implementation of error correction. (Chap. 6 of Text 2) 28 Reed -Solomon codes. (Chap. 7 of Text 2) Majority Logic decodable codes: One -step majority logic decodable codes, Two-step majority logic, decoding, Multiple-step majority logic. (Chap. 8 of Text 2).	08 Hours	L1, L2,L3	
Module-5	•		
Convolutioncodes:ConvolutionalEncoding,ConvolutionalEncoderRepresentation,Formulation oftheConvolutionalDecodingProblem,PropertiesConvolutionalCodes:Distancepropertyofconvolutionalcodes,SystematicandNonsystematicConvolutionalCodes,PerformanceBoundsforConvolutionalCodes,CodingGain.OtherConvolutionalDecodingAlgorithms:SequentialDecoding, FeedbackDecoding.(Chap. 7 of Text 3)Course outcomes:After studying this course, students with1.Analyse a discrete memoryless channel, given theIn 1997	08 Hours 08 Hours ill be able to: source and tran	L1,L2,L3	
probabilities.2. Apply the concept of modern linear algebra for the error control coding technique.3. Construct and Implement efficient LBC, Cyclic codes etc encoder and			
decoders.4. Apply decoding algorithms for efficient decoding of Block codes and Convolutional codes.			
Text Books:			
 Simon Haykin, "Digital Communication systems", First edition, Wiley India Private. Ltd, 2014. ISBN 978-81-265-4231-4 Shu Lin and Daniel J. Costello. Jr, "Error control coding", Pearson, Prentice Hall, 2nd edition, 2004. Bernard Sklar, "Digital Communications - Fundamentals and Applications", 2nd Edition Pearson Education (Asia) Ptv. Ltd, 2001. 			
Reference Books:			
 Blahut. R. E, "Theory and practice of error contr 1984. 	ol codes", Add	ison Wesley,	
 Salvatore Gravano, "Introduction to Error control press,2007. 	l coding", Oxfo	rd university	

RF AND MICROWAVE CIRCUIT DESIGN					
[As per Choice Based Credit System (CBCS) Scheme]					
SEMESTER-II					
Subject Code	19LDN231	CIE Marks		50	
Number Lecture	03	SEE Marks		50	
Hour/Week					
Number of Lecture	40	Exam Hours		03	
Hours					
	CRED	DITS-03	•		
Course Objectives: This course will enable students to:					
1. Understand waves propagating in Networks.					
2. Use the Smith	Chart for various appl	ications.			
3. Understand th	e basic considerations	in active networ	:ks		
4. Design active	networks.				
5. Understand R	F/MW Frequency Mixed	er and Phase Sh	ifter Design		
Modules			Teaching	Revised	
			Hours	Bloom's	
				Taxonomy	
				(RBT) Level	
Module -1				•	
Wave propagation	in networks: Introduc	ction, Reasons	08 Hours	L1, L2, L3	
for Using RF/Microv	waves, Applications, F	RF Waves, RF		, ,	
and Microwave	circuit design, Int	roduction to			
Components Basics,	Analysis of Simple Cir	rcuit in Phasor			
Domain, RF Impeda	nce Matching, Transn	nission Media,			
High Frequency	Parameters, Formula	tion of S-			
parameters, Properti	es of S-Parameters,	Transmission			
Matrix, Generalized S	S-parameters.				
Module -2	1				
Smith chart and its	Applications: Introduc	tion. Smith	08 Hours	L1.L2. L3	
Chart. Derivation of	Smith Chart. Smith	Chart Circular		,	
and	·····				
Radial Scales, Applic	ation of Smith chart.				
Module -3					
Basic consideration	in active networks: St	ability	08 Hours	L1.L2	
Considerations, Gain	Considerations and No	oise			
Considerations.					
Module -4					
RF/Microwave Amr	lifiers: Small Signal D	Design:	08 Hours	L1. L2.L3	
Introduction. Types of	of amplifier. Design of	different types	00 110415	,,,	
of amplifiers.		amerene types			
RF/Microwave Free	mency Conversion: M	ixers:			
Introduction. Mixer	Types. Conversion La	osses for SSB			
Mixers, SSB versus I	DSB mixers. One diod	e mixers. Two			
diode Mixers.		, 0			
Module-5					
RE/Microwave Control Circuit Design: Introduction 08 Hours 111213					
PN	and the second states and the second s		55 HUUIS		
'				1	

Junction	Devices, Phase shifters, Digital phase shifters,				
Semicor	nductor phase shifters, PIN diode attenuators.				
RF and	Microwave IC design: MICs, MIC materials,				
Types of	of MICs, Hybrid verses Monolithic ICs, Chip				
mathema	atics				
Course	Outcomes: After studying this course, students will be able to:				
1. Discuss and analyse waves propagation in Networks					
2. A	2. Apply the Smith Chart for finding various parameters in transmission Lines				
3. A	3. Analyse the basic considerations in active networks				
4. I	4. Describe and design active networks				
5. I	5. Design RF/MW Frequency Mixers and phase shifters				
Text Bo	ook:				
1. Matthew M. Radmanesh, "RF and Microwave Electronics Illustrated",					
Pearson Education edition, 2004.					
Referen	ce Book:				
1. F	Reinhold Ludwig, and Pavel Bretchko, "RF circuit design theory and				
applications", Pearson Education edition, 2004.					

A	DVANCED COMPU	TER NETV	VORK	<u>S</u>	
[As pe	r Choice Based Credit	System (CB	CS) Scl	heme]	
	SEMEST	ER-II			
Subject Code	19LDN232	CIE Marks		50	
Number of Lecture	03	SEE Marks	5	50	
Hour/Week					
Total Number of	40	Exam Hours 03		03	
Lecture Hours					
CREDITS-03					
Course Objectives: 7	This course will enable	students to:			
1. Overview of In	nternet-Concepts.				
2. Packet Schedu	ling Algorithms-requir	ements, Sch	eduling	guarant	eed service.
3. Control theore	tic analysis of active qu	ieue manage	ment.		
4. Concept of Eff	fective bandwidth.				
5. IPV4, IPV6, II	P tunneling				
Modules			Teaching		Revised
			Hours	5	Bloom's
					Taxonomy
					(RBT)
					Level
Module -1					-
Internet Concepts:	Overview of Internet	t-Concepts,	08 H o	ours	L1,L2,L3
challenges and histor	ry. Overview of -ATI	M. TCP/IP			
Congestion and Flow	Control in Internet-	Fhroughput			
analysis of TCP co	ngestion control. TCI	P for high			
bandwidth delay netw	orks. Fairness issues in	TCP.			
Module -2			I		
Real Time Commun	ications over Internet	t. Adaptive	08 H o	ours	L1,L2,L3
applications. Latency	and throughput issues.	Integrated			
Services Model (int	Serv). Resource rese	ervation in			
Internet. RSVP, Chara	acterization of Traffic b	by Linearly			
Bounded Arrival Pr	ocesses (LBAP). Lea	iky bucket			
algorithm and its prop	perties				
Module -3			1		T
Packet Scheduling	Algorithms: Require	ments and	08 H o	ours	L1,L2,L3
choices. Scheduling	guaranteed service co	onnections.			
GPS, WFQ and Rat	e proportional algorit	hms. High			
speed scheduler desig	n. Theory of Latency R	late servers			
and delay bounds in	n packet switched ne	tworks for			
LBAP traffic. Activ	e Queue Managemer	nt - RED,			
WRED and Virtual cl	lock. Control theoretic	analysis of			
active queue manager	nent.				
Nodule -4			00.77		11 1010
IP address lookup-	challenges: Packet cla	assification	08 H o	ours	L1, L2,L3
algorithms and Flow	Identification-Grid of I	ries, Cross			
producting and contro	billed prefix expansion a	algorithms.			
Admission control in	n Internet. Concept of	I Effective			
bandwidth. Measure	ment based admissio	n control.			
Differentiated Service	es in internet (DiffServ). DIIIServ			
architecture and frame	ework.				1

Module-5				
IPV4, IPV6 : IP tunneling, IPswitching and MPLS, 08 Hours L1,L2,L3				
Overview of IP over ATM and its evolution to IP				
switching. MPLS architecture and framework. MPLS				
Protocols. Traffic engineering issues in MPLS.				
Course outcomes: After studying this course, students will be able to:				
1. Acquire knowledge of characteristics of mobile/wireless communication				
channels				
2. Understand advanced concepts in Communication Networking.				
3. Design and develop protocols for Communication Networks.				
4. Understand the mechanisms in Quality of Service in networking.				
5. Optimise the Network Design.				
Text Books:				
1. Jean Wairand and PravinVaraiya, "High Performance Communications				
Networks", 2 nd edition, 2000				
2. Jean Le Boudec and Patrick Thiran, "Network Calculus A Theory of				
Deterministic Queueing Systems for the Internet", Springer Veriag, 2001.				
3. Zhang Wang, "Internet QoS", Morgan Kaufman, 2001				
Reference Books:				
1. Anurag Kumar, D. Manjunath and Joy Kuri, "Communication Networking:				
An Analytical Approach", Morgan Kaufman Publishers, 2004.				

WIRELESS SENSOR NETWORKS					
[As per Choice Based Credit System (CBCS) Scheme]					
SEMESTER-II					
Subject Code	19LDN233	CIE Marks	50		
Number of	03	SEE Marks	50		
Lecture					
Hour/Week					
Total Number of	40	Exam Hours	03		
Lecture Hours					
CREDITS-03					
Course Objectives: This course will enable students to:					
1. Explain sen	sor networks for varie	ous application setup	S.		
2. Demonstrate	e the design space and	d conduct trade-off a	nalysis between		
performance	e and resources.				
3. Assess cove	rage and conduct not	le deployment planni	ing.		
4. Devise appr	opriate data dissemin	ation protocols and r	nodel links cost.		
5. Determine s	uitable medium acce	ss protocols and radio	o hardware.		
6. Illustrate ser	nsor networks using c	commercial compone	ents.		
7. Discuss qua	lity of service, fault-t	olerance, security an	d other dependability		
requirement	s while coping with r	resource constraints.			
Modules		Teach	ning Revised		
		Hours	s Bloom's		
			Taxonomy		
	_		(RBT) Level		
Module -1					
Introduction: Ov	verview and Appl	ications of 08 Ho	ours L1,L2,L3		
Wireless Sensor	Networks Introduc	tion, Basic			
overview of the	Technology, App	lications of			
Wireless Senso	r Networks:	Introduction,			
Background, Rang	e of Applications, I	Examples of			
Category 2 WSI	N Applications, E	xamples of			
Category 1 WSN A	Applications, Anothe	r Taxonomy			
of WSN Technolog	y. (Chapter 1: 1.1, 1)	2, Chapter2:			
2.1-2.6)					
Module -2					
Basic Wireless Se	nsor Technology ar	nd Systems: 08 Ho			
Introduction, Sens					
Taxonomy W/N	sor Node Technolo	bgy, Sensor			
	or Node Technolo Operating Environ	by sensor ogy, Sensor iment, WN			
Trends, Wireless	sor Node Technolo Operating Environ Transmission Tech	ogy, Sensor ment, WN nology and			
Trends, Wireless Systems: Introduct	sor Node Technolo Operating Environ Transmission Tech ion, Radio Technol	ogy, Sensor ment, WN nology and ogy Primer,			
Trends, Wireless Systems: Introduct Available Wireless	sor Node Technolo Operating Environ Transmission Tech ion, Radio Technol Technologies (Chapt	ogy, Sensor ument, WN nology and ogy Primer, cer3: 3.1-3.5,			
Trends, Wireless Systems: Introduct Available Wireless Chapter 4: 4.1-4.3)	sor Node Technolo Operating Environ Transmission Tech ion, Radio Technol Technologies (Chapt	by Sensor ogy, Sensor ment, WN nology and ogy Primer, cer3: 3.1-3.5,			
Trends, Wireless Systems: Introduct Available Wireless Chapter 4: 4.1-4.3) Module -3	sor Node Technolo Operating Enviror Transmission Tech ion, Radio Technol Technologies (Chapt	a systems. 00 mo ogy, Sensor ment, WN nology and ogy Primer, eer3: 3.1-3.5,			
Trends, Wireless Systems: Introduct Available Wireless Chapter 4: 4.1-4.3) Module -3 MAC and Routing	sor Node Technolo Operating Enviror Transmission Tech ion, Radio Technol Technologies (Chapt	eless Sensor 08 Ho	ours L1,L2,L3		
Trends, Wireless Systems: Introduct Available Wireless Chapter 4: 4.1-4.3) Module -3 MAC and Routing Networks: Introduc	sor Node Technolo Operating Enviror Transmission Tech ion, Radio Technol Technologies (Chapt g Protocols for Wire ction, Background, F	eless Sensor undamentals	ours L1,L2,L3		
Trends, Wireless Systems: Introduct Available Wireless Chapter 4: 4.1-4.3) Module -3 MAC and Routing Networks: Introduct of MAC Protocol	sor Node Technolo Operating Enviror Transmission Tech ion, Radio Technol Technologies (Chapt g Protocols for Wire ction, Background, F s, MAC Protocols	au Systems. 00 Ho ogy, Sensor ument, WN nology and ogy Primer, cer3: 3.1-3.5, eless Sensor 08 Ho undamentals for for WSNs,	ours L1,L2,L3		
Trends, Wireless Systems: Introduct Available Wireless Chapter 4: 4.1-4.3) Module -3 MAC and Routing Networks: Introduct of MAC Protocol Sensor-MAC case	sor Node Technolo Operating Enviror Transmission Tech ion, Radio Technol Technologies (Chapt g Protocols for Wire ction, Background, F s, MAC Protocols Study, IEEE 80	au Systems. 00 Ho ogy, Sensor ument, WN nology and ogy Primer, cer3: 3.1-3.5, eless Sensor 08 Ho undamentals for for WSNs, /2.15.4 LR-	Durs L1,L2,L3		
Trends, Wireless Systems: Introduct Available Wireless Chapter 4: 4.1-4.3) Module -3 MAC and Routing Networks: Introdu- of MAC Protocol Sensor-MAC case WPANs Standard C	sor Node Technolo Operating Enviror Transmission Tech ion, Radio Technol Technologies (Chapt g Protocols for Wire ction, Background, F s, MAC Protocols Study, IEEE 80 Case Study. Routing I	au Systems. oo Interpretended ogy, Sensor on Interpretended ument, WN nology and ogy Primer, or 3.1-3.5, eless Sensor 08 Ho undamentals for WSNs, 2.15.4 LR- Protocols for or and	ours L1,L2,L3		
	1				
--	--------------------------	-----------------			
Background, Data Dissemination and Gathering, Routing Challenges and Design Issues in WSNs, Routing Strategies in WSNs. (Chapter 5: 5.1-5.6, Chapter 6: 6.1-6.5) Gathering, Routing Challenges and Design Issues in WSNs, Routing Strategies in WSNs (Chapter 5: 5.1-5.6, Chapter 6: 6.1-6.5)					
Madula 4					
Module -4	00 TT				
Transport Control and Middleware for Wireless Sensor Networks: Traditional Transport, Control	08 Hours	L1, L2,L3			
Examples of Existing Transport Control Protocols,					
Performance of Transport Control Protocols.					
Middleware for Wireless Sensor Networks:					
Introduction, WSN Middleware Principles,					
Middleware Architecture, Existing Middleware.					
(Chapter 7: 7.1-7.4, Chap. 8: 8.1-8.4)					
Module-5					
Network Management and Operating System for	08 Hours	L1.L2.L3			
Wireless Sensor Networks: Introduction. Network		, ,			
Management Requirements, Traditional Network					
Management Models, Network Management Design					
Issues. Operating Systems for Wireless Sensor					
Networks: Introduction, Operating System Design					
Issues Examples of Operating Systems (Chapter 9:					
9 1-9 5 Chapter 10: 10 1-10 3)					
Course outcomes: After studying this course student	s will be able to)'			
1 Explain existing applications of wireless senso	r actuator netw	orks			
2 Apply in the context of wireless sensor networ	ks and explain	elements of			
distributed computing and network protocol de	ks and explain	cicilitis of			
3 Contrast Various hardware, software platforms	sign that exist for s	ensor networks			
A Summarize various network level protocols for	r MAC routing	time			
4. Summarize various network is ver protocols to	istributed track	ing			
synchronization, aggregation, consensus and u	Istituted track	ing.			
Text Books.					
1 KAZEM SOHRARY DANIEL MINOLL TA	IER ZNATI "	Wireless Sensor			
1. KAZEWI SOTIKADI, DANIEL WINOEL, TA Natworks: Tashnalagy, Protocols and Applica	tiona: WILEV	Second			
Edition (Indian) 2014		, Second			
Deference Decks					
L Ion E Alwildig Mohmot Con Vymon "Wind	and Concor No.	twombo" Wilow			
2010	ess sensor me	tworks, whey			
2. Feng Zhao & Leonidas J. Guibas, "Wir Information Processing Approach". Elsevier. 2	eless Sensor 2007.	Networks- An			

	MIMO SY	(STEMS		
[As pe	er Choice Based Credi	t System (CBCS) S	cheme]	
	SEMES	ΓER- II		
Subject Code	19LDN241	CIE Marks	50	
Number of Lecture	03	SEE Marks	50	
Hour/Week				
Total Number of	40	Exam Hours	03	
Lecture Hours				
~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~	CREDI	TS-03		
Course Objectives:	This course will enable	e students to:	_	
1. To make stu	dents familiar with f	undamentals of wir	eless com	nunication
systems.	1.1 1 1 1			
2. To understan	d the diversity and spa	atial multiplexing pl	nenomenor	i in MIMO
system.	1.1		(TT 1	c '1'
3. To understan	d the receiver system	design for MIMO. 4	I. To becor	ne familiar
	and MIMO-OFDM sy	stems. Course Out	comes Ane	er studying
this course	. Imperiados of ama	uning insure for i		
4. Gain enough	n knowledge of eme	rging issues for i	mplementi	ng MIMO
5 Different fed	ine shannal distributio	ng in multingth wir	lage chann	a1
5. Different lau	an for multiple entor	ns in munipati wite	ation of n	el.
0. USIDC UESI	f MIMO wireless syste	na system. Comput	ation of pe	
Modules		To:	ching	Rovisod
wiouules		Ho	urs	Reviseu Bloom's
		110	u15	Taxono
				(RRT)
Module -1				eve
mouule 1				Level
Introduction to M	ulti-antenna Systems	: Motivation 08	Hours	Level
Introduction to M Types of multi-an	ulti-antenna Systems tenna systems.MIM(: Motivation, 08	Hours	Level L1,L2,L 3
Introduction to M Types of multi-an antenna systems.I	ulti-antenna Systems tenna systems,MIMC Diversity, Exploiting	Motivation, 08 0 vs. multi- g multipath	Hours	Level L1,L2,L 3
Introduction to M Types of multi-an antenna systems.I diversity, Transmit	ulti-antenna Systems tenna systems,MIMO Diversity, Exploiting diversity, Space-time	Motivation, 08 0 vs. multi- g multipath e codes. The	Hours	Level L1,L2,L 3
Introduction to M Types of multi-an antenna systems.I diversity, Transmit Alamouti scheme,	ulti-antenna Systems tenna systems,MIMO Diversity, Exploiting diversity, Space-time Delay diversity, O	Motivation, 08 O vs. multi- g multipath e codes, The Cvclic delay	Hours	Level L1,L2,L 3
Introduction to Ma Types of multi-an antenna systems.I diversity, Transmit Alamouti scheme, diversity, Space-fre	ulti-antenna Systems tenna systems,MIMC Diversity, Exploiting diversity, Space-time Delay diversity, G quency codes, Rece	Motivation, 08 0 vs. multi- g multipath e codes, The Cyclic delay ive diversity.	Hours	Level L1,L2,L 3
Introduction to Ma Types of multi-an antenna systems.I diversity, Transmit Alamouti scheme, diversity, Space-fre The rake receiver	ulti-antenna Systems tenna systems,MIMC Diversity, Exploiting diversity, Space-time Delay diversity, G quency codes, Rece	: Motivation, 08 D vs. multi- g multipath e codes, The Cyclic delay ive diversity,	Hours	Level L1,L2,L 3
Introduction to Ma Types of multi-an antenna systems.I diversity, Transmit Alamouti scheme, diversity, Space-fre The rake receiver,. Module -2	ulti-antenna Systems tenna systems,MIMO Diversity, Exploiting diversity, Space-time Delay diversity, Q quency codes, Rece	Motivation, 08 0 vs. multi- g multipath e codes, The Cyclic delay ive diversity,	Hours	Level L1,L2,L 3
Introduction to Ma Types of multi-an antenna systems.I diversity, Transmit Alamouti scheme, diversity, Space-fre The rake receiver,. Module -2 Combining technic	ulti-antenna Systems tenna systems,MIMC Diversity, Exploiting diversity, Space-time Delay diversity, O quency codes, Rece	Motivation, 08 vs. multi- g multipath e codes, The Cyclic delay ive diversity, xing, Spectral 08	Hours Hours	Level L1,L2,L 3
Introduction to Ma Types of multi-an antenna systems. I diversity, Transmit Alamouti scheme, diversity, Space-fre The rake receiver,. Module -2 Combining technic efficiency and ca	ulti-antenna Systems tenna systems,MIMO Diversity, Exploiting diversity, Space-time Delay diversity, O quency codes, Rece gues:Spatial Multiplez pacity, Transmitting	Motivation, 08 Vs. multi- g multipath e codes, The Cyclic delay ive diversity, 08 08 08 08 08 08 08 08 08 08 08 08 08 08 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 09 0 0 0 0 	Hours	Level L1,L2,L 3 L1,L2,L 3
Introduction to Ma Types of multi-an antenna systems.I diversity, Transmit Alamouti scheme, diversity, Space-fre The rake receiver,. Module -2 Combining technic efficiency and cap streams in parallel,	ulti-antenna Systems tenna systems,MIMO Diversity, Exploiting diversity, Space-time Delay diversity, Q quency codes, Rece ques:Spatial Multiplez pacity, Transmitting Mathematical notation	 Motivation, 08 vs. multi- g multipath e codes, The Cyclic delay ive diversity, king, Spectral independent The generic 	Hours	Level L1,L2,L 3 L1,L2,L 3
Introduction to Ma Types of multi-an antenna systems.I diversity, Transmit Alamouti scheme, diversity, Space-fre The rake receiver,. Module -2 Combining technic efficiency and ca streams in parallel, MIMO problem, Sir	ulti-antenna Systems tenna systems,MIMO Diversity, Exploiting diversity, Space-time Delay diversity, O quency codes, Rece ques:Spatial Multiplez pacity, Transmitting Mathematical notation ngular Value Decomp	 Motivation, 08 vs. multi- g multipath codes, The Cyclic delay ive diversity, king, Spectral independent The generic osition, Eigen 	Hours	Level L1,L2,L 3 L1,L2,L 3
Introduction to Ma Types of multi-an antenna systems.I diversity, Transmit Alamouti scheme, diversity, Space-fre The rake receiver,. Module -2 Combining technic efficiency and ca streams in parallel, MIMO problem, Sir values and eigenve	ulti-antenna Systems tenna systems,MIMO Diversity, Exploiting diversity, Space-time Delay diversity, O quency codes, Rece ques:Spatial Multiples pacity, Transmitting Mathematical notation ngular Value Decomp ctors, Equalizing MI	 Motivation, 08 vs. multi- g multipath codes, The Cyclic delay ive diversity, king, Spectral independent The generic osition, Eigen MO systems, 	Hours	Level L1,L2,L 3 L1,L2,L 3
Introduction to Ma Types of multi-an antenna systems.I diversity, Transmit Alamouti scheme, diversity, Space-fre The rake receiver,. Module -2 Combining technic efficiency and ca streams in parallel, MIMO problem, Sir values and eigenve Disadvantages of	ulti-antenna Systems tenna systems, MIMO Diversity, Exploiting diversity, Space-time Delay diversity, O quency codes, Rece gues: Spatial Multiplez pacity, Transmitting Mathematical notation ngular Value Decomp ctors, Equalizing MIM equalizing MIM	 Motivation, O8 vs. multi- g multipath e codes, The Cyclic delay ive diversity, king, Spectral independent The generic osition, Eigen MO systems, O systems, 	Hours	Level L1,L2,L 3 L1,L2,L 3
Introduction to Ma Types of multi-an antenna systems.I diversity, Transmit Alamouti scheme, diversity, Space-fre The rake receiver,. Module -2 Combining technic efficiency and ca streams in parallel, MIMO problem, Sir values and eigenve Disadvantages of Predistortion in MIN	ulti-antenna Systems tenna systems,MIMO Diversity, Exploiting diversity, Space-time Delay diversity, O quency codes, Rece gues:Spatial Multiples pacity, Transmitting Mathematical notation ngular Value Decomp- ctors, Equalizing MI equalizing MIM MO systems, Disadvan	 Motivation, O8 vs. multi- g multipath codes, The Cyclic delay ive diversity, king, Spectral independent The generic osition, Eigen MO systems, O systems, ntages of pre- 	Hours	Level L1,L2,L 3 L1,L2,L 3
Introduction to Ma Types of multi-an antenna systems.I diversity, Transmit Alamouti scheme, diversity, Space-fre The rake receiver,. Module -2 Combining technic efficiency and ca streams in parallel, T MIMO problem, Sin values and eigenve Disadvantages of Predistortion in MIMO	ulti-antenna Systems tenna systems,MIMO Diversity, Exploiting diversity, Space-time Delay diversity, Q quency codes, Rece ques:Spatial Multiplez pacity, Transmitting Mathematical notation ngular Value Decomp ctors, Equalizing MIM equalizing MIM MO systems, Disadvan systems, Pre-coding a	Motivation, D vs. multi- g multipath e codes, The Cyclic delay ive diversity,08king, Spectral independent a. The generic osition, Eigen MO systems, O systems, ntages of pre- nd combining08	Hours	Level L1,L2,L 3 L1,L2,L 3
Introduction to Ma Types of multi-an antenna systems.I diversity, Transmit Alamouti scheme, diversity, Space-fre The rake receiver,. Module -2 Combining technic efficiency and ca streams in parallel, MIMO problem, Sir values and eigenve Disadvantages of Predistortion in MIMO in MIMO systems	ulti-antenna Systems tenna systems,MIMO Diversity, Exploiting diversity, Space-time Delay diversity, O quency codes, Rece ques:Spatial Multiples pacity, Transmitting Mathematical notation ngular Value Decomp ctors, Equalizing MI equalizing MIM MO systems, Disadvan systems, Pre-coding a , Advantages of pr	 Motivation, O8 vs. multi- g multipath e codes, The Cyclic delay ive diversity, king, Spectral independent The generic osition, Eigen MO systems, O systems, ntages of pre- nd combining e-coding and 	Hours	Level L1,L2,L 3 L1,L2,L 3
Introduction to Ma Types of multi-an antenna systems.I diversity, Transmit Alamouti scheme, diversity, Space-fre The rake receiver,. Module -2 Combining technic efficiency and ca streams in parallel, MIMO problem, Sir values and eigenve Disadvantages of Predistortion in MIM distortion in MIMO in MIMO systems combining, Disadvar	ulti-antenna Systems tenna systems,MIMO Diversity, Exploiting diversity, Space-time Delay diversity, O quency codes, Rece gues:Spatial Multiplez pacity, Transmitting Mathematical notation ngular Value Decomp ctors, Equalizing MI equalizing MIM MO systems, Disadvan systems, Pre-coding a , Advantages of pre-	Image: Motivation, D vs. multi- g multipath e codes, The Cyclic delay ive diversity,08king, Spectral independent a. The generic cosition, Eigen MO systems, O systems, ntages of pre- nd combining e-coding and ad combining,08	Hours	Level L1,L2,L 3 L1,L2,L 3
Introduction to Ma Types of multi-an antenna systems.I diversity, Transmit Alamouti scheme, diversity, Space-fre The rake receiver,. Module -2 Combining technic efficiency and ca streams in parallel, T MIMO problem, Sin values and eigenve Disadvantages of Predistortion in MIMO in MIMO systems combining, Disadvan Channel state inform	ulti-antenna Systems tenna systems,MIMO Diversity, Exploiting diversity, Space-time Delay diversity, Q quency codes, Rece ques:Spatial Multiplez pacity, Transmitting Mathematical notation ngular Value Decomp ctors, Equalizing MIM equalizing MIM MO systems, Disadvan systems, Pre-coding a , Advantages of pre- ntages of precoding an nation	Image: Motivation, D vs. multi- g multipath e codes, The Cyclic delay ive diversity,08king, Spectral independent a. The generic osition, Eigen MO systems, O systems, ntages of pre- nd combining e-coding and nd combining,08	Hours	Level L1,L2,L 3 L1,L2,L 3
Introduction to Ma Types of multi-an antenna systems.I diversity, Transmit Alamouti scheme, diversity, Space-fre The rake receiver,. Module -2 Combining technic efficiency and ca streams in parallel, MIMO problem, Sir values and eigenve Disadvantages of Predistortion in MIMO in MIMO systems combining, Disadvar Channel state inform Module -3	ulti-antenna Systems tenna systems,MIMO Diversity, Exploiting diversity, Space-time Delay diversity, O quency codes, Rece gues:Spatial Multiplez pacity, Transmitting Mathematical notation ngular Value Decomp ctors, Equalizing MIM MO systems, Disadvan systems, Pre-coding a , Advantages of pre- ntages of precoding an mation	 Motivation, D vs. multi- g multipath codes, The Cyclic delay ive diversity, a codes, The Cyclic delay ive diversity, a code and a combining e-coding and a combining, a combining, 	Hours	Level L1,L2,L 3 L1,L2,L 3

principles, Increased spectrum efficiency, Interference		3		
cancellation, Switched beamformer, Adaptive				
beamformer, Narrowband beamformer, Wideband				
beamformer Case study: MIMO in LTE, Codewords to				
layers mapping, Pre-coding for spatial multiplexing,				
Pre-coding for transmit diversity, Beamforming in LTE,				
Cyclic delay diversity based pre-coding, Pre-coding				
codebooks,				
Module -4				
Propagation Channels : Time & frequency channel	08 Hours	L1,		
dispersion, AWGN and multipath propagation channel,		L2,L3		
Delay spread values and time variations. Fast and slow				
fading environments, Complex baseband multipath				
channels, Narrowband and wideband channels, MIMO				
channel models.				
Module-5				
Channel Estimation: Channel estimation techniques,	08 Hours	L1,L2,		
Estimation and tracking, Training based channel		L3		
estimation, Blind channel estimation, Channel				
estimation architectures, Iterative channel estimation,				
MMSE channel estimation, Correlative channel				
sounding, Channel estimation in single carrier systems,				
Channel estimation for CDMA, Channel estimation for				
OFDM				
Course outcomes: After studying this course, students wi	ll be able to:			
1. Understand channel modelling and propagation,	MIMO Capaci	ity, space-		
time coding, MIMO receivers, MIMO for m	ulti-carrier syst	tems (e.g.		
MIMO-OFDM), multi-user communications, mult	i-user MIMO.			
2. Understand cooperative and coordinated multi-ce	ll MIMO, intro	duction to		
MIMO in 4G (LTE, LTE-Advanced, WiMAX).				
3. Perform Mathematical modelling and analysis of M	/IMO systems.			
4. Channel estimation techniques, Estimation and trad	cking			
Text Books:				
1. Kwang-Cheng Chen and Ramiee Prasad. "Cognitive Radio Networks". John				
it itt ung eneng enen und rumjee i tubud, eoginti	ve Radio Netwo	rks", John		
Wiley & sons, 2009.	ve Radio Netwo	rks", John		
Wiley & sons, 2009. Reference Books:	ve Radio Netwo	orks", John		
Wiley & sons, 2009. Reference Books: 1. MohinderJanakiraman, "Space - Time Codes and N	ve Radio Netwo MIMO Systems	", Artech		

	ANTENNA THEO	RY AND DES	SIGN		
[As p	ber Choice Based Cred	it System (CBC	CS) Sch	eme]	
	SEMES	TER- II			
Subject Code	19LDN242	CIE Marks		50	
Number of Lecture	03	SEE Marks		50	
Hour/Week					
Total Number of	40	Exam Hours		03	
Lecture Hours					
	CRED	ITS-03			
Course Objectives:	This course will enabl	e students to:			
1. Introduce an	d discuss different ty	ypes of Antenn	nas, va	rious te	rminologies,
excitations.					
2. Study differe	nt types of Arrays, Pat	tern-multiplica	tion, Fe	eding te	chniques
3. Calculate ga	in of aperture antenna	s, Reflector an	tennas	and ana	lyze general
feed model.					
4. Define, descr	ribe, and illustrate prin-	ciple behind an	tenna s	ynthesis	
5. Introduction	of Method of moment	ts, Pocklington	's integ	gral equa	tion, Source
modeling.					
Modules			Teach	ning	Revised
			Hour	S	Bloom's
					Taxonomy
					(RBT)
					Level
Module -1			-		
Antenna Fundame	ntals and Definition	s: Radiation	08 H o	ours	L1,L2
Mechanisms, Overv	iew, EM Fundamental	s, Solution of			
Maxwell's Equation	ns for Radiation Pro	oblems, Ideal			
Dipole, Radiation	patterns, Directivity	and Gain,			
Antenna impedance	e, Radiation efficier	ncy, Antenna			
polarization					
Module -2					
Arravs&Antenna	Svnthesis : Arrav fac	tor for linear	08 H c	ours	L1.L2.L3.
arrays. Uniformly e	xcited equally spaced	linear arrays.			L4.L5
Pattern multiplicatio	n. Directivity of linear	arrays. Non-			
uniformly excited e	qually spaced linear a	rravs. Mutual			
coupling.		5 /			
Formulation of th	ne synthesis problem	n, Synthesis			
principles, Line sou	rces shaped beam syn	thesis, Linear			
array shaped beam s	synthesis, Fourier serie	es, Woodward			
- Lawson sampling	g method, Compariso	on of shaped			
beam synthesis methods, low side lobe narrow main					
beam synthesis methods. DolphChebyshev linear array.					
Taylor line source m	Taylor line source method.				
Module -3					
Resonant Antenna	s & Broadband an	tennas:Wires	08 H d	ours	L1,L2
and Patches, Dipo	ole antenna, Yagi-U	da antennas,			,
Micro-strip antenna.	, U	,			
Traveling wave ant	ennas Helical antenn	as, Biconical			
antennas, Sleeve and	tennas, and Principles	of frequency			

independent antennas, Spiral antennas, and Log -		
Module -4		
Aparture antennas · Techniques for evaluating gain	08 Hours	I1 I 2 I 3
Aperture antennas . rechniques for evaluating gain, Reflector antennas . Parabolic reflector antenna	00 110015	L1, L2,L3, I 5
principles Axi symmetric perspelie reflector antenna		LJ
Offset persbolic reflectors. Dual reflector antennas		
Gain calculations for reflector enternas. East enternas		
for reflectors Field representations. Matching the feed		
to the reflector. General feed model. East entennes used		
in practice		
Medule 5		
Module-5 Mathada of Momenta & Smort Antonnos	00 II	1112
Introduction to methods of moments, Dealdington's	vo nours	L1,L2
Introduction to methods of moments, Fockington's		
Smort Another and MIMOR		
Smart Anetinas and MINOS	11 1 1. 1	
Course outcomes: After studying this course, students with	ill be able to:	
1. Classify different types of antennas		
2. Define and illustrate various types of array antenna	as	
3. Design antennas like Yagi-Uda, Helical anteni	has and other	broad band
antennas	1 .1 1 111	
4. Describe different antenna synthesis methods. App	bly methods like	e MOM
5. Realization of Smart Antennas.		
Text Books:		- 1
1. Stutzman and Thiele, "Antenna Theory and Design	n", 2nd Edition,	John
Wiley, 2010.		
2. Andreas Molisch, 'Wireless Communication'. 2nd	Edition, John V	Viley.
Reference Books:		
1. C. A. Balanis, "Antenna Theory Analysis and Des	ign", John Wile	y, 2nd
Edition 2007.		
2. J. D. Krauss, "Antennas and Wave Propagation", I	McGraw Hill TM	MH, 4th
Edition, 2010.		
3. A.R.Harish, M.Sachidanada, "Antennas and propa	gation", Pearson	n Education,
2015		

IOT & ITS APPLICATIONS					
[As pe	er Choice Based Credi	t System (CBC	S) Sch	eme]	
	SEMES'	TER-II			
Subject Code	19LDN243	CIE Marks		50	
Number Lecture	03	SEE Marks		50	
Hour/Week					
Number of Lecture	40	Exam Hours		03	
Hours					
	CREDI	TS-03			
Course Objectives:	This course will enabl	e students to:			
1. Introduce cor	ncept of IOT and its ap	plications in to	day's s	cenario.	
2. Understand I	OT content generation	and transport t	hrough	networl	KS .
3. Understand th	ne devices employed f	or IOT data acc	quisitio	n and	
4. communication	on access technologies	5			
5. Introduce som	ne use cases of IOT				
Modules			Teach	ning	Revised
			Hours	S	Bloom's
					Taxono
					my
					(RBT)
					Level
Module -1			n		1
What is IOT:Genes	sis, Digitization, Impa	ct, Connected	08 H o	ours	L1,L2
Roadways, Buildings	s,Challenges				
IOT Network Are	chitecture and Des	ign: Drivers			
behind new networ	k Architectures, Co	mparing IOT			
Architectures, M2N	f architecture, IOT	world forum			
standard, IOT Re	ference Model, Sin	nplified IOT			
Architecture.					
Module -2			1		1
IOT Network Archi	itecture and Design:		08 H o	ours	L2,L3
Core IOT Function	onal Stack, Layer1(Sensors and			
Actuators),Layer 2(0	Communications Subl	ayer), Access			
network sublayer,G	ateways and backh	aul sublayer,			
Network transport su	iblayer,IOT Network r	nanagement.			
Layer 3(Application	is and Analytics) –	Analytics vs			
Control, Data vs	Network Analytic	cs,101 Data			
Management and Co	mpute Stack				
Module - 5	trucales Things in IC	T Canaana	00 TT		1010
A structure MEMS	etworks Inings in IC	$\mathcal{O}I - Sensors,$	U8 H 0	ours	L2,L3
WSN Community	nu smart objects. Sen	for WCN			
WSN, Communication protocols for WSN					
communications C	Topology Constrai	ned Devices			
Constrained Node N	etworks IOT Access	Technologies			
TEEE 202 15 4	ciwolks, IO1 Access	rechnologies,			
ILEE 002.13.4.	ologiog Overview or	Ny of IEEE			
$802.15 A_{0} A_{0}$ IEEE	1001 20 Standard A	lliances ITE			
Cot0 Cot M ND 10	r 1701.2a Stalluald A. T	mances LIE			
Calo, Cal-IVI, IND-IO	1				

Module -4		
Engineering IOT Networks:	08 Hours	L3,L4
IP as IOT network layer, Key Advantages, Adoption,		
Optimization, Constrained Nodes, Constrained		
Networks, IP versions, Optimizing IP for IOT.		
Application Protocols for IOT – Transport Layer,		
Application. Transport layer, Background only of		
SCADA, Generic web based protocols, IOT Application		
Layer Data and Analytics for IOT – Introduction,		
Structured and Unstructured data, IOT Data Analytics		
overview and Challenges.		
Module-5		I
IOT in Industry (Three Use cases)	08 Hours	L3,L4
IOT Strategy for Connected manufacturing,		ŕ
Architecture for Connected Factory		
Utilities – Power utility, IT/OT divide, Grid blocks		
reference model, Reference Architecture, Primary		
substation grid block and automation.		
Smart and Connected cities –Strategy, Smart city		
network Architecture, Street layer, city layer, Data		
center layer, services layer, Smart city security		
architecture, Smart street lighting.		
Course outcomes: After studying this course, students wi	ill be able to:	
1. Understand the basic concepts IOT Architecture and d	evices employe	d.
2. Analyze the sensor data generated and map it to IOT p	protocol stack for	or
transport.		
3. Apply communications knowledge to facilitate transpo	ort of IOT data	over
various available communications media.		
4. Design a use case for a typical application in real	life ranging fro	m sensing
devices to analyzing the data available on a serve	er to perform ta	sks on the
device.	1	
Text Books:		
1. CISCO, IOT Fundamentals – Networking Technolog	gies, Protocols,	Use Cases
for IOT, Pearson Education; First edition (16 A	August 2017).	ISBN-10:
9386873745, ISBN-13: 978-9386873743		
Reference Books:		
1. Arshdeep Bahga and Vijay Madisetti, 'Internet of Thing	gs – A Hands or	1
Approach', Orient Blackswan Private Limited - New D	elhi; First editio	on
(2015), ISBN-10: 8173719543, ISBN-13: 978-8173719	9547	

	ADVANCED	DSP LAB		
[As pe	r Choice Based Credit	System (CBCS) schem	le]	
	SEMESTE	R – II		
Laboratory code	19LDNL25	CIE Marks	50	
Number Lecture	01Ur Tutorial	SEE Morka	50	
Hour/Week	$(Instructions) \perp$	SEE WAIKS	50	
	02 HoursLaboratory			
		Exam Hours	03	
	CREDIT	S-02		
Course Objectives: This	s laboratory course ena	bles students to get pra	actical ex	perience on
the	•	0 1	-	•
1. Compute the DF	Γ for a discrete signal			
2. Find solution to t	he difference equations	and computation of co	onvolutio	n
3. Evaluate Samplin	ig rate conversion			
4. Matlab implement	tation of LTI systems	using DSP processor		
PART-A: Experiments	to be done using MA'	ГLАВ		
1 Computation of I	incor convolution Cir	aular convolution Line	201	111212
1. Computation of 1	a sireular convolution, Circ	cular convolution, Line	ar	L1,L2,L3
2 Computation of	DET IDET Circula	or convolution in fre	allency	
domain	DI I, IDI I, CIICUIA		quency	
3. Determination of	power spectrum densit	y of a given sequence		
4. Implementation	of Decimation Proc	ess and Implementat	tion of	
Interpolation Pro	cess			
5. Time-Frequency	Analysis with the Cont	inuous Wavelet Transf	form	
6. Signal Reconst	ruction from Conti	nuous Wavelet Tra	ansform	
Coefficients				
7. Denoising Signal	s and Images			
8. Haar Wavelet Im	age Compression			
Part – B: Experiments	to be done using the L	SP processor		L1,L2,L3
1 Write an ALP to	obtain the response of	a system using linear		
convolution who	se input and impulse r	esponse are specified		
2 Write on ALP to	se input and impulse real	popeo of the given ever	tom	
2. White all ALF it		polise of the given sys	tem,	
given the difference equation.				
5. Computation of FFT when N is not a power of 2.				
Course outcomes: On the	ne completion of this la	boratory course, the st	udents w	ill be
aule to: 1 Peolize the Deep	once of ITI avatome up	ving Matlah		
2 Understand the or	oncents of frequency de	omg Mailau	fsignale	
3 Provide a solution	n for a given difference	equation	i signais.	
4. Understand the co	oncepts of frequency do	omain up/down sampli	ng of sig	nals.
5. Implement the of	LTI system using DSI	P processor	0 0	
1		•		

NETWORK SIMULATION LAB - II					
	[As]	per Choice Based Cred	lit System (CBCS) sch	neme]	
T 1		SEMES'	TER – II	50	
Labora	atory code	19LDNL26	CIE Marks	50	
Numb	er Lecture	01Hr Tutorial	SEE Marks	50	
Hour/	week	(Instructions) + 02			
		U2 Hound chonstom			
		HoursLaboratory	Even Hours	02	
		CPED	Exam nours	05	
Cours	o Objectives	• This laboratory of	113-02 ourse enables stude	nts to	get practical
evperi	ence on the		ourse chables stude	nts to	get practical
1.	Understand the protocols three	he scenario and study to build be scenario and study to build be build be build be build be build be build be b	he performance of var	rious net	twork
2.	Understandin	g the congestion contr	ol technique and encr	yption a	lgorithm.
3.	Understand the Distance vector	he concept of Routing tor algorithm.	algorithm to find suita	able path	n using
Part -	- A: Experime	ents to be done using [Network Simulators		
	-P				
1.	Simulate a the between then number of pa	ree node point to point n. Set queue size and v ckets dropped.	network with duplex ary the bandwidth and	links 1 find	L1, L2, L3
2.	Simulate a fo connected as agent betwee relevant appl parameter an UDP.	ur node point to point follows: $n0 - n2$, $n1 - n$ n $n0 - n3$ and UDP age ications over TCP and d determine the numbe	network with the link n2 and n2 – n3. Appl ent between $n1 - n3$. UDP agents changing or of packets sent by T	s y TCP Apply g the 'CP /	
3.	A network c n0 –n2 and n simplex in na CSMA/CD a	onsists of seven(n0-n6) 1-n2 is duplex in nature ture. Simulate the local s medium access contr) nodes. The links ber re. Link between n2-n ll area network with ol protocol.	tween 13 is	
4.	Simulate mul	ticast protocol for netw	work consists of six (n	0-n6)	
5.	Simulate Ad routing proto	hoc on demand distanc	ce vector (AODV) as		
6.	For a wireles protocol.	s network simulate dyr	namic source routing ((DSR)	
Part -	B: Experime	nts to be done using u	using C/C++ or equiv	valent	L2, L3
with I	LINUX/Windo	ows environment			
7.	Write a progr decrypt the d	am for simple RSA algata.	gorithm to encrypt and	đ	

- 8. Write a program for congestion control using leaky bucket algorithm.
- 9. Write a program for distance vector algorithm to find suitable path for transmission.
- 10. Implement Dijkstra's algorithm to compute shortest path for transmission

Course outcomes: On the completion of this laboratory course, the students will be able to:

- 1. Defining the different agents and their applications like TCP/UDP
- 2. Understand the network routing protocol using AODV and DSR protocol
- 3. Understand the basic concepts of link layer properties including error detection.
- 4. Implement the data link and routing protocols using C programming.
- 5. Students get exposure to the real implementation of the computer network scenarios.

ENG	ENGLISH FOR RESEARCH PAPER WRITING				
[As per Choice Based Credit System (CBCS) Scheme]					
SEMESTER-I/II					
Subject Code	19AD11/21	CIE Marl	KS .		50
Number of Lecture	01	SEE Mar	KS		50
Hour/Week	20				
Total Number of	20	Exam Hou	ırs		03
Lecture Hours	ODED				
CREDITS-00					
Course Objectives:	I his course will enabl	e students to:	and law	alafaa	a dala ilitar
1. Understand tha	at now to improve you	r writing skills	and lev	el of re	adability
5. Learn about w	a altilla mandad when	clion witing a Title	Engu	a tha ar	ad quality of
0. Understand th	First time submission	writing a Title	Ensure	e the go	bod quanty of
paper at very i	list-time submission		Taaak	ina	Deviced
wiodules			Hour	ung	Reviseu Bloom's
			Hours	•	Tayonomy
					(RRT)
					(ICD1) Level
Module -1					Lever
Planning and Prepa	ration. Word Order.	Breaking up	04 Ho	ours	L1.L2
long sentences. Stru	cturing Paragraphs at	nd Sentences.	0.120		
Being Concise and Removing Redundancy. Avoiding					
Ambiguity and Vagu	eness	<i>, , , ,</i>			
Module -2			1		
Clarifying Who Did	What, Highlighting Y	our Findings,	04 Ho	ours	L1,L2
Hedging and Critici	zing, Paraphrasing an	d Plagiarism,			
Sections of a Paper, A	Abstracts. Introduction	1			
Module -3			_		
Review of the Litera	ture, Methods, Result	s, Discussion,	04 Ho	urs	L1,L2
Conclusions, The Fir	nal Check.				
Module -4			n		
key skills are needed	when writing a Title,	key skills are	04 Ho	urs	L1, L2,L3
needed when writing	g an Abstract, key skil	lls are needed			
when writing an	Introduction, skills r	needed when			
writing a Review of	the Literature.				
Module-5					
Skills are needed	when writing the M	ethods, skills	04 Ho	ours	L1, L2,L3
needed when writing	the Results, skills are	needed when			
writing the Discussion	on, skills are needed	when writing			
the Conclusions. use	agibly be the first time	isure paper is			
as good as it could pe	bissibily be the first- tim	c submission			1
Toyt Rooks					
1 Goldbort R (2006) Writing for Se	ience Vale Ur	niversity	Press	(available on
Google Book	s)				

2. Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press

	DISASTER M	ANAGEMENT	
[As	per Choice Based Cree	lit System (CBCS) Sche	eme]
	SEMES	STER-I/II	
Subject Code	19AD12/22	CIE Marks	50
Number Lecture	01	SEE Marks	50
Hour/Week			
Number of Lecture	20	Exam Hours	03
Hours			
CREDITS-00			
Course Objectives:-	Students will be able	to:	

- 1. Learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.
- 2. Critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
- 3. Develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
- 4. Critically understand the strengths and weaknesses of disaster management approaches, planning and programming in different countries, particularly their home country or the countries they work in

Modules	Teaching Hours	Revised Bloom's Taxonomy (RBT) Level
Module -1		Lever
Introduction Disaster: Definition, Factors And Significance; Difference Between Hazard And Disaster; Natural And Manmade Disasters: Difference, Nature, Types And Magnitude.	04 Hours	L1,L2
Module -2	ſ	1
Repercussions Of Disasters And Hazards : Economic Damage, Loss Of Human And Animal Life, Destruction Of Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts And Famines, Landslides And Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks And Spills, Outbreaks Of Disease And Epidemics, War And Conflicts.	04 Hours	L1,L2
Module -3	ſ	1
Disaster Prone Areas In India Study Of Seismic Zones; Areas Prone To Floods And Droughts, Landslides And Avalanches; Areas Prone To Cyclonic And Coastal Hazards With Special Reference To Tsunami; Post-Disaster Diseases And Epidemics	04 Hours	L1,L2
Module -4		-
Disaster Preparedness And Management Preparedness: Monitoring Of Phenomena Triggering A	04 Hours	L1, L2,L3

Disaster Or Hazard; Evaluation Of Risk: Application Of			
Remote Sensing, Data From Meteorological And Other			
Agencies, Media Reports: Governmental And			
Community Preparedness.			
Module-5			
Risk Assessment	04 Hours	L1,L2,L3	
Disaster Risk: Concept And Elements, Disaster Risk			
Reduction, Global And National Disaster Risk			
Situation. Techniques Of Risk Assessment, Global Co-			
Operation In Risk Assessment And Warning, People's			
Participation In Risk Assessment. Strategies for			
Survival.			
Disaster Mitigation			
Meaning, Concept And Strategies Of Disaster			
Mitigation, Emerging Trends In Mitigation. Structural			
Mitigation And Non-Structural Mitigation, Programs Of			
Disaster Mitigation In India.			
Course outcomes: After learning the course the students	should be able t	0:	
1. Understand disasters, disaster preparedness and	mitigation mea	sures	
2. Understand role of IT, remote sensing, GIS and	GPS in risk red	uction	
3. Understand disaster management acts and gu	idelines along	with role of	
various stackholders during disasters.			
Text Books:			
1. Nishith, Singh AK, "Disaster Management in Indi	a: Perspectives,	issues and	
strategies "'New Royal book Company.			
2. Sahni, PardeepEt.Al. (Eds.)," Disaster Mitigation	2. Sahni, PardeepEt.Al. (Eds.)," Disaster Mitigation Experiences And		
Reflections", Prentice Hall Of India, New Delhi.			
3. Goel S. L., Disaster Administration And Managen	nent Text And C	Case	
Studies", Deep & Deep Publication Pvt. Ltd., New	Delhi.		

SAN	NSKRIT FOR TECH	INICAL KNO	WLED	GE	
[As per Choice Based Credit System (CBCS) Scheme]					
Subject Code	19AD13/23	CIE Mar	ks		50
Number Lecture	01	SEE Mar	ks		50
Hour/Week					
Number of Lecture Hours	20	Exam Hou	urs		03
110013	CRED	ITS-00			
Course Objectives:-	Students will be able	to:			
1. To get a working k world	mowledge in illustriou	is Sanskrit, the	scientif	ic langu	age in the
2. Learning of Sanski	rit to improve brain fu	nctioning			
3. Learning of Sanski	rit to develop the logic	e in mathematic	cs, scien	ce & ot	her subjects
4. enhancing the men	nory power	Sonalmit will h	a abla ta	avelor	a tha
6. huge knowledge fr	com ancient literature	Saliski it will b	e able ic	exploi	e the
Modules			Teach	ing	Revised
			Hours	0	Bloom's
					Taxonomy
					(RBT) Level
Module -1					Level
Alphabets in Sanskrit	t		04 Ho	urs	L1,L2
I					,
Module -2			T		
Past/Present/Future T	Cense, Simple Sentend	ces	04 Ho	urs	L1,L2
Module -3					•
Order, Introduction o	f roots		04 Ho	urs	L1,L2
Module -4					<u> </u>
Technical informatio	n about Sanskrit Liter	ature	04 Ho	urs	L1, L2,L3
Module-5					
Technical concepts o	f Engineering-Electric	cal,	04 Ho	urs	L1,L2,L3
Mechanical, Architec	cture, Mathematics				
Course outcomes:St	udents will be able to				
1. Understanding bas	ic Sanskrit language	0 / 1 1	1	1 (1
2. Ancient Sanskrit li	terature about science	& technology	can be t	indersto	bod
Text Books.	iguage will help to dev	velop logic ill s	tudents.		
1. "Abhvaspusta		Samskrita-Bha	rti Publi	cation.	New Delhi
2. "Teach Yours	self Sanskrit" Pratham	a Deeksha-Vei	npatiKu	tumbsh	astri.
Rashtriva San	skrit Sansthanam. Ne	w Delhi Public	ation		- 7
3. "India's Glori	ious Scientific Traditio	on" Suresh Sor	ni, Oceaı	1 books	(P) Ltd.,
New Delhi.			-		

	VALUE EI	DUCATION			
[As per Choice Based Credit System (CBCS) Scheme]					
	SEMES	TER-I/II			
Subject Code	19AD14/24	CIE Marks			50
Number Lecture	01	SEE Marks			50
Hour/Week	• •				
Number of Lecture	20	Exam Hours	8		03
Hours					
	CRED	DTS-00			
Course Objectives:-	Students will be able	to:			
1. Understand value (of education and self-	development			
2. Implue good value	s in students	as of abarastar			
5. Let the should kno	w about the importan	ce of character	Teesh		Derrad
wiodules			Teach	ung	Revised Bloom ² a
			nours	5	DIOOIII S Toxonomy
					(DRT)
Module -1					Level
Values and self-deve	lonment –Social valu	es and individual	04 Ho	iirs	L1L2
attitudes Work ethic	s Indian vision of h	umanism Moral	V - 110	uis	1.1,1.2
and non- moral value	ation Standards and	nrinciples Value			
indoments	thom. Standards and	principies. Value			
Module -2					
Importance of cult	ivation of values	Sense of duty	04 Ho	urs	L1.L2
Devotion Self-reliance Confidence Concentration			04 110	uis	11,112
Truthfulness Cleanliness Honesty Humanity Power of					
faith. National Unity.	Patriotism.Love for	nature.			
Module -3					I
Personality and Be	ehavior Developmen	nt - Soul and	04 H o	urs	L1.L2
Scientific attitude.	Positive Thinking.	Integrity and			,
discipline. Punctuali	ty, Love and Kindn	ess. Avoid fault			
Thinking. Free from	anger, Dignity of l	abour. Universal			
brotherhood and re	eligious tolerance.	True friendship.			
Happiness Vs suffer	ring, love for truth.	Aware of self-			
destructive habits. As	sociation and Cooper	ation.			
Module -4					
Character and Comp	petence -Holy books	s vs Blind faith.	04 Ho	urs	L1, L2,L3
Self-management	and Good health	. Science of			
reincarnation. Equal	ity, Nonviolence,Hu	mility, Role of			
Women.					
Module-5					ſ
All religions and sa	me message. Mind y	our Mind, Self-	04 Ho	urs	L1,L2,L3
control. Honesty, Stu	dying effectively				
Course outcomes:St	udents will be able to				
1. Knowledge of self	-development				
2. Learn the importan	ice of Human values				
3. Developing the over	erall personality				

Text Books:

 Chakroborty, S.K. "Values and Ethics for organizations Theory and practice", Oxford University Press, New Delhi

<u>CONSTITUTION OF INDIA</u> [As per Choice Based Credit System (CBCS) Scheme]					
	SEMESTER-I/II				
Subject Code	19AD15/25	CIE Marks	50		
Number Lecture	01	SEE Marks	50		
Hour/Week					
Number of Lecture	20	Exam Hours	03		
Hours					
	CREDITS-00				

Course Objectives:-Students will be able to:

- 1. Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
- 2. To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
- 3. To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.

Modules	Teaching	Revised
	Hours	Bloom's
		Taxonomy
		(RBT)
		Level
Module -1		
History of Making of the Indian Constitution: History	04 Hours	L1,L2
Drafting Committee, (Composition & Working)		
Module -2		
Philosophy of the Indian Constitution: Preamble Salient	04 Hours	L1,L2
Features		
Module -3		
Contours of Constitutional Rights & Duties: Fundamental	04 Hours	L1,L2
Rights, Right to Equality, Right to Freedom, Right against		
Exploitation, Right to Freedom of Religion, Cultural and		
Educational Rights, Right to Constitutional Remedies,		
Directive Principles of State Policy		
Module -4		
Organs of Governance: Parliament, Composition,	04 Hours	L1, L2,L3
Qualifications and Disqualifications, Powers and Functions,		
Executive, President, Governor, Council of Ministers		
Judiciary, Appointment and Transfer of Judges,		
Qualifications		
Module-5		
Local Administration: District's Administration head: Role	04 Hours	L1,L2,L3
and Importance, Municipalities: Introduction, Mayor and		
role of Elected Representative, CEO of Municipal		
Corporation. Pachayati raj: Introduction, PRI: ZilaPachayat.		

Elected officials and their roles, CEO ZilaPachayat: Position	
and role. Block level: Organizational Hierarchy (Different	
departments), Village level: Role of Elected and Appointed	
officials,	
Election Commission: Election Commission: Role and	
Functioning. Chief Election Commissioner and Election	
Commissioners. State Election Commission: Role and	
Functioning. Institute and Bodies for the welfare of	
SC/ST/OBC and women.	

Course outcomes: Students will be able to

- 1. Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
- 2. Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
- 3. Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.

Text Books:

- 1. The Constitution of India, 1950 (Bare Act), Government Publication.
- 2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
- 3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
- 4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

	PEDAGOO	V STUDIES			
[As]	[As per Choice Based Credit System (CBCS) Scheme]				
L]	SEMES	STER-I/II	,]	
Subject Code	19AD16/26	CIE Marks			50
Number Lecture	01	SEE Marks			50
Hour/Week					
Number of Lecture	20	Exam Hours			03
Hours					
	CREI	DITS-00			
Course Objectives:-	Students will be able	to:			
1. Review existing	evidence on the revie	ew topic to infor	m prog	gramme o	lesign and
policy making ur	dertaken by the DfII	D, other agencie	s and r	esearche	rs.
	• 1 1				
2. Identify critical e	vidence gaps to guid	e the developm	ent.		
Modules			Teach	ning	Revised
Woulds			Hours	s s	Bloom's
				-	Taxonomy
					(RBT)
					Level
Module -1			_		
Introduction and Met	hodology:		04 Ho	ours	L1,L2
Aims and rationale,	Policy background	d, Conceptual			
framework and ter	minology Theories	of learning,			
Curriculum, Teacher	education. Conceptu	al framework,			
Research questions.	Overview of met	hodology and			
Searching.					
NIOdule -2	Dadagagiaal practic	and are haing	04 II.		1112
used by teachers in f	Fedagogical practic	cless are being	V4 H 0	ours	L1,L2
developing countries	Curriculum Teache	r education			
Module -3	Curriculum, reache				
Evidence on the effect	tiveness of pedagogi	cal practices	04 Ho	mrs	L1L2
Methodology for the	in depth stage: qual	ity assessment	0.110	uib	L 1, L 2
of included studies	B. How can teach	her education			
(curriculum and prac	ticum) and the scho	ol curriculum			
and guidance ma	terials best supp	ort effective			
pedagogy?					
Theory of change. S	trength and nature of	of the body of			
Theory of change. S evidence for effective	trength and nature of pedagogical practic	of the body of ces. Pedagogic			
Theory of change. S evidence for effective theory and pedagogic	trength and nature of pedagogical practic al approaches.	of the body of ces. Pedagogic			
Theory of change. S evidence for effective theory and pedagogic Module -4	trength and nature of pedagogical practical approaches.	of the body of ces. Pedagogic	0.1		
Theory of change. S evidence for effective theory and pedagogic Module -4 Professional develop	trength and nature of e pedagogical practic al approaches.	of the body of ces. Pedagogic	04 Ho	ours	L1, L2,L3
Theory of change. S evidence for effective theory and pedagogic Module -4 Professional develop practices and follow- from the head teacher	trength and nature of e pedagogical practic al approaches. ment: alignment w -up support Peer su r and the community	of the body of ces. Pedagogic with classroom apport Support	04 Ho	ours	L1, L2,L3

and large class sizes		
Module-5	·	
Research gaps and future directions Research design	04 Hours	L1,L2,L3
Contexts Pedagogy Teacher education Curriculum and		
assessment		
Course outcomes: Students will be able to 1 What pedagogical practices are being used by teacher	rs in formal and	informal
classrooms in developing countries?	is in formuland	intorniur
2. What is the evidence on the effectiveness of these pe	dagogical practi	ces, in what
conditions, and with what population of learners?		
3. How can teacher education (curriculum and practicul	m) and the school	ol curriculum
and guidance materials best support effective pedago	gy?	
Text Books:		
1. Ackers J, Hardman F (2001) Classroom interaction	in Kenyan prin	nary schools,
Compare, 31 (2): 245-261	• • • •	1
2. Agrawal M (2004) Curricular reform in schools: The Journal of Curriculum Studies 36 (3): 361-379	importance of e	evaluation,
3. Akyeampong K (2003) Teacher training in Ghana - c	loes it count? M	ulti-site
teacher education research project (MUSTER) count	ry report 1. Lon	don: DFID.
4. Akyeampong K, Lussier K, Pryor J, Westbrook J (20	13) Improving t	eaching and
learning of basic maths and reading in Africa: Does t	eacher preparati	on count?
International Journal Educational Development, 33 (3): 272–282.	
5 Alexander RI (2001) Culture and pedagogy. Internat	ional compariso	ns in
primary education. Oxford and Boston: Blackwell.		
(1, 1)		
6. Chavan M (2003) Kead India: A mass scale, rapid, 'I	earning to read?	campaign.

	STRESS MANAG	EMENT BY YO	DGA	-		
[As	[As per Choice Based Credit System (CBCS) Scheme]					
Subject Code	19AD17/27	CIE Marks			50	
Number Lecture	01	SEE Marks			50	
Hour/Week					00	
Number of Lecture	20	Exam Hours			03	
Hours						
	CREDITS-00					
Course Objectives:-	Students will be able	to:				
1. To achieve overall	health of body and n	nind				
2. To overcome stres	S			•	D	
Modules			Teach	ung	Revised	
			nour	5	Diuuiii s Tavonomy	
					(RBT)	
					Level	
Module -1					I	
Definitions of Eight	parts of yog. (Ashtan	iga)	04 Ho	ours	L1,L2	
Module -2			I			
Ahinsa, satya, astheya, bramhacharya andaparigraha			04 Ho	ours	L1,L2	
Module -3						
Shaucha, santosh, tap	oa, swadhyay, ishwarj	pranidhan	04 Ho	ours	L1,L2	
Module -4			1			
Various yog poses ar	nd their benefits for m	ind & body	04 Ho	ours	L1, L2,L3	
Module-5						
Regularization of br	eathing techniques a	nd its effects-	04 Ho	ours	L1,L2,L3	
Types of pranayam						
Course outcomes:St	udents will be able to)				
1. Develop healthy m	ind in a healthy body	thus improving	g social	health a	lso	
2. Improve efficiency		. The T 1	<u>a :</u>	X 7 11		
1. Yogic Asanas for	r Group Tarining-Pai	rt-1" :Janardan	Swami	Yogabh	yası Mandal,	
Nagpur 2 "Pajayoga	or conquering	the Internal	Nat	uro"	by Swami	
Vivekananda,Advaita	aAshrama (Publicatio	on Department),	Kolkat	a	oy Swalli	

PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT						
L A	\underline{S}	<u>KILLS</u>		1		
[A:	s per Choice Based Ci	redit System (CB	CS) Sch	emej		
Subject Code		CIF Marks			50	
Number Lecture	19AD10/20	SEE Marks			50	
Hour/Week						
Number of Lecture	20	Exam Hours 03				
Hours						
	CRI	EDITS-00				
Course Objectives	-Students will be ab	le to:				
1. To learn to achiev	ve the highest goal ha	appily				
2. To become a pers	son with stable mind,	, pleasing person	ality and	l determ	nination	
5. 10 awaken wisdo	in in students		Toool	ina	Doviced	
wiouules			Hour	nng s	Reviseu Bloom's	
			nour	5	Taxonomy	
					(RBT)	
					Level	
Module -1					-	
Neetisatakam-Holis	tic development of p	ersonality	04 Ho	ours	L1,L2	
Module -2						
Approach to day to	day work and duties.	•	04 Ho	ours	L1,L2	
Module -3						
Shrimad Bhagwad	leeta		04 Ho	ours	L1,L2	
Modulo 4						
Shrimad Bhagwade	leeta		04 Ha	MIRG	111213	
Module-5	lecta		04 110	Juis	11, 12,13	
Personality of Role	model. Shrimad Bha	gwadGeeta:	04 Ha	ours	L1.L2.L3	
Course outcomes:	Students will be able	e to	0 1 1 2 0			
1. Study of Sl	nrimad-Bhagwad-Ge	eta will help th	ne stude	nt in d	eveloping his	
personality a	and achieve the higher	est goal in life				
2. The person	who has studied Gee	eta will lead the	nation a	ind man	kind to peace	
and prosperi	ty				-	
3. Study of Ne	etishatakam will help	o in developing v	ersatile	persona	lity of	
students.	Ĩ			-		
Text Books:						
1. "Srimad Bhagava	d Gita" by Swami S	warupanandaAd	vaita As	hram (P	ublication	
Department), Ko	olkata					
3. Bhartrihari's Thre	ee Satakam (Niti-srir	ngar-vairagya) by	P.Gopi	inath,		

4. Rashtriya Sanskrit Sansthanam, New Delhi.

	COGNITIVE RA	DIO NETWO	RKS		
[As t	per Choice Based Cred	lit System (CBC	CS) Sch	neme]	
	SEMES	TER-III	,	-	
Subject Code	19LDN311	CIE Marks		50	
Number of Lecture	03	SEE Marks		50	
Hour/Week					
Total Number of	40	Exam Hours		03	
Lecture Hours					
	CRED	ITS-03			
Course Objectives:	This course will enabl	e students to:			
1. Depth knowl	edge of Cognitive wire	eless networks			
2. Explore curr	ent cognitive radio tec	chnology by re	searchi	ng kev :	areas such as
Cognitive Ra	dio				
3. Relay Netwo	rks SDR Architecture	es and applicati	ons		
4. Understand t	he issues involved in s	vnchronization	and see	curity	
Modules		<u></u>	Teach	ning	Revised
1.100000			Hours	8 S	Bloom's
				-	Taxonomy
					(RBT)
					Level
Module -1					
Introduction: Awar	e. Adaptive and Cog	nitive Radios.	08 H o	ours	L1.L2.L3
Cognitive Radio Technology, Cognitive Radio Network		00 220			
Architectures, Cogni	tive Radio Networks A	Applications.			
Module -2		-pp.i.canonsi			
Network Coding	for Cognitive R	Radio Relav	08 Ho	urs	L1.L2.L3
Networks: Cognit	ive Radio Networks	Architecture.	00 110	ui b	11,12,10
Terminal Architectu	re for CRN. Mathem	atical Models			
Toward Networking	Cognitive Radios. Sc	aling Laws of			
CRN. Primary use	r detection techniqu	es – energy			
detection, feature	detection, matche	ed filtering,			
cooperative detection	on, Optimum spectru	um sensing -			
KullbackLeibler Di	ivergence and other	approaches,			
Fundamental Tradeo	offs in spectrum sensi	ng, Spectrum			
Sharing Models o	f Dynamic Spectru	m Access -			
Unlicensed and	Licensed Spectru	m Sharing,			
Fundamental Limits	of Cognitive Radio				
Module -3					•
Spectrum Sensing	And Spectrum M	Management:	08 Ho	ours	L1,L2,L3
Spectrum Sensing t	o detect specific Prin	mary System.			
Spectrum Sensing	for Cognitive Rac	lio OFDMA			
Systems and Cogniti	ve Multi-Radio Netwo	orks.			
Spectrum Managem	ent- Spectrum Sharin	ng, Spectrum			
Pricing, Mobility	Management to H	Ieterogeneous			
Wireless Networks,	Regulatory Issues and	International			
Standards					
Module -4					
MAC and Network	Layer Design & Tru	sted	08 Ho	ours	L1, L2,L3
Cognitive Radio Ne	tworks: Spectrum Ser	nsing to			
detect specific Prima	ry System. Spectrum S	Sensing for			

Cognitive Radio OFDMA Systems and Cognitive Multi-						
Radio Networks.						
Spectrum Management- Spectrum Sharing, Spectrum						
Pricing, Mobility Management to Heterogeneous						
Wireless Networks, Regulatory Issues and International						
Standards.						
Module-5						
Advanced Topics In Cognitive Radio: Cognitive radio 08 J	Hours	L1,L2,L3				
for Internet of Things - Features and applications –						
Enabling technologies and protocols – M2M						
technologies - Data storage and analysis techniques -						
Requirement and challenges of IoT – Energy						
efficiency– MIMO Cognitive Radio – Power allocation						
algorithms						
Course outcomes: After studying this course, students will be	e able to:					
1. Compare MAC and network layer design for cognitive	e radio					
2. Discuss cognitive radio for Internet of Things and M2M technologies						
3. Calculation of Energy Efficiency.						
4. Realize and analyze the protocols.						
Text Books:						
1. Kwang-Cheng Chen and Ramjee Prasad, "Cognitive Radio Networks", John						
Wiley & sons, 2009.						
Reference Books:						
1. Ahmed Khattab, Dmitri Perkins, MagdyBayoumi, "Cog	gnitive Rad	io Networks				
: From Theory to Practice", Springer, 2013.						
2. Walter Tuttlebee, "Software Defined Radio- Baseband	d Technolog	gy for				
3. Alexander M. Wyglinski, MaziarNekovee, Thomas Ho	ou, "Cogniti	ve Radio				
Communications and Networks", Academic Press, Elsevier, 2010.						
4. Bruce Fette, "Cognitive Radio Technology", Newnes, 2	4. Bruce Fette, "Cognitive Radio Technology", Newnes, 2006.					
5. HuseyinArslan (Ed.), "Cognitive Radio, Software Defin	ined Radio,	and				
Adaptive Wireless Systems, Springer, 2007.						
6. S.Shanmugavel, M.A.Bhagyaveni, R.Kalidoss, "Cognit	itive Radio-	An Enabler				
for Internet of things", River Publishers, 2017						

	CMOS RF CIR	RCUIT DESIG	N		
[As per Choice Based Credit System (CBCS) Scheme]					
	SEMES	TER-III			
Subject Code	19LVE312	CIE Marks		50	
Number Lecture	03	SEE Marks		50	
Hour/Week					
Number of Lecture	40	Exam Hours		03	
Hours	CDED				
		0118-03			
Course Objectives:	This course will enable	e students to:		1	· · · · · · · · · · · · · · · · · · ·
1. Learn bas	sic concepts in RF and	microwave de	sign en	nphasizii	ng the effects
	earity and noise.	tion anatoms a	14 : 1		and minutess
2. Able to a	appreciate communica	tion system, n	nuitipie	access	and wireless
3 Abla to d	necessary for KF circl	ult design.		noision on	d transmittar
5. Able to u	bair marits and demari	cintecture, var	ious rec	erver an	u transmitter
1 Understa	nell merits and demen	us E building bl	ocks a	uch as	Low Noise
4. Understan Δmplifier	s and Mivers	i building bi	OCKS S	such as	Low Noise
			Teach	nina	Revised
Mounes			Hour	nng s	Revised Bloom's
			mour	3	Taxonomy
					(RBT)
					Level
Module -1					
Introduction to RF	Design and Wireless	Technology:	08 H o	ours	L1,L2,L3
Basic concepts	in RF design ((I): General			
considerations, Ef	tects of Nonlinea	rity, Noise,			
Sensitivity and dynai	mic range.				
Module -2		• 1	00.11		111010
Basic concepts in R	F design (II): Passive	impedance	U8 H 0	ours	L1,L2,L3
transformation, sca	ittering parameters,	analysis of			
nonimear dynamic sy	ystems				
Module -3	anaanta. Canaral aan	ante analag	00 TT		111212
modulation digital	modulation space	lepts, analog	υδΠ	ours	L1,L2,L3
Mobile PE cor	modulation, specific munications Mult	in le-glowill,			
techniques Wireless	standards	ipie access			
Modulo -4	standarus.				
Transceiver Archit	ecture (I). General c	onsiderations	08 H	ure	111213
Receiver architecture		onsiderations,	00 110	Juis	11, 12,13
Module-5					
Transceiver Ar	chitecture (II).	Transmitter	08 H	urs	111213
architectures	(11).	1 runsmittel		u 15	LI,L <i>2</i> ,L <i>3</i>
Low Noise Ampli	fiers: LNA topologi	es: common-			
source stage with in	ductive load common	-source stage			
	ok				

Mi	xers:	General	considerations,	passive	down		
con	versio	n mixers.					
Co	urse O	utcomes: A	After studying this	course, st	udents w	ill be able to:	
	1.	Analyse th	ne effect of nonlin	earity and	noise in	RF and microw	vave design.
	2.	Exemplify	the approaches t	aken in act	ual RF p	products.	
	3.	Minimize	the number of o	ff-chip co	mponent	ts required to d	esign mixers
		and Low-	Noise Amplifiers.				
	4.	Explain va	arious receivers a	nd transmi	itter topo	ologies with the	ir merits and
		drawbacks	8.				
	5.	Demonstr	ate how the syste	em require	ements d	lefine the parar	neters of the
		circuits an	d how the perform	nance of e	ach circu	uit impacts that	of the overall
		transceive	r.				
Te	xt Bool	K:					
	1. B.	Razavi, "R	F Microelectronic	es", PHI, se	econd ed	lition.	
Re	ference	e Book:					
1.	R. Jac	ob Baker,	H.W. Li, D.E.	Boyce "	CMOS	Circuit Design,	, layout and
	Simula	ation", PHI	1998.				
2.	Thom	as H. Lee '	'Design of CMOS	RF Integr	ated Cir	cuits" Cambridg	ge University
	press 1	998.					
3.	Y.P. 7	Tsividis, "N	fixed Analog and	Digital De	vices an	d Technology",	TMH 1996

ADVANCED EMBEDDED SYSTEM					
As per choice	As per choice based credit system(CBCS)scheme				
Semester – III					
Subject Code	19LVE313	CIE Marks	50		
Number of Lecture	02	SEE Marks	50		
Hours/Week	03				
Total Number of	40	Exam Hours	03		
Lecture Hours	40				
	CREDITS : 03				

Course objectives: This course will enable students to:

- 1. Understand the basic hardware components and their selection method based on the characteristics and attributes of an embedded system.
- 2. Describe the hardware software co-design and firmware design approaches
- 3. Explain the architectural features of ARM CORTEX M3, a 32 bit microcontroller including memory map, interrupts and exceptions.
- 4. Program ARM CORTEX M3 using the various instructions, for different applications.

	1	
Modules	Teaching Hours	Revised Bloom's Taxonomy (RBT) Level
Module-1:		
Embedded System : Embedded vs General computing system, classification, application and purpose of ES. Core of an Embedded System, Memory, Sensors, Actuators, LED, Opto coupler, Communication Interface, Reset circuits, RTC, WDT, Characteristics and Quality Attributes of Embedded Systems.	08 Hours	L1,L2,L3
Module -2		
Hardware Software Co-Design :Embedded firmware design approaches, computational models, embedded firmware development languages, Integration and testing of Embedded Hardware and firmware, Components in embedded system development environment (IDE), Files generated during compilation, simulators, emulators and debugging.	08 Hours	L1,L2,L3
Module -3	1	
ARM-32 bit Microcontroller :Thumb-2 technology and applications of ARM, Architecture of ARM Cortex M3, Various Units in the architecture, General Purpose Registers, Special Registers, exceptions, interrupts, stack operation, reset sequence.	08 Hours	L1,L2,L3
Module -4	Γ	1
Instruction Sets : Assembly basics, Instruction list and description, useful instructions, Memory Systems, Memory maps, Cortex M3 implementation overview, pipeline and bus interface.	08 Hours	L1, L2,L3

Modu	le-5		
Excep	tions : Nested Vector interrupt controller design,	08 Hours	L1,L2,L3
Systic	x Timer, Cortex-M3 Programming using		
assemt	bly and C language, CMSIS.		
Cours	e outcomes: After studying this course, students wi	ill be able to:	
1.	Understand the basic hardware components and t	heir selection n	nethod based
	on the characteristics and attributes of an embedde	d system.	
2.	Explain the hardware software co-design and firm	ware design app	oroaches.
3.	Acquire the knowledge of the architectural feature	es of ARM CO	RTEX M3, a
	32 bit microcontroller including memory map, inte	errupts and exce	ptions.
4.	Apply the knowledge gained for Programming	g ARM CORT	EX M3 for
	different applications.		
	Text Books:		
1.	K. V. Shibu, "Introduction to embedded systems	", TMH educat	ion Pvt. Ltd.
	2009.		
2.	Joseph Yiu, "The Definitive Guide to the AI	RM Cortex-M3	", 2nd edn,
	Newnes, (Elsevier), 2010		
Refere	ence Books:		
1.	James K. Peckol, "Embedded systems- A conte	mporary design	n tool", John
	Wiley, 2008.		

BUSSINESS ANALYTICS					
[As per Choice Based Credit System (CBCS) Scheme]					
Subject Code	19LOE321	CIE Marks		50	
Number of Lecture	03	SEE Marks		50	
Hour/Week					
Total Number of	40	Exam Hours		03	
Lecture Hours					
	CRED	DITS-03			
Course Objectives:	This course will enab	le students to:			
1. The main ob	jective of this cours	e is to give the	ne stud	ent a co	omprehensive
understanding	g of business analytics	s methods.			
				•	D • 1
Modules			Teach	ling	Revised
			Hours	5	Bloom's
					(DRT)
					(KD1) Level
Module -1					Level
Business Analysis:	Overview of Busine	ess Analysis.	08 H o	ours	L1.L2.L3
Overview of Requi	rements. Role of t	he Business			, , -
Analyst.					
Stakeholders: the pr	oject team, manager	ment, and the			
front line, Handling,	Stakeholder Conflicts	5.			
Module -2					
Trendiness and R	egression Analysis:	Modelling	08 H o	ours	L1,L2,L3
Relationships and	Trends in Data, si	mple Linear			
Regression.					
Important Resources,	Business Analytics P	ersonnel, Data			
and models for Bus	siness analytics, pro	blem solving,			
Visualizing and Ex	Visualizing and Exploring Data, Business Analytics				
Technology.					
Module -3			00.11		111010
Organization Structu	ires of Business ana	lytics, Team	08 H a	ours	L1,L2,L3
management, Ma	nagement Issues,	Designing			
Information Policy	, Outsourcing, En	suring Data			
Quality, Measuring of	contribution of Busin	ess analytics,			
Managing Changes.					
Descriptive Analytics, predictive analytics, predicative					
Modelling, Predictive analytics analysis, Data Mining,					
Data Mining Method	lologies, Prescriptive	analytics and			
its step in the busin	ess analytics Process	s, Prescriptive			
Nodelling, nonlinear	Optimization.				
			00 TT -		I1 I 7 I 2
Forecasting Techniq	ues: Qualitative and	l Judgmental		urs	11, 12,13
Forecasting, Stat	istical Forecasting	g Models,			
Forecasting Models	s for Stationary T	ime Series.	1		

Forecasting Models for Time Series with a Linear Trend, Forecasting Time Series with Seasonality, Regression Forecasting with Casual Variables, Selecting Appropriate Forecasting Models. Monte Carlo Simulation and Risk Analysis: Monte Carle Simulation Using Analytic Solver Platform, New-Product Development Model, Newsvendor Model, Overbooking Model, Cash Budget Model.				
Decision Analysis: Formulating Decision Problems.	08 Hours	L1.L2.L3		
Decision Strategies	00 110 0115			
with the without Outcome Probabilities, Decision Trees,				
The Value of Information, Utility and Decision Making.				
Recent Trends in : Embedded and collaborative				
business intelligence, Visual data recovery, Data				
Storytelling and Data journalism.				
Course outcomes:				
1. Students will demonstrate knowledge of data analy	tics.			
2. Students will demonstrate the ability of think critic	ally in making c	lecisions		
based on data and deep analytics.				
3. Students will demonstrate the ability to use technic	cal skills in prec	licative and		
prescriptive modeling to support business decision	-making.			
4. Students will demonstrate the ability to translate	e data into clea	r, actionable		
insights				
REFERENCE BOOKS:				
 Business analytics Principles, Concepts, and Applications by Marc J. Schniederjans, Dara G. Schniederjans, Christopher M. Starkey, Pearson FT Press. Business Analytics by James Evans, persons Education. 				

[As per Choice Based Credit System (CBCS) Scheme] SEMESTER-III Subject Code 19LOE322 CIE Marks 50 Number Lecture 03 SEE Marks 50 Number of Lecture 40 Exam Hours 03 CREDITS-03 Course Objectives: This course will enable students to: 1. To know about Industrial safety programs and toxicology, Industrial laws , regulations and source models 2. To understand about fire and explosion, preventive methods, relief and its sizing methods. 3. To analyse industrial hazards and its risk assessment Teaching Hours Revised Bloom's Taxonomy (RBT) Modules Image: Course of the about and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and firefighting, equipment and methods. 08 Hours L1,L2 Module -1 Fundamentals of maintenance engineering. Definition and is of maintenance engineering. Primary and secondary functions and responsibility of maintenance cost & its relation with replacement economy, Service life of equipment 08 Hours L1,L2 Wear and Corrosion and their prevention: Kear- types, and applications, L brication methods, lubricatis- types and applications, L brication methods, lubricatis- types and applications, L brication with select wear reduction methods, lubricatis- types and application, Vi Kik feed lubrication, vi, Side feed lubrication, vi, Kik feed lubrication, vi, Side feed	INDUSTRIAL SAFETY					
SEMESTER-III SEMESTER-III Subject Code 19LOE322 CIE Marks 50 Number Lecture 03 SEE Marks 50 Number of Lecture 40 Exam Hours 03 Hour/Week 03 CREDITS-03 03 CREDITS-03 COUSE Objectives: This course will enable students to: 1. To know about Industrial safety programs and toxicology, Industrial laws , regulations and source models Teaching Revised 2. To understand about fire and explosion, preventive methods, relief and its sizing methods. 3. To analyse industrial hazards and its risk assessment Teaching Revised Bloom's Taxonomy (RBT) Module 1 Industrial safety: Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1940 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc., Safety color codes. Fire prevention and firefighting, equipment and methods. 08 Hours L1,L2 Fundamentals of maintenance engineering. Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Type and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment 08 Hours L1,L2 Module -3	[As p	[As per Choice Based Credit System (CBCS) Scheme]				
Subject Code 19LOE322 CIE Marks 50 Number Lecture 03 SEE Marks 50 Number Lecture 40 Exam Hours 03 Hour/Week 03 CREDITS-03 03 CREDITS-03 Course Objectives: This course will enable students to: 1. To know about Industrial safety programs and toxicology, Industrial laws , regulations and source models . regulations and sourt fire and explosion, preventive methods, relief and its sizing methods. 3. To analyse industrial hazards and its risk assessment Teaching Hours Revised Bloom's Taxonomy (RBT) Modules Versite and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1940 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc. Safety color codes. Fire prevention and firefighting, equipment and methods. 08 Hours L1,L2 Fundamentals of maintenance engineering: Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance cost & its relation with replacement economy, Service life of equipment 08 Hours L1,L2 Wodule -3 Vear and Corrosion and their prevention: Wear- types, and applications, Lubrication methods, lubricatis- types and applications, Lubrication methods, lubricatis- types and applications, Lubrication methods, lubricatas- types and a		SEMES	STER-III			
Number Lecture 03 SEE Marks 50 Hour/Week 40 Exam Hours 03 Course Objectives: This course will enable students to: 03 1. To know about Industrial safety programs and toxicology, Industrial laws , regulations and source models 03 2. To understand about fire and explosion, preventive methods, relief and its sizing methods. Teaching Hours Revised Modules Teaching Hours Revised Bloom's Taxonomy (RBT) Level Module -1 Industrial safety: Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1940 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and firefighting, equipment and methods. 08 Hours L1,L2 Module -3 Fundamentals of maintenance engineering: Definition and aim of maintenance engineering. Primary and secondary functions and responsibility of maintenance cost & its relation with replacement economy, Service life of equipment 08 Hours L1,L2 Wear and Corrosion and their prevention: Wear- types, causes, effects, wear reduction methods, lubrication, vi. King lubrication, vi	Subject Code	19LOE322	CIE Marks		50	
Hour/Week Image: CREDITS-03 CREDITS-03 CREDITS-03 Course Objectives: This course will enable students to: 1. To know about Industrial safety programs and toxicology, Industrial laws , regulations and source models 2. To understand about fire and explosion, preventive methods, relief and its sizing methods. 3. To analyse industrial hazards and its risk assessment Teaching Hours Revised Bloom's Taxonomy (RBT) Modules Teaching Hours Revised Bloom's Taxonomy (RBT) Level Module -1 Industrial safety: Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1940 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and firefighting, equipment and methods. 08 Hours L1,L2 Fundamentals of maintenance engineering: Definition and aim of maintenance engineering. Primary and secondary functions and responsibility of maintenance cost & its relation with replacement economy, Service life of equipment 08 Hours L1,L2 Wear and Corrosion and their prevention: Wear- types, causes, effects, wear reduction methods, lubricantistypes and applications, Lubrication wito, side feed lubrication, vi. Ring lubrication, iv. Gravity lubrication, vi. King lubrication, its of the safety prevention response of the safety prevention response of corrosion prevention methods. 08 Hours<	Number Lecture	03	SEE Marks		50	
Number of Lecture Hours 40 Exam Hours 03 Hours CREDITS-03 CREDITS-03 Course Objectives: This course will enable students to: To know about Industrial safety programs and toxicology, Industrial laws , regulations and source models To understand about fire and explosion, preventive methods, relief and its sizing methods. To analyse industrial hazards and its risk assessment Modules Teaching Hours Revised Bloom's Taxonomy (RBT) Level Module -1 Industrial safety: Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1940 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and firefighting, equipment and methods. 08 Hours L1,L2 Fundamentals of maintenance engineering: Definition and aim of maintenance engineering. Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Maintenance department, Types of maintenance, Maintenance exist is relation with replacement economy, Service life of equipment Module -3 Wear and Corrosion and their prevention: Wear- types, causes, effects, wear reduction methods, lubrication, vi. Gravity lubrications, Lubrication methods, general sketch, working and applications, Lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion. corrosion prevention methods.	Hour/Week					
Hours CREDITS-03 Course Objectives: This course will enable students to: . 1. To know about Industrial safety programs and toxicology, Industrial laws , regulations and source models 2. To understand about fire and explosion, preventive methods, relief and its sizing methods. 3. To analyse industrial hazards and its risk assessment Teaching Hours Revised Bloom's Taxonomy (RBT) Level Modules Teaching Hours Revised Bloom's (RBT) Level Module -1 Industrial safety: Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1940 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and firefighting, equipment and methods. 08 Hours L1,L2 Fundamentals of maintenance engineering: Definition and aim of maintenance engineering: Primary and specondary functions and responsibility of maintenance ecst & its relation with replacement economy, Service life of equipment 08 Hours L1,L2 Module -3 Wear and Corrosion and their prevention: Wear- types, causes, effects, wear reduction methods, general setch, working and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vi. Ring lubrication, Definition, principle and factors affecting the corosion. Types of corosion, corrosion prevention methods. 08 Hours L1,L2 <	Number of Lecture	40	Exam Hours		03	
CREDITS-03 Course Objectives: This course will enable students to: 1. To know about Industrial safety programs and toxicology, Industrial laws , regulations and source models 2. To understand about fire and explosion, preventive methods, relief and its sizing methods. 3. To analyse industrial hazards and its risk assessment Teaching Hours Revised Bloom's Taxonomy (RBT) Modules Teaching Hours Iteavel Iteavel Module -1 Industrial safety: Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1940 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and firefighting, equipment and methods. 08 Hours L1,L2 Module -2 Fundamentals of maintenance engineering: Definition and aim of maintenance engineering. Primary and secondary functions and responsibility of maintenance ecost & its relation with replacement economy, Service life of equipment 08 Hours L1,L2 Module -3 Wear and Corrosion and their prevention: Wear- types, causes, effects, wear reduction methods, general sett, working and applications, Lubrication methods, general sett	Hours					
Course Objectives: This course will enable students to: 1. To know about Industrial safety programs and toxicology, Industrial laws , regulations and source models toxicology, Industrial laws , regulations and source models 2. To understand about fire and explosion, preventive methods, relief and its sizing methods. Teaching Hours Modules Teaching Hours Revised Bloom's Taxonomy (RBT) Level Module -1 Industrial safety: Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1940 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and firefighting, equipment and methods. 08 Hours L1,L2 Fundamentals of maintenance engineering: Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance department, Types of maintenance, Maintenance deficients applications, Lubrication methods, general sketch, working and applications, Lubrication methods, general sketch, working and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication, vi. Side feed lubrication, vi. King lubrication, principle and factors affecting the corrosion. Types of corrosion prevention methods. 08 Hours <td></td> <td>CRED</td> <td>DITS-03</td> <td></td> <td></td> <td></td>		CRED	DITS-03			
1. To know about Industrial safety programs and toxicology, Industrial laws , regulations and source models 2. To understand about fire and explosion, preventive methods, relief and its sizing methods. 3. To analyse industrial hazards and its risk assessment Teaching Hours Revised Bloom's Taxonomy (RBT) Level Module -1 Industrial safety: Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1940 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and firefighting, equipment and methods. 08 Hours L1,L2 Fundamentals of maintenance engineering: Definition and aim of maintenance engineering. Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment 08 Hours L1,L2 Wear and Corrosion and their prevention: Wear- types, and applications, Lubrication methods, lubricants-types and applications, Lubrication methods, general sketch, working and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, vi. King lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods. Method Low	Course Objectives:	This course will enab	le students to:			
regulations and source models 2. To understand about fire and explosion, preventive methods, relief and its sizing methods. 3. To analyse industrial hazards and its risk assessment Modules Teaching Hours Revised Bloom's Taxonomy (RBT) Level Module -1 Industrial safety: Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1940 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and firefighting, equipment and methods. 08 Hours L1,L2 Fundamentals of maintenance engineering: Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment 08 Hours L1,L2 Wear and Corrosion and their prevention: Wear- types, eases effects, wear reduction methods, lubricants-types and applications, Lubrication methods, general sketch, working and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, vi. King lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods. 08 Hours L1,L2	1. To know abo	out Industrial safety	programs and	toxicol	ogy, Ind	ustrial laws,
2. To understand about fire and explosion, preventive methods, relief and its sizing methods. 3. To analyse industrial hazards and its risk assessment Modules Teaching Hours Revised Bloom's Taxonomy (RBT) Level Module -1 Industrial safety: Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1940 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc., Safety color codes. Fire prevention and firefighting, equipment and methods. 08 Hours L1,L2 Fundamentals of maintenance engineering: Definition and aim of maintenance engineering. Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment 08 Hours L1,L2 Module -3 Wear and Corrosion and their prevention: Wear- types, causes, effects, wear reduction methods, lubricants-types and applications, Lubrication methods, general sketch, working and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, vi. King lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion prevention methods. Not Librication with set of the corrosion. Types of corrosion, corrosion prevention methods.	regulations an	nd source models				
sizing methods. 3. To analyse industrial hazards and its risk assessment Modules Teaching Hours Revised Bloom's Taxonomy (RBT) Level Module -1 Industrial safety: Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1940 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and firefighting, equipment and methods. 08 Hours L1,L2 Module -2 08 Hours L1,L2 Fundamentals of maintenance engineering: Definition and aim of maintenance engineering. Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment 08 Hours L1,L2 Wear and Corrosion and their prevention: Wear- types, causes, effects, wear reduction methods, lubricants- types and applications, Lubrication methods, general sketch, working and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, vi. King lubrication, vi. Side feed lubrication, vi. King lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods. Module -3	2. To understan	d about fire and exp	plosion, preven	tive me	ethods,	relief and its
3. To analyse industrial hazards and its risk assessment Modules Teaching Hours Revised Bloom's Taxonomy (RBT) Level Module -1 Industrial safety: Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1940 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and firefighting, equipment and methods. 08 Hours L1,L2 Module -2 Industrial maintenance engineering: Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment 08 Hours L1,L2 Wear and Corrosion and their prevention: Wear- types, causes, effects, wear reduction methods, lubricants- types and applications, Lubrication methods, general sketch, working and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, vi. Ring lubrication, vi. Side feed lubrication, vi. Ring lubrication, Vi. Side feed lubrication, vi. Ring lubrication, Types of corrosion, corrosion prevention methods. 08 Hours L1,L2	sizing method	ls.				
ModulesTeaching HoursRevised Bloom's Taxonomy (RBT) LevelModule -1Industrial safety: Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1940 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and firefighting, equipment and methods.08 HoursL1,L2Module -2Image: Comparison of the secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment08 HoursL1,L2Module -3Vear and Corrosion and their prevention: Wear- types, causes, effects, wear reduction methods, lubricants- types and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication, vi. Side feed lubrication, vii. Ring lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion prevention methods.08 HoursL1,L2	3. To analyse in	dustrial hazards and it	ts risk assessme	ent		1
HoursBloom's Taxonomy (RBT) LevelModule -1Industrial safety: Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1940 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and firefighting, equipment and methods.08 HoursL1,L2Module -2Image: Comparison of the maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment08 HoursL1,L2Module -3Vear and Corrosion and their prevention: Wear- types, causes, effects, wear reduction methods, lubricants- types and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication, vi. Side feed lubrication, vii. Ring lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion prevention methods.08 HoursL1,L2	Modules			Teach	ing	Revised
Module -1Taxonomy (RBT) LevelIndustrial safety: Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1940 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and firefighting, equipment and methods.08 HoursL1,L2Module -2Turbule -2Understand Fundamentals of maintenance engineering: Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment08 HoursL1,L2Wear and Corrosion and their prevention: Wear- types, causes, effects, wear reduction methods, lubricatis- types and applications, Lubrication methods, general sketch, working and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vi. Ring lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods.08 HoursL1,L2				Hours	5	Bloom's
Module -1(RBT) LevelIndustrial safety: Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1940 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and firefighting, equipment and methods.08 HoursL1,L2Module -2Fundamentals of maintenance engineering: Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment08 HoursL1,L2Wear and Corrosion and their prevention: Wear- types, causes, effects, wear reduction methods, lubrication, iv, Gravity lubrication, v. Wick feed lubrication, vi. Gravity lubrication, vii. Ring lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion prevention methods.08 HoursL1,L2						Taxonomy
Module -1LevelIndustrial safety: Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1940 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and firefighting, equipment and methods.08 HoursL1,L2Module -2Image: Color Codes of the prevention and firefighting, equipment and methods.08 HoursL1,L2Fundamentals of maintenance engineering: Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment08 HoursL1,L2Wear and Corrosion and their prevention: Wear- types, causes, effects, wear reduction methods, lubricants- types and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vii. Ring lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods.08 HoursL1,L2						(RBT)
Module -1Industrial safety: Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1940 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and firefighting, equipment and methods.08 HoursL1,L2Module -2Image: Color codes of the sector codes of maintenance engineering: Definition and aim of maintenance engineering. Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment08 HoursL1,L2Module -3Wear and Corrosion and their prevention: Wear- types, causes, effects, wear reduction methods, lubricants-types and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vii. Ring lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion prevention methods.08 HoursL1,L2						Level
Industrial safety: Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1940 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and firefighting, equipment and methods. 08 HoursL1,L2 Module -2Fundamentals of maintenance engineering: Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment 08 HoursL1,L2 Wear and Corrosion and their prevention: Wear- types, causes, effects, wear reduction methods, lubricants- types and applications, Lubrication methods, general sketch, working and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vii. Ring lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods. 08 HoursL1,L2	Module -1					1
control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1940 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and firefighting, equipment and methods. 08 HoursL1,L2 Module -2Fundamentals of maintenance engineering: Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment 08 HoursL1,L2 Wear and Corrosion and their prevention: Wear- types, causes, effects, wear reduction methods, lubricants- types and applications, Lubrication methods, general sketch, working and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, vi. King lubrication, vi. Side feed lubrication, vii. Ring lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods. 08 HoursL1,L2	Industrial safety: Ac	cident, causes, type	s, results and	08 H o	ours	L1,L2
and preventive steps/procedure, describe salient points of factories act 1940 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and firefighting, equipment and methods.08 HoursModule -2Fundamentals of maintenance engineering: Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment08 HoursL1,L2Wear and Corrosion and their prevention: Wear- types, causes, effects, wear reduction methods, lubricants- types and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vi. Ring lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods.08 HoursL1,L2	control, mechanical a	ind electrical hazards,	, types, causes			
of factories act 1940 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and firefighting, equipment and methods. Image: Color Codes in the image: Color Color Codes in the image: Co	and preventive steps	/procedure, describe	salient points			
drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and firefighting, equipment and methods.1Module -2Fundamentals of maintenance engineering: Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment08 HoursL1,L2Module -3Wear and Corrosion and their prevention: Wear- types, causes, effects, wear reduction methods, lubricants- types and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vii. Ring lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods.Mult -4	of factories act 1940	for health and safety	, wash rooms,			
pressure vessels, etc, Safety color codes. Fire prevention and firefighting, equipment and methods.Image: Color codes. Fire prevention and firefighting, equipment and methods.Module -2Image: Color codes. Fire prevention and aim of maintenance engineering: Definition and aim of maintenance engineering. Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipmentImage: Color code and the c	drinking water layou	ts, light, cleanliness,	fire, guarding,			
And Hirefighting, equipment and methods.Module -2Fundamentals of maintenance engineering: Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment08 HoursL1,L2Module -3Wear and Corrosion and their prevention: Wear- types, causes, effects, wear reduction methods, lubricants- types and applications, Lubrication methods, general sketch, working and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vii. Ring lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods.08 Hours	pressure vessels, etc,	Safety color codes. F	ire prevention			
Module -2Fundamentals of maintenance engineering: Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipmentU1,L2Module -3Wear and Corrosion and their prevention: Wear- types, causes, effects, wear reduction methods, lubricants- types and applications, Lubrication methods, general sketch, working and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vii. Ring lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion prevention methods.08 Hours	and firefighting, equi	pment and methods.				
Fundamentals of maintenance engineering: Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment 08 HoursL1,L2 Module -3Wear and Corrosion and their prevention: Wear- types, causes, effects, wear reduction methods, lubricants- types and applications, Lubrication methods, general sketch, working and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vii. Ring lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods. 08 HoursL1,L2	Module -2	• • • •		00 II		
and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment08 HoursL1,L2Module -308 HoursL1,L2Wear and Corrosion and their prevention: Wear- types, causes, effects, wear reduction methods, lubricants- types and applications, Lubrication methods, general sketch, working and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vii. Ring lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods.Maintenance	Fundamentals of ma	intenance engineerir	ng: Definition	08 H 0	ours	LI,LZ
secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment Module -3 Wear and Corrosion and their prevention: Wear- types, 08 Hours L1,L2 causes, effects, wear reduction methods, lubricants- types and applications, Lubrication methods, general sketch, working and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vii. Ring lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods.	and aim of mainte	enance engineering,	Primary and			
department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment Module -3 Wear and Corrosion and their prevention: Wear- types, causes, effects, wear reduction methods, lubricants- types and applications, Lubrication methods, general sketch, working and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vii. Ring lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods.	secondary functions	and responsibility of	Tumos			
applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipmentImage: Construct of the service Module -3Module -308 HoursL1,L2Wear and Corrosion and their prevention: Wear- types, causes, effects, wear reduction methods, lubricants- types and applications, Lubrication methods, general sketch, working and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vii. Ring lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods.Maintenance (Maintenance)	apartment, Types	of maintenance,	Types and Maintananaa			
Cost & its relation with replacement economy, service Ife of equipment Module -3 Wear and Corrosion and their prevention: Wear- types, causes, effects, wear reduction methods, lubricants-types and applications, Lubrication methods, general sketch, working and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vi. Ring lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods. Vear All All All All All All All All All Al	applications of tools	used for maintenance				
Module -3Wear and Corrosion and their prevention: Wear- types, causes, effects, wear reduction methods, lubricants- types and applications, Lubrication methods, general sketch, working and applications, i. Screw down grease 	life of equipment	an replacement ecor	ioniy, service			
Wear and Corrosion and their prevention: Wear- types, causes, effects, wear reduction methods, lubricants- types and applications, Lubrication methods, general sketch, working and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vii. Ring lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods.08 HoursL1,L2	Modulo 3					
causes, effects, wear reduction methods, lubricants- types and applications, Lubrication methods, general sketch, working and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vii. Ring lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods.	Wear and Corresion	and their prevention	Wear types	08 Ho		1112
types and applications, Lubrication methods, fubricants- types and applications, Lubrication methods, general sketch, working and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vii. Ring lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods.	wear and Corrosion	and their prevention.	wear-types,	UO 11 0	Juis	L1,L2
sketch, working and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vii. Ring lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods.	types and application	an reduction method	bods general			
cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vii. Ring lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods.	sketch working and	applications i Screw	down grease			
Gravity lubrication, v. Wick feed lubrication, iv. feed lubrication, vii. Ring lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods.	cup ii Pressure gree	applications, 1. Screw	ubrication iv			
feed lubrication, vi. Ring lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods.	Gravity lubrication v Wick feed lubrication vi Side					
principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods.	feed lubrication vii Ring lubrication Definition					
corrosion, corrosion prevention methods.	principle and factors affecting the corrosion Types of					
	corrosion corrosion	revention methods	ion. Types of			
	Module -4	nevenuon methous.		1		I
Fault tracing: Fault tracing-concept and importance 08 Hours 11 1 2 1 2	Fault tracing: Fault	tracing_concept_and	d importance	08 H	ure	I1 I 7 I 3
decision tree concept need and applications sequence	decision tree concen	t need and application	ons sequence		u15	11, 12,13
of fault finding activities show as decision tree draw	of fault finding activ	vities show as decisi	on tree draw			

decision tree for problems in machine tools, hydraulic, pneumatic,automotive, thermal and electrical equipment's like, I. Any one machine tool, ii. Pump iii. Air compressor, iv. Internal combustion engine, v. Boiler, vi. Electrical motors, Types of faults in machine tools and their general causes.		
Module-5		
Periodic and preventive maintenance: Periodic inspection-concept and need, decreasing, cleaning and repairing schemes, overhauling of mechanical components, overhauling of electrical motor, common troubles and remedies of electric motor, repair complexities and its use, definition, need, steps and advantages of preventive maintenance. Steps/procedure for periodic and preventive maintenance of: I. Machine tools, ii. Pumps, iii. Air compressors, iv. Diesel generating (DG) sets, Program and schedule of preventive maintenance of mechanical and electrical equipment, advantages of preventive maintenance. Repair cycle concept and importance	08 Hours	L1,L2,L3
Course outcomes: By the end of the course the students y	will be able to	
 Analyze the effect of release of toxic substances Understand the industrial laws, regulations and Apply the methods of prevention of fire and exp Understand the relief and its sizing methods. Understand the methods of hazard identification Text Books: Digital signal processing – Principles Algorithms Monalakis, Pearson education, 4th Edition, New E Digital signal processing-Theory and Lab practice 	source models. plosions. <u>and preventive</u> & Application Delhi, 2007.	measures. s, Proakis & Rao Vinceta
P.Gejji, Second addition, PEARSON, 2010.	ee, D.Galesh I	xao, vinceta
 Reference Books: 1. Maintenance Engineering Handbook, Higgins & M Services. 2. Maintenance Engineering, H. P. Garg, S. Chand an 3. Pump-hydraulic Compressors, Audels, Mcgrew H 4. Foundation Engineering Handbook, Winterkorn, H London. 	Morrow, Da Info nd Company. ill Publication. Hans, Chapman	rmation & Hall

OPERATION RESEARCH						
	SEMESTER-III					
Course Code	19LOE323	CIE Marks	50			
Number of Lecture	03	SEE Marks	50			
Hours/Week						
Total Number of Lecture	40	Exam Hours	03hrs			
Hours						
	CREDITS-0	3				

Course Learning Objectives:

- 1. Analyze any real life systems with limited constraints and depict it in model form.
- 2. Understand variety of problems such as Assignment, Transportation, Travelling sales man etc.
- 3. Formulate and solve problems as Networks and Graphs.
- 4. Construct Linear Integer Programming Models and discuss the solution Techniques.
- 5. Set up Decision Models and use some Solution Methods for Nonlinear Optimization Problems.
- 6. Propose the best Strategy using Decision making methods under Uncertainty.

Modules	Teaching Hours	Revised Bloom's Taxonomy (RBT) Level
Module -1		
Introduction: What is Operation Research, Operation Research		
Models, Solving the OR Model, Art of Modeling, More than Just	08 Hours	L1,L2,L3
Mathematics, Phases of an OR Study.		
Modeling with Linear Programming: Two Variable LP Model,		
Graphical LP Solution, Selected LP Applications, Computer		
Solution with Excel Solver and AMPL.		
Module -2		1
Simplex method and sensitivity analysis : LP Model in Equation Form, Transition from Graphical to Algebraic Solution, the Simplex Method, Artificial Starting Solution, Special Cases in Simplex Method, Sensitivity Analysis.	08 Hours	L1,L2,L3
Module -3		
Duality and post -optimal analysis: Definition of the Dual	08 Hours	
Problem, Primal-Dual Relationships, Economic Interpretation of	1	L1,L2,L3
Duality, Additional Simplex Algorithms, Post Optimal Analysis.		
Module –4	1	

Transportation model and its variable: Definition of the 08 Hours	
Transportation Model, Nontraditional Transportation Models, the	13
Transportation Algorithm, the Assignment Model, the	,113
Transshipment Model.	
Network Models: Scope and Definition of Network Models,	
Minimal Spanning Tree Algorithm, Shortest-Route Problem,	
Maximal Flow Model, CPM and PERT.	
Module -5	
Classical optimization theory: Unconstrained problem, constrained	
problem. 08 Hours	13
Nonlinear programming algorithms: Unconstrained algorithm,	,L3
constrained algorithm.	
Course Outcomes: At the end of this course, students should be able to	
1. Understand the given problem as transportation and assignment problem and sol	ve.
2. Solve problems as Networks and Graphs.	
3. Construct Linear Integer Programming Models.	
4. Solve the problems on Strategy using Decision making methods under Uncertain	ıty.
5. Solve the problems on Decision Models and use some Solution Methods	for
Nonlinear Optimization Problems.	
Text Book:	
1. H.A Taha, Operations Research, An Introduction, PHI, 2008.	

2. D.S Hira and PK Gupta, Operations Research, (Revised Addition), published by S. Chand and company Ltd. 2014.

Reference Books:

- S Kalavathy, operation Research, Vikas Publishing House Pvt Limited, 01-Aug-2002.
 S D Sharma, Operation Research, KedarNath Ram Nath Publishers.

COST MANAGEM	IENT OF ENGINEERIN	G PROJECT	<u>S</u>		
[As per Choice]	Based Credit System (CBC	S) Scheme]			
	SEMESTER-III				
Subject Code 19LOE32	CIE Marks	50			
Number of Lecture 03	SEE Marks	50			
Hour/Week					
Total Number of 40	Exam Hours	03			
Lecture Hours					
	CREDITS-03				
Course Objectives: This course	e will enable students to:				
1. Recognize and apply appropriate theories, principles and concepts relevant to					
cost accounting.					
2. Exercise appropriate jud	2. Exercise appropriate judgment in selecting and presenting information using				
3 Plan design and execut	e practical activities using	techniques an	d procedures		
appropriate to cost accol	infing	teeninques and	a procedures		
4. Respond to change with	in the external and internal	business envir	onments and		
its effect on cost account	ting.				
5. Develop appropriate effe	ective written and oral con	nmunication sl	kills relevant		
to cost accounting.					
6. Use organization skills (including task and time ma	anagement) rel	evant to cost		
accounting systems both	individually and in a group	o situation.			
7. Solve problems relevant	to cost accounting systems	using ideas an	d techniques		
some of which are at the	forefront of the discipline.				
		T 1.	D · 1		
Modules		Teaching	Revised		
Modules		Teaching Hours	Revised Bloom's		
Modules		Teaching Hours	Revised Bloom's Taxonomy (RBT)		
Modules		Teaching Hours	Revised Bloom's Taxonomy (RBT) Level		
Modules Module -1		Teaching Hours	Revised Bloom's Taxonomy (RBT) Level		
Modules Module -1 Introduction and Overview	of the Strategic Cost	Teaching Hours 08 Hours	Revised Bloom's Taxonomy (RBT) Level L1.L2.L3		
Modules Module -1 Introduction and Overview Management Process	of the Strategic Cost	Teaching Hours 08 Hours	Revised Bloom's Taxonomy (RBT) Level L1,L2,L3		
Modules Module -1 Introduction and Overview Management Process	of the Strategic Cost	Teaching Hours 08 Hours	Revised Bloom's Taxonomy (RBT) Level L1,L2,L3		
Modules Module -1 Introduction and Overview Management Process Module -2	of the Strategic Cost	Teaching Hours 08 Hours	Revised Bloom's Taxonomy (RBT) Level L1,L2,L3		
Modules Module -1 Introduction and Overview Management Process Module -2 Cost concepts in decision making	of the Strategic Cost	Teaching Hours 08 Hours 08 Hours	Revised Bloom's Taxonomy (RBT) Level L1,L2,L3		
Modules Module -1 Introduction and Overview Management Process Module -2 Cost concepts in decision-maki Differential cost	of the Strategic Cost	Teaching Hours 08 Hours 08 Hours	Revised Bloom's Taxonomy (RBT) Level L1,L2,L3		
Modules Module -1 Introduction and Overview Management Process Module -2 Cost concepts in decision-maki Differential cost, Increme Opportunity cost, Objectives of	of the Strategic Cost ng; Relevant cost, ntal cost and a Costing System:	Teaching Hours 08 Hours 08 Hours	Revised Bloom's Taxonomy (RBT) Level L1,L2,L3		
Modules Module -1 Introduction and Overview Management Process Module -2 Cost concepts in decision-maki Differential cost, Increme Opportunity cost. Objectives of Inventory, valuation: Creation	of the Strategic Cost ng; Relevant cost, ntal cost and a Costing System; of a Database for	Teaching Hours 08 Hours 08 Hours	Revised Bloom's Taxonomy (RBT) Level L1,L2,L3		
Modules Module -1 Introduction and Overview Management Process Module -2 Cost concepts in decision-maki Differential cost, Increme Opportunity cost. Objectives of Inventory valuation; Creation operational control:	of the Strategic Cost ng; Relevant cost, ntal cost and a Costing System; of a Database for on of data for	Teaching Hours 08 Hours 08 Hours	Revised Bloom's Taxonomy (RBT) Level L1,L2,L3		
Modules Module -1 Introduction and Overview Management Process Module -2 Cost concepts in decision-makin Differential cost, Increment Opportunity cost. Objectives of Inventory valuation; Creation operational control; Provision Decision-Making.	of the Strategic Cost ng; Relevant cost, ntal cost and a Costing System; of a Database for on of data for	Teaching Hours 08 Hours 08 Hours	Revised Bloom's Taxonomy (RBT) Level L1,L2,L3		
Modules Module -1 Introduction and Overview Management Process Module -2 Cost concepts in decision-makin Differential cost, Increment Opportunity cost. Objectives of Inventory valuation; Creation operational control; Provision Decision-Making.	of the Strategic Cost ng; Relevant cost, ntal cost and a Costing System; of a Database for on of data for	Teaching Hours 08 Hours 08 Hours	Revised Bloom's Taxonomy (RBT) Level L1,L2,L3		
Modules Module -1 Introduction and Overview Management Process Module -2 Cost concepts in decision-maki Differential cost, Increme Opportunity cost. Objectives of Inventory valuation; Creation operational control; Provision Decision-Making.	of the Strategic Cost ng; Relevant cost, ntal cost and a Costing System; of a Database for on of data for	Teaching Hours 08 Hours 08 Hours	Revised Bloom's Taxonomy (RBT) Level L1,L2,L3		
Modules Module -1 Introduction and Overview Management Process Module -2 Cost concepts in decision-maki Differential cost, Increme Opportunity cost. Objectives of Inventory valuation; Creation operational control; Provision Decision-Making. Module -3 Project: meaning, Different type	of the Strategic Cost ng; Relevant cost, ntal cost and a Costing System; of a Database for on of data for	Teaching Hours 08 Hours 08 Hours 08 Hours	Revised Bloom's Taxonomy (RBT) Level L1,L2,L3		
Modules Module -1 Introduction and Overview Management Process Module -2 Cost concepts in decision-maki Differential cost, Increme Opportunity cost. Objectives of Inventory valuation; Creation operational control; Provision Decision-Making. Module -3 Project: meaning, Different type overruns centres various state	of the Strategic Cost ng; Relevant cost, ntal cost and a Costing System; of a Database for on of data for	Teaching Hours 08 Hours 08 Hours 08 Hours	Revised Bloom's Taxonomy (RBT) Level L1,L2,L3 L1,L2,L3		
Modules Module -1 Introduction and Overview Management Process Module -2 Cost concepts in decision-maki Differential cost, Increment Opportunity cost. Objectives of Inventory valuation; Creation operational control; Provision Decision-Making. Module -3 Project: meaning, Different typoverruns centres, various stage conception to commissioning	of the Strategic Cost ng; Relevant cost, ntal cost and a Costing System; of a Database for on of data for pes, why to manage, cost ges of project execution:	Teaching Hours 08 Hours 08 Hours 08 Hours	Revised Bloom's Taxonomy (RBT) Level L1,L2,L3 L1,L2,L3		
Modules Module -1 Introduction and Overview Management Process Module -2 Cost concepts in decision-maki Differential cost, Increme: Opportunity cost. Objectives of Inventory valuation; Creation operational control; Provision Decision-Making. Module -3 Project: meaning, Different typoverruns centres, various stage conception to commissioning conglomeration of technical	of the Strategic Cost ng; Relevant cost, ntal cost and a Costing System; of a Database for on of data for pes, why to manage, cost ges of project execution: g. Project execution as l and non- technical	Teaching Hours 08 Hours 08 Hours 08 Hours	Revised Bloom's Taxonomy (RBT) Level L1,L2,L3 L1,L2,L3		
Modules Module -1 Introduction and Overview Management Process Module -2 Cost concepts in decision-maki Differential cost, Increment Opportunity cost. Objectives of Inventory valuation; Creation operational control; Provision Decision-Making. Module -3 Project: meaning, Different typoverruns centres, various stage conception to commissioning conglomeration of technica activities, Detailed Engineering	of the Strategic Cost ng; Relevant cost, ntal cost and a Costing System; of a Database for on of data for pes, why to manage, cost ges of project execution: g. Project execution as 1 and non- technical ng activities. Pre project	Teaching Hours 08 Hours 08 Hours 08 Hours	Revised Bloom's Taxonomy (RBT) Level L1,L2,L3 L1,L2,L3		

team: Role of each member. Importance Project site:								
Data required with significance. Project contracts.								
Types and contents. Project execution Project cost								
control. Bar charts and Network diagram. Project								
commissioning: mechanical and process								
Module -4								
Cost Behavior and Profit Planning Marginal Costing; Distinction between Marginal Costing and Absorption Costing; Break-even Analysis, Cost-Volume-Profit Analysis. Various decision-making problems. Standard Costing and Variance Analysis. Pricing strategies: Pareto Analysis. Target costing, Life Cycle Costing. Costing of service sector. Just-in-time approach, Material Requirement Planning, Enterprise Resource Planning, Total Quality Management and Theory of constraints. Activity-Based Cost Management, Bench Marking; Balanced Score Card and Value-Chain Analysis. Budgetary Control; Flexible Budgets; Performance budgets; Zero-based budgets. Measurement of Divisional profitability pricing	08 Hours	L1, L2,L3						
decisions including transfer pricing.								
Module-5								
Module-5 Quantitative techniques for cost management, Linear Programming, PERT/CPM, Transportation problems, Assignment problems, Simulation, Learning Curve Theory.	08 Hours	L1,L2,L3						
Module-5 Quantitative techniques for cost management, Linear Programming, PERT/CPM, Transportation problems, Assignment problems, Simulation, Learning Curve Theory. Course outcomes:	08 Hours	L1,L2,L3						
Module-5 Quantitative techniques for cost management, Linear Programming, PERT/CPM, Transportation problems, Assignment problems, Simulation, Learning Curve Theory. Course outcomes: 1. Students will demonstrate knowledge of data analy 2. On completion of this course, students should be a interpret the results of costing techniques appropridecisions. 3. Formulate and use standards and budgets for pla understand the role of responsibility accounting and standards and	08 Hours 108 Hours Vtics. Ible to identify, ate to different anning and cont ad performance	L1,L2,L3 use and activities and rol purposes;						
 decisions including transfer pricing. Module-5 Quantitative techniques for cost management, Linear Programming, PERT/CPM, Transportation problems, Assignment problems, Simulation, Learning Curve Theory. Course outcomes: Students will demonstrate knowledge of data analy On completion of this course, students should be a interpret the results of costing techniques appropridecisions. Formulate and use standards and budgets for pla understand the role of responsibility accounting at REFERENCE BOOKS: 	08 Hours vtics. ble to identify, ate to different nning and cont d performance	L1,L2,L3 use and activities and rol purposes;						
COMPOSITE MATERIALS								
--	--	-----------------	---------------	-----------	------------------	--	--	--
[As per Choice Based Credit System (CBCS) Scheme]								
SEMESTER-III								
Subject Code	19LOE325	CIE Marks	50					
Number Lecture	03	SEE Marks		50				
Hour/Week								
Number of Lecture	40	Exam Hours	s 03					
Hours								
CREDITS-03								
Course Objectives: This course will enable students to:								
1. Identify, describe and evaluate the properties of fibre reinforcements,								
polyn	ner matrix materials an	d commercial of	compos	ites.				
2. Deve	lop competency	in in	one	01	more			
comn	non composite manufa	cturing techniq	ues, and	d be able	to select the			
appro	priate technique	for ma	inufacti	ure	of fibre-			
reinfo	orced composite produce	cts.						
Modules			Teaching		Revised			
			Hours	5	Bloom's			
					Taxonomy			
					(\mathbf{RBT})			
					Level			
Module -1		· C' · · · 1	00 11					
INTRODUCTION: Definition – Classification and		ification and	vo nours		L1,L2			
characteristics of Co	omposite materials. Ac	ivantages and						
application of composites. Functional requirements of								
reinforcement and matrix. Effect of reinforcement (size,		cement (size,						
shape, distribution, volume fraction) on overall								
Modulo 2								
DEINEODCEMENT	C: Droporation law	in ouring	09 U	11100	1112			
nenortias and applic	s. Teparation-lay	ap, curing,	00 110	Juis	L1,L2			
Keyler fibers and	Boron fibers Pr	carbon nuers,						
applications of w	biskers particle re	inforcements						
Mechanical Rehavio	or of composites: Rule	of mixtures						
Inverse rule of t	nivtures Isostrain a	and Isostress						
conditions	initiales. isostiani e	130511055						
Module -3								
Manufacturing of N	letal Matrix Composit	es: Casting –	08 Ho	ours	L1.L2			
Solid State diffusion	Solid State diffusion technique Cladding – Hot isostatic		00 110					
pressing. Properties	pressing Properties and applications Manufacturing of							
Ceramic Matrix Cor	nposites: Liquid Metal	Infiltration –						
Liquid phase sintering. Manufacturing of Carbon –								
Carbon composites: Knitting, Braiding, Weaving,								
Properties and applic	cations.	<i>,</i>						
Module -4								
Manufacturing of	Polymer Matrix	Composites:	08 H o	ours	L1, L2,L3			
Preparation of Mou	lding compounds an	d prepregs –			, ,			
hand layup method	– Autoclave metho	d – Filament						

winding method – Compression moulding – Reaction				
injection moulding. Properties and applications.				
Module-5				
Strength: Laminar Failure Criteria-strength ratio, 08 Hours	L1,L2,L3			
maximum stress criteria, maximum strain criteria,				
interacting failure criteria, hygro thermal failure.				
Laminate first play failure-insight strength; Laminate				
strength-ply discount truncated maximum strain				
criterion; strength design using caplet plots; stress				
concentrations.				
Course outcomes: After studying this course, students will be able t	0:			
1. Explain the mechanical behavior of layered composites compared to				
isotropic materials.				
2. Apply constitutive equations of composite materials and under	stand mechanical			
behavior at micro and macro levels.				
Text Books:				
1. Material Science and Technology – Vol 13 – Composites by R.W.Cahn –				
VCH. West Germany.				
2. Materials Science and Engineering. An introduction. WD Callister. Jr.,				
Adapted by R. Balasubramaniam, John Wiley & Sons, NY, Indian edition.				
2007.				
Reference Books:				
1. Hand Book of Composite Materials-ed-Lubin.				
2. Composite Materials – K.K.Chawla.				
3. Composite Materials Science and Applications – Deborah D.L. Chung.				
4. Composite Materials Design and Applications – Danial Gay, Suong V, Hoa.				
and Stephen W. Tasi.				

	WASTE T	O ENERGY					
[As per Choice Based Credit System (CBCS) Scheme]							
SEMESTER-III							
Subject Code	19LOE326	CIE Marks	50				
Number Lecture	03	SEE Marks		50			
Hour/Week							
Number of Lecture	40	Exam Hours	03				
Hours							
	CRED	DITS-03					
Course Objectives: This course will enable students to:							
1. The objective	of the course is to	provide insig	ts in	to waste	management		
options by re	ducing the waste dest	tined for dispos	sal and	encoura	iging the use		
of waste as a	resource for alternate	energy product	ion				
2 This course	is designed to provid	le an understar	nding o	f the va	rious aspects		
of Waste to E	Energy.						
Modules			Teaching		Revised		
			Hours	5	Bloom's		
					Taxonomy		
				(RBT)			
					Level		
Module -1							
Introduction to Ener	rgy from Waste: Cla	assification of	08 H o	ours	L1,L2		
waste as fuel - Agr	to based, Forest resid	lue, Industrial					
waste - MSW - C	Conversion devices -	Incinerators,					
gasifiers, digestors							
Module -2			n				
Biomass Pyrolysis:	Pyrolysis - Types,	slow fast –	08 Ho	ours	L1,L2		
Manufacture of ch	arcoal – Methods ·	- Yields and					
application - Manufacture of pyrolytic oils and gases,		ils and gases,					
yields and application	ns.						
Module -3			I		•		
Biomass Gasification	on: Gasifiers Fixed	bed system	08 H o	ours	L1,L2		
Downdraft and updr	aft gasifiers Fluidized	l bed gasifiers					
Design, construction	n and operation Ga	asifier burner					
arrangement for th	ermal heating – Ga	asifier engine					
arrangement and el	ectrical power – Eq	uilibrium and					
kinetic consideration	in gasifier operation.						
Module -4			a				
Biomass Combusti	on: Biomass stove	es Improved	08 H o	ours	L1, L2,L3		
chullahs, types, so	ome exotic designs.	, Fixed bed					
combustors, Types, inclined grate combustors, Fluidized							
bed combustors, Design, construction and operation -							
Operation of all the above biomass combustors.							
Module-5			-				
Biogas: Properties of biogas (Calorific value and		08 Ho	ours	L1,L2,L3			
composition) - Biogas plant technology and status - Bio							
energy system - De	sign and constructio	nal features -					
Biomass resources	and their classification	on - Biomass					

conversion processes - Thermo chemical conversion -	
Direct combustion - biomass gasification - pyrolysis and	
liquefaction - biochemical conversion - anaerobic	
digestion - Types of biogas Plants – Applications -	
Alcohol production from biomass - Bio diesel	
production - Urban waste to energy conversion -	
Biomass energy programme in India.	

Course outcomes:. After studying this course, students will be able to:

- 1. To provide insights into waste management options by reducing the waste destined for disposal and encouraging the use of waste as a resource for alternate energy production.
- 2. To provide an understanding of the various aspects of Waste to Energy.

Reference Books:

- 1. Non Conventional Energy, Desai, Ashok V., Wiley Eastern Ltd., 1990.
- 2. Biogas Technology A Practical Hand Book Khandelwal, K. C. and Mahdi, S. S., Vol. I & II, Tata McGraw Hill Publishing Co. Ltd., 1983.
- 3. Food, Feed and Fuel from Biomass, Challal, D. S., IBH Publishing Co. Pvt. Ltd., 1991.
- 4. Biomass Conversion and Technology, C. Y. WereKo-Brobby and E. B. Hagan, John Wiley & Sons, 1996.