RV Educational Institutions [®] RV College of Engineering



Autonomous Institution Affiliated to Visvesvaraya Technological University, Belagavi Approved by AICTE, New Delhi



Scheme and Syllabus of I – IV semester (Autonomous System of 2022 Scheme) Master of Technology (M. Tech.) in DIGITAL COMMUNICATION (MDC)

DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Academic Year 2022-23



RV-Mercedes Benz Centre for Automotive Mechatronics

RV Educational Institutions [®] RV College of Engineering [®]



Approved by AICTE, New Delhi

Glossary of Abbreviations

1.	AS	Aerospace Engineering
2.	BS	Basic Sciences
3.	BT	Biotechnology
4.	СН	Chemical Engineering
5.	CHY	Chemistry
б.	CIE	Continuous Internal Evaluation
7.	CS	Computer Science & Engineering
8.	CV	Civil Engineering
9.	EC	Electronics & Communication Engineering
10.	EE	Electrical & Electronics Engineering
11.	EI	Electronics & Instrumentation Engineering
12.	ET	Electronics & Telecommunication Engineering
13.	GE	Global Elective
14.	HSS	Humanities and Social Sciences
15.	IM	Industrial Engineering & Management
16.	IS	Information Science & Engineering
17.	L	Laboratory
18.	MA	Mathematics
19.	MBT	M. Tech in Biotechnology
20.	MCE	M. Tech. in Computer Science & Engineering
21.	MCN	M. Tech. in Computer Network Engineering
22.	MCS	M. Tech. in Communication Systems
23.	MDC	M. Tech. in Digital Communication
24.	ME	Mechanical Engineering
25.	MHT	M. Tech. in Highway Technology
26.	MIT	M. Tech. in Information Technology
27.	MMD	M. Tech. in Machine Design
28.	MPD	M. Tech in Product Design & Manufacturing
29.	MPE	M. Tech. in Power Electronics
30.	MSE	M. Tech. in Software Engineering
31.	MST	M. Tech. in Structural Engineering
32.	MVE	M. Tech. in VLSI Design & Embedded Systems
33.	Ν	Internship
34.	Р	Projects (Minor / Major)
35.	PHY	Physics
36.	SDA	Skill Development Activity
37.	SEE	Semester End Examination
38.	Т	Theory
39.	TL	Theory Integrated with Laboratory
40.	VTU	Visvesvaraya Technological University

RV Educational Institutions [®] RV College of Engineering [®]



Approved by AICTE, New Delhi

POSTGRADUATE PROGRAMS

Sl. No	Core Department	Program	Code
1.	BT	M. Tech in Biotechnology	MBT
2.	CS	M. Tech in Computer Science & Engineering	MCE
3.	CS	M. Tech in Computer Network Engineering	MCN
4.	CV	M. Tech in Structural Engineering	MST
5.	CV	M. Tech in Highway Technology	MHT
6.	EC	M. Tech in VLSI Design & Embedded Systems	MVE
7.	EC	M. Tech in Communication Systems	MCS
8.	EE	M. Tech in Power Electronics	MPE
9.	ET	M. Tech in Digital Communication	MDC
10.	IS	M. Tech in Software Engineering	MSE
11.	IS G	M. Tech in Information Te <mark>chno</mark> logy	MIT
12.	ME	M. Tech in Product Design & Manufacturing	MPD
13.	ME	M. Tech in Machine Desig <mark>n</mark>	MMD

RV Educational Institutions * RV College of Engineering * Autonomous Institution Affiliated to Visvesvaraya Technological University, Belagavi

DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION ENGINEERING

VISION

Imparting quality education in electronics and telecommunication engineering through focus

on fundamentals, research and innovation for sustainable development.

MISSION

1. Provide comprehensive education that prepares students to contribute effectively to the profession and society in the field of Telecommunication.

2. Create state-of-the-art infrastructure to integrate a culture of research with a focus on Telecommunication Engineering Education.

3. Encourage students to be innovators to meet local and global needs with ethical practice.

4. Create an environment for faculty to carry out research and contribute to their field of specialization, leading to Center of Excellence with focus on affordable innovation.

5. Establish a strong and wide base linkage with industries, R&D organization, and academic Institutions.

PROGRAMME OUTCOMES (PO)

M. Tech in **Digital Communication** graduates will be able to:

- PO1: Acquire in-depth knowledge of Digital Communication Engineering with an ability to analyse, synthesize, evaluate existing and new technologies.
- PO2: Learn and apply modern engineering tools to solve complex engineering problems.
- PO3: Engage in life-long learning independently, to contribute for multidisciplinary research work.
- PO4: Independently carry out research /investigation and development work to solve practical problems.
- PO5: Write and present a substantial technical report/document.
- PO6: Demonstrate a degree of mastery over the area of Digital Communication Engineering. The mastery would be at a level higher than the requirements in the appropriate bachelor program.

Go, change the world

RV Educational Institutions [®] RV College of Engineering [®]



Approved by AICTE, New Delhi

INDEX

S1. No.	Course Code	Course Title	Page No.			
1	22MAT11CT	Linear Algebra and Probability Theory	09 – 10			
2	22MDC12TL	Advanced Digital Communication	11 - 12			
3	22MDC13TL	Advanced Signal Processing	13 - 14			
4	22MDC14L	Object Oriented Programming and Machine	15			
	22MDC141T	Mobile Adhoc Networks	16 - 17			
5	22MDC1A1T	Multimedia Communications	18 - 19			
5	22MDC1A2T	Image Processing and Computer Vision	10 - 10			
	22MDC1R1T	Artificial Intelligence and Deep Learning	20 - 21			
6	22MDC1B1TArtificial Intelligence and Deep Learning622MDC1B2TData Structures and Algorithms					
0	22MDC1D21	Data Structures and Algorithms	27 - 23			
7		Bioaubaliu Networks	20 - 27			
1		Ontional Fiber Communication and Naturalis	20 - 29			
0		Automa Amore and Applications	30 - 31			
9	22MDC231	Antenna Arrays and Applications	32 - 33			
	22MDC2C1T	Communication Systems	34 - 35			
10	22MDC2C2T	Vehicular Communications and Networks	36 - 37			
10	22MDC2C3T	Software Defined Networks in Telecom Industry	38 – 39			
	22MVE2C3T	Robotics and Industrial Automation	40 - 41			
	22MCS2C4T	Advanced 5G	40a -40b			
	22BT2D01T	Bioinspired Engineering	42 - 43			
	22BT2D02T	Health Informatics	44 – 45			
	22CS2D03T	Business Analytics	46 - 47			
	22CV2D04T	Industrial and Occupational Health and Safety	48 - 49			
	22CV2D05T	Intelligent Transportation Systems	50 - 51			
	22EC2D06T	Electronic System Design	52 - 53			
11	22EC2D07T	Evolution of Wireless Technologies	54 – 55			
	22ET2D08T	Tracking and Navigation Systems	56 - 57			
	22IM2D09T	Project Management	58 – 59			
	22IS2D10T	Database and Information Systems	60 - 61			
	22IS2D11T	Management Information Systems	62 - 63			
	22MAT2D12T	Statistical and Optimization Methods	64 - 65			
	22ME2D13T	Industry 4.0	66 - 67			
12	22MDC24L	Antennas and RF Laboratory	68			
13	22HSS25T	Professional Skills Development-I	69 – 70			
14	22MDC31T	Advanced Wireless Systems	71 - 72			
	22MDC3E1T	Adaptive Signal Processing	73 - 74			
15	22MDC3E2T	Channel Coding Techniques	75 - 76			
	22MDC3E3T	Cryptography and Network Security	77 – 78			
16	22MDC32N	Internship	79			
17	22MDC33P	Minor Project	80			

RV	RV Educational Ins RV College of Autonomous Institution Affiliated to Visvesvaraya Technological University, Belagavi	Go. change the Engineering [©] Approved by AICTE, New Delhi	e world
18	22MDC41P	Major Project	81
19	22HSS42	Professional Skills Development-II	





M.Tech in Digital Communication: MDC

I SE	EMESTER M.Te	ch										
S1				redit A	lloc	ation			CIE	Max	SEE	Max
No.	Course Code	Course Title	т	T/	D	T-+-1	BoS	Category	Duration	Marks	Duration	Marks
110.		12.0	L	SDA	Г	Total		CIE CategoryMax Duration (H)SEE Marks CIEDuration Duration (H)Theory1.51003Theory+Lab1.51003Theory+Lab1.51003Lab1.5503Theory1.51003Theory1.51003	(H)	SEE		
1	22MAT11CT	Linear Algebra and Probability Theory	3	1	0	4	MA	Theory	1.5	100	3	100
2	22MDC12TL	Advanced Digital Communication	3	0	1	4	ET	Theory+Lab	1.5	100	3	100
3	22MDC13TL	Advanced Signal Processing	3	0	1	4	ET	Theory+Lab	1.5	100	3	100
1	22MDC14I	Object Oriented Programming and Machine					19					
+	ZZIVIDC14L	Learning Laboratory	1	0	1	2	ET	Lab	1.5	MaxSonMarksDurCIE((100(10010050100100100course can be s	3	50
5	22MDC1AXT	Elective A (Professional Elective)	3	0	0	3	ET	Theory	1.5	100	3	100
6	22MDC1BXT	Elective B (Professional Elective)	3	0	0	3	ET	Theory	1.5	100	3	100
Not	e: For the course	code 22HSS42, Students need to select one ONLIN	EMC) 00 co	ours	e as <mark>re</mark>	<mark>com</mark> mende	d by HSS Bos	S. This cou	rse can	be selected	d
any	time between I t	to III semester and it will be eval <mark>uated during IV</mark> ser	neste	r.								

		2 <mark>0</mark>	(J)
Code	Elective A (Professional Elective)	Code	Elective B (Professional Elective)
22MDC1A1T	Mobile Adhoc Networks	22MDC1B1T	Artificial Intelligence and Deep Learning
22MDC1A2T	Multimedia Communications	22MDC1B2T	Data Structures and Algorithms
22MDC1A3T	Image Processing and Computer Vision	22MDC1B3T	Broadband Networks

II SEMESTER M.Tech Credit Allocation CIE Max SEE Max S1. Course Code Course Title Duration Marks Duration Marks T/ BoS Category No. Ρ L Total SDA (H) CIE (H) SEE 1 22IM21T Research Methodology 3 0 0 1.5 100 3 IM Theory 3 100 2 22MDC22TL **Optical Fiber Communication and Networks** 3 Theory+Lab 3 0 1 4 ET 1.5 100 100 3 22MDC23T 3 0 0 3 ΕT 1.5 100 3 100 Antenna Arrays and Applications Theory 4 22XXX2CXT Elective C (Professional Elective) 3 0 0 3 EΤ Theory 1.5 100 3 100 5 22XXX2DXXT Elective D (Global Elective) 3 0 0 3 Res. BoS Theory 1.5 3 100 100 6 22MDC24L Antennas and RF Laboratory 0 1 2 ΕT 1.5 50 3 50 1 Lab 7 22HSS25T 0 Professional Skills Development-I 2 0 2 HSS Theory* 1.5 50 2 50

* External Agency will be conducting the classes and both CIE and SEE will be evaluated by the Agency.

Code	Elective C (Professional Elective)	
22MDC2C1T	RF and Microwave Circuit Design for Wireless Communication Systems	22MCS2C4T: Advanced 5G
22MDC2C2T	Vehicular Communications and Networks	
22MMD2C3M.Tech	Software Defined Networks in Telecom Indust2022 SCHEME	Page 6 of 7
22MVE2C3T	Robotics and Industrial Automation	

Go. change the world

Page 6 of 74

RV Educational In RV College of Autoncmous Institution Affaited to Visvesvaraya	stitutions [©] f Engineering [©] Approved by AICTE, New Defi		Go, change the world
Technological University, Belagavi			
Elective D (Global E	Elective)		
22BT2D01T	Bioinspired Engineering	22ET2D08T	Tracking and Navigation Systems
22BT2D02T	Health Informatics	22IM2D09T	Project Management
22CS2D03T	Business Analytics	22IS2D10T	Database and Information Systems
22CV2D04T	Industrial and Occupational Health and Safety	22IS2D11T	Management Information Systems
22CV2D05T	Intelligent Transportation Systems	22MAT2D12T	Statistical and Optimization Methods
22EC2D06T	Electronic System Design	22ME2D13T	Industry 4.0
22EC2D07T	Evolution of Wireless Technologies	- T/D -	





Go, change the world

III S	SEMESTER M.1	fech							_			-
<u>91</u>				redit /	Alloc	cation			CIE	Max	SEE	Max
No.	Course Code	Course Title	т	T/	D	Toto1	BoS	Category	Duration	Marks	Duration	Marks
110.			L	SDA	· ·	TOLAI			(H)	CIE	(H)	SEE
1	22MDC31T	Advanced Wireless Systems	3	1	0	4	ΕT	Theory	1.5	100	3	100
2	22MDC3EXT	Elective E (Professional Elective)	3	1	0	4	ET	Theory	1.5	100	3	100
3	22MDC32N	Internship	0	0	6	6	ET	Internship	1.5	50	3	50
4	22MDC33P	Minor Project	0	0	6	6	ET	Project	1.5	50	3	50
		1.83				20	11/2					
Cod	e	Elective E (Professional Elective)					2.					
22N	IDC3E1T	Adaptive Signal Processing										
22N	IDC3E2T	Channel Coding Techniques					-					
22MDC3E3T		Cryptography and Network Security										
IV S	SEMESTER M.1	Tech	/									
91			C	edit 4	Alloc	ation			CIE	Max	SEE	Max
1 21.								-				

Q1			Credit Allocation						CIE	Max	SEE	Max
No.	Course Code	Course Title	т	Τ/	ъ	Total	BoS	Category	Duration	Marks	Duration	Marks
110.			L	SDA	Р	Total	11		(H)	CIE	(H)	SEE
1	22MDC41P	Major Project	0	0	18	18	ET	Project	1.5	100	3	100
2	22HSS42	Professional Skills Development-II	2	0	0	2	HSS	NPTEL		50	ONLINE	50
Student need to submit the certificate for the evaluation of Course code 22HSS42												

20

omrerony, be	angun 1								
		SEMESTER: I							
Course Code	: 22MAT11CT	LINEAD ALCEDDA AND DOODADH 1000 000000	CIE Marks	: 100					
Credits L-T-P	: 3-1-0	LINEAR ALGEBRA AND PROBABILITY THEORY	SEE Marks	: 100					
Hours	: 42L+28T	Common Course (MDC, MIT, MSE)	SEE Durations	: 3 Hrs					
Facu	lty Coordinator:	Dr. Sowmya M	1	1 1					
	5	UNIT - I		09 Hrs					
Matrices and V	Vector spaces: (Geometry of system of linear equations, vector space	es and subspaces.	linear					
independence,	basis and dimer	nsion, four fundamental subspaces, change of basis	Rank-nullity the	orem					
(without proof)	, linear transforr	nations, representation of transformations by matric	ces.						
		UNIT - II		09 Hrs					
Orthogonality	and least squa	re approximations: Inner product, orthogonal vector	ors, orthogonal pr	ojections,					
orthogonal bas	es, Fourier expa	nsion. Eigen subspaces, Gram-Schmidt orthogonali	zation process. Q	R					
factorisation, le	east square prob	lems, application to linear models (least square line	s and least squar	e fitting of					
other curves).									
		UNIT - III		08 Hrs					
Symmetric an	d Quadratic for	ms:							
Quadratic form	ns, constrained o	optimization, symmetric forms, diagonalization, sing	ular value decom	position,					
mean and cova	riance matrix, p	rincipal component analysis.		-					
	/	UNIT - IV		08 Hrs					
Multiple Rand	om variables: J	oint probability mass functions and probability den	sity functions, ma	rginal					
density functio	n, conditioning o	of random variables, statistical independence, correl	ation and covaria	nce					
functions, cova	riance and corre	elation matrices, transformation of random variables	s, Markov and Ch	ebyshev					
inequalities, Ga	aussian distribu	tion-Multivariate normal density and its properties.							
_ 1 _ _	6	UNIT - V		08 Hrs					
	esses:	andom processes stationers and independence and	a completion from	tion and					
properties cro	assilication of r	and on processes, stationary and independence, autors covariance functions. Markov processes, transit	tion and state pro	bability in					
Markov chain	ergodic processe	and ergodicity	ion and state pro	bability ill					
	mes:								
After going th	rough this cour	se the student will be able to:							
CO1	Illustrate the	fundamental concepts of vector spaces, orthogonalit	v. joint probabilit	v					
	: distributions a	and random process arising in various fields engined	ering.	5					
CO2	Derive the sol	ution by applying the acquired knowledge and skills	of linear						
	algebra/proba	ability/optimization techniques to solve problems of	probability distrib	outions,					
	: linear algebra	and random process.							
CO3	Evaluate the s	solution of the problems using appropriate linear alg	gebra, statistical a	nd random					
	: process techn	iques to the real world problems arising in many pra	actical situations.						
CO4	Compile the o	verall knowledge of multivariate probability distribu	tions, linear algeb	ora and					
	: random proce	ss methods gained to engage in life – long learning.							
Reference Boo	oks:								
1. Alberto Leon	-Garcia, "Probal	bility, Statistics, and Random Processes for Electrica	al Engineering", P	earson					
Prentice Hall, 3	Brd Edition, 2008	8, ISBN: 978-0-13-147122-1.							
2. Edgar G. Go ISBN-13: 978-9	odaire "Linear A 9814508360.	lgebra: Pure & Applied Kindle Edition", World Scient	tific, 1st Edition, 2	2013,					
3. Gilbert Strar	ng, "Linear Algeb	ora and its Applications", Cengage Learning, 4th Edi	tion, 2006, ISBN:						
4. Hwei P. Hsu	, Schaum's Outl	ine of Theory and Problems of Probability, Random	Variables, and Ra	ndom					
Processes, McC	Processes, McGraw Hill Education, 4th edition, 2017, ISBN-10: 978-0070589506.								
3rd Edition, 20	008, ISBN:978-0-	-07-066925-3.		Lillineu,					

Go, change the world

Autonomous Institution Affiliated to Visvesvaraya Tachnological University, Belegavi

Scheme of Continuous Internal Evaluation (CIE): 20 + 40 + 40 = 100

QUIZZES: Quizzes will be conducted in online/offline mode. Two quizzes will be conducted & Each Quiz will be evaluated for 10 Marks. The sum of two quizzes will be the Final Quiz marks.

TESTS: Students will be evaluated in test, descriptive questions with different complexity levels (Revised Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating). Two tests will be conducted. Each test will be evaluated for 50 Marks, adding upto 100 Marks. Final test marks will be reduced to 40 Marks.

EXPERIENTIAL LEARNING: Students will be evaluated for their creativity and practical implementation of the problem. Case study-based teaching learning and Program specific requirements (15), Video based seminar/presentation/demonstration (25) adding upto 40 marks.

RUBRIC for CIE			RUBRIC for SEE		
SLNo	Content	Marks	Q. No	Contents	Marks
1	Quizzes - Q1 & Q2	20	Each u	nit consists of TWO questions of 20 Marks each. Answ	ver FIVE
2	Tests - T1 & T2	40		full questions selecting ONE from each unit (1 to 5).	
3	Experiential Learning - EL1 & EL2	40	1&2	Unit-1: Question 1 or 2	20
	Total Marks	100	3&4	Unit-2: Question 3 or 4	20
			5&6	Unit-3: Question 5 or 6	20
			7 & 8	Unit-4: Question 7 or 8	20
			9 & 10	Unit-5: Question 9 or 10	20
				Total Marks	s 100



University, Be	elag	avi			-		
			SEMESTER: I				
Course Code	:	22MDC12TL	ADVANCED DICITAL COMM		CIE Marks		100
Credits L-T-P	:	3-0-1	ADVANCED DIGITAL COMMU	ICATION	SEE Marks	:	100
Hours	:	42L + 28P	(Professional Core -	1)	SEE Durations	:	3 Hrs
Facu	lt	y Coordinator:	Dr. Ranjani. G, Dr. Nagamani.K ,Dı	r. K. Saraswathi	i		
		<u> </u>	UNIT - I				9 Hrs
Digital Modula	ti	on and Detection	n: AWGN Channels, Signal-to-Noise	e Power Ratio ar	nd Bit /Symbol Er	ne	rgy, Error
Probability for	В	PSK and QPSK	Error Probability for MPSK, Error I	Probability for M	IPAM and MQAM,	E	rror
Probability for	F	SK and CPFSK	Error Probability Approximation for	· Coherent Modu	alations, Error Pro	bb	ability for
Differential Mo	ď	ulation, Alterna	e Q-Function Representation, Fadi	ing: Outage Prol	bability, Average F	Pro	bability
of Error, Doppl	le	r Spread,Inter	ymbol Interference.				
			UNIT - II				9 Hrs
Equalization: E	Eq	ualizer Noise E	hancement, Equalizer Types, Folde	ed Spectrum an	d ISI-Free Transn	nis	sion,
Linear Equalize	er	s, Zero-Forcing	(ZF) Equalizers, Minimum Mean-So	quare Error (MM	ASE) Equalizers, M	/Ia	ximum
Likelihood Sequ	u	ence Estimation	, Decision-Feedback Equalization,	Adaptive Equali	zers: Training and	łΤ	racking
			UNIT - III				8 Hrs
Spread Spectru	٦r	n: Spread-Spec	rum Principles, Direct-Sequence Sp	pread Spectrum	(DSSS), Frequence	cy	-Hopping
Spread Spectru	lr	n (FHSS), Mult	aser DSSS Systems(CDMA), Multiu	ser FHSS Syste	ms(FH-CDMA)		
		- /	UNIT - IV	S.N.	· · · ·		8 Hrs
Multicarrier Mo	00	lulation: Data '	ransmission Using Multiple Carrier	s, Discrete Imp	lementation of Mu	ilt	icarrier
Modulation, Th	ıe	DFT and Its P	operties, The Cyclic Prefix, Orthogo	nal Frequency-l	Division Multiplex	in	g (OFDM),
Matrix Represe	en	tation of OFDM	Case Study: The IEEE 802.11a Wi	ireless LAN Star	ndard.		
		1.5	UNIT - V				8 Hrs
New Modulatio	n	Formats: Filte	bank Multicarrier, Generalized Fre	a <mark>uency</mark> Divisior	n Multiplexing, Bi-	-01	thogonal
Frequency Divi	is	ion Multiplexin	, Universal Filtered Multicarrier, Ti	me-frequency P	acking, Null cyclic	c n	orefix
single carrier (I	N	CP-SC) scheme	Waveform Choice for new modulati	ion formats.	8, 11 1, 1	- 1	_
		,	LABORATORY				28 Hrs
Link level simu	112	ation to evaluat	BER performance of modulation to	e <mark>chnique</mark> s with	and without chan	ne	el coding.
System-level m	10	deling of Bluet	oth communications systems-WLA	N Interference a	nd Adaptive Frequ	ie	ncv
Hopping, GSM.	. (CDMA and Wi	AX Channel Models Basic WLAN Li	nk Modeling.OF	DM with User-Sp	ec	ified Pilot
Indices. SDR in	, n	plementation a	d performance analysis of Equalize	er for OPSK sign	al passed through	n a	1
frequency-selec	ct	ive fading char	nel.		na passoa anougi		-
j		8					
Course Outcou	m	es:		~ /			
After going thro	01	igh this course	the student will be able to:				
CO1	$\overline{\cdot}$	Analyze chant	el behaviours and the performance	of different mod	fulation technique	28	
CO2	· ·	Design Equali	ers for mitigation of channel distor	tions	adiation toominque		
CO2	· .	Implement sp	ading techniques for single and m	ultiuser commu	inication		
C03	ŀ	Devices we still se	eating techniques for single and in				
C04	:	Derive matner	atical model for multicarrier and of	ther new modul	ation formats		
	_						
Reference Boo)k	S					
1. Andrea Gold	ls	mith, Wireless	communications, Cambridge Univer	rsity Press, 200	5,Online		
ISBN:97805118	84	41224					
2. Fa-Long Luo),	Charlie (Jianzł	ong) Zhang, Signal Processing for 5	G Algorithms a	nd Implementation	ns	, 1ed,
John Wiley & S	30	ns Ltd, 2016, l	SBN: 978-1-119-11646-2				
3. John G. Proa	al	kis, Masoud Sa	ehi Digital Communications, 5th ed	lition, McGraw I	Hill,		
2001,ISBN-109	93	33920479	<u> </u>				
4. Bernard Skl	a1	, Digital Com	unications - Fundamentals and Ap	plications", 3ed	l, Pearson Educat	io1	n (Asia)
Ptv. Ltd, 2021,	I	SBN-13: 97801	\$7569076				

Autonomous Institution Affiliated to Visvesvaraya Technological University, Belagavi

Scheme of Continuous Internal Evaluation (CIE): 10 + 30 + 30 + 30 = 100

QUIZZES: Quizzes will be conducted in online/offline mode. Two quizzes will be conducted & Each Quiz will be evaluated for 10 Marks. The average of two quizzes will be the Final Quiz marks.

TESTS: Students will be evaluated in test, descriptive questions with different complexity levels (Revised Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating). Two tests will be conducted. Each test will be evaluated for 50 Marks, adding upto 100 Marks. Final test marks will be reduced to 30 Marks.

EXPERIENTIAL LEARNING: Students will be evaluated for their creativity and practical implementation of the problem. Case study-based teaching learning and Program specific requirements (10), Video based seminar /presentation /demonstration (20) adding upto 30 marks.

Laboratory: Conduction of laboratory exercises, Lab report & observation & analysis (30 Marks), Lab Test (10 Marks) & Innovative Experiment/Concept Design & Implementation (10 Marks) adding up to 50 Marks. The final marks will be reduced to 30 Marks.

Scheme of Semester End Examination (SEE) for 100 marks: Each unit consists of TWO Questions of 16 Marks each. Answer FIVE full questions selecting one from each unit (from 1 to 5). Question No. 11 is compulsory (Laboratory component) for 20 Marks.

RUBRIC of CIE			RUBRIC of SEE			
SLNo	Content	Marks	Q. No	Contents	Marks	
1	Quizzes - Q1 & Q2	10	Each u	nit consists of TWO questions of 16 Marks each. Answ	er FIVE	
2	Tests - T1 & T2	30	Questi	full questions selecting ONE from each unit (1 to 5). on No. 11 is compulsory (Laboratory component) for 20	Marks.	
3	Experiential Learning - EL1 & EL2	30	1&2	Unit-1: Question 1 or 2	16	
4	Laboratory	30	3&4	Unit-2: Question 3 or 4	16	
	To <mark>tal Marks</mark>	100	5&6	Unit-3: Question 5 or 6	16	
			7 & 8	Unit-4: Question 7 or 8	16	
	NO SEE for Laborate		9 & 10	Unit-5: Quest <mark>ion 9 or</mark> 10	16	
	NO SEE IOF LADORALOFY		11	Laboratory Component (Compulsory)	20	
				Total Marks	100	

Oliversity, De	nayavi						
				SEMESTER	R: I		
Course Code	: :	22MDC13TL		CED SIGNAL	DDOCESSING	CIE Marks	: 100
Credits L-T-P	: :	3-0-1	ADVAN	CED SIGNAL	FROCESSING	SEE Marks	: 100
Hours: 42L + 28P(Professional Core - 1)SEE Durations:							
Faculty Coordinator: Dr. B. Roja Reddy, Dr. K Saraswathi, Prof. P.Nagaraju							
			τ	UNIT - I			9 Hrs
Design of Digita	al I	Filters: Genera	al Consideration	s, Design of I	FIR filters using window	ving, frequency sa	mpling
technique, Des	igr	n of FIR differe	ntiators and Hil	bert Transfor	rmers.		
			U	JNIT - II			9 Hrs
Multi rate Digit conversion by a of sampling rat	tal a R te c	Signal Proces ational Factor conversion, Sa	sing: Decimation I/D. Implement mpling rate conv	n by a factor l tation of sam version by an	D, Interpolation by a fa pling Rate Conversion, Arbitrary Factor.	ctor I, Sampling ra Multistage implen	ate nentation
			U	NIT - III			8 Hrs
Applications of Bank, M-chann Modulation An	M nel alc	ulti rate Digita QMF Bank. C og to Digital Co	al Signal Process oversampling and onversion and Cl	sing: Digital F d Analog-to-I D Player.	Filter Banks, Two-Chan Digital Conversion Reso	nel Quadrature M lution, Sigma-Delt	irror Filter a
UNIT - IV 8 Hrs							8 Hrs
Adaptive Filters: Applications of Adaptive filters, Adaptive Direct-Form FIR Filters- The LMS algorithm, and Adaptive Direct Form Filters- RLS algorithm.							
1	UNIT - V 8 Hrs						
Machine learning in Signal Processing: Introduction, Supervised learning, unsupervised learning, semi supervised learning, Reinforcing learning, Use cases of signal processing using supervised and Unsupervised learning							
		1 60	LAB	ORATORY			28 Hrs
Design of FIR,	De	cimation and	Interpolation us:	ing sequence	e, Signal <mark>or ima</mark> ge, Desig	gn of Adaptive filte	r and ML
algorithms for	sig	nal Processin	g applications		0		
Course Outcon After going three	me	s: The this course	the student will	he able to:			
CO1		Apply design t	echniques for FI	IR filters.			
CO2	:]	Design and de	monstrate vario	us adaptive f	ilters and sampling rate	e conversions.	
CO3	• 1	Design and de	monstrate vario	us Processing	g systems		
CO4	:	Apply machin	e learning algorit	thms to signa	al processing test cases		
	<u> </u>						
Reference Boo	oks		0.2				
1. John G. Pros	aki 05	s and Manola	kis, "Digital Sigr	nal Processing	g", Prentice Hall, 4th Eo	dition, 2007,ISBN:	
2 Li Tan "Digi	tal	Signal Proces	sing Fundamen	tals and Appl	lications" Academic Pro	ess India 3rd edit	ion 2018
3 Robert O Cri	isti	"Modern Dig	ital Signal Proce	essing" 1st er	dition Cengage nublish	ers India 2003 ISI	SN 13.
978053440095	58 58	, modern Dig	itai Oigilai i 1000	, , , , , , , , , , , , , , , , , , , ,	and and a set of the s	inana, 2000,101	511 10,
9780534400958 4. Sudeep Tanwar, Anand Nayyar, Rudra Rameshwar, "Machine Learning in Signal Processing –Applications, Challenges, And the Road Ahead", CRC Press Taylor & Francis Group ,1st edition,2022,ISBN 9780367618902							

Autonomous Institution Allifieled Versevaraya Technological University, Belagavi

Scheme of Continuous Internal Evaluation (CIE): 10 + 30 + 30 + 30 = 100

QUIZZES: Quizzes will be conducted in online/offline mode. Two quizzes will be conducted & Each Quiz will be evaluated for 10 Marks. The average of two quizzes will be the Final Quiz marks.

TESTS: Students will be evaluated in test, descriptive questions with different complexity levels (Revised Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating). Two tests will be conducted. Each test will be evaluated for 50 Marks, adding upto 100 Marks. Final test marks will be reduced to 30 Marks.

EXPERIENTIAL LEARNING: Students will be evaluated for their creativity and practical implementation of the problem. Case study-based teaching learning and Program specific requirements (10), Video based seminar /presentation /demonstration (20) adding upto 30 marks.

Laboratory: Conduction of laboratory exercises, Lab report & observation & analysis (30 Marks), Lab Test (10 Marks) & Innovative Experiment/Concept Design & Implementation (10 Marks) adding up to 50 Marks. The final marks will be reduced to 30 Marks.

Scheme of Semester End Examination (SEE) for 100 marks: Each unit consists of TWO Questions of 16 Marks each. Answer FIVE full questions selecting one from each unit (from 1 to 5). Question No. 11 is compulsory (Laboratory component) for 20 Marks.

RUBRIC of CIE			RUBRIC of SEE			
SLNo	Content	Marks	Q. No	Contents	Marks	
1	Quizzes - Q1 & Q2	10	Each u	nit consists of TWO questions of 16 Marks each. Answ	ver FIVE	
2	Tests - T1 & T2	30	Questi	full questions selecting ONE from each unit (1 to 5). on No. 11 is compulsory (Laboratory component) for 20	Marks.	
3	Experiential Learning - EL1 & EL2	30	1 & 2	Unit-1: Question 1 or 2	16	
4	Laboratory	30	3&4	Unit-2: Question 3 or 4	16	
	To <mark>tal Mar</mark> ks	100	5&6	Unit-3: Question 5 or 6	16	
			7 & 8	Unit-4: Question 7 or 8	16	
			9 & 10	Unit-5: Quest <mark>ion 9 or</mark> 10	16	
	NO SEE IOF LADORALOFY		11	Laboratory Component (Compulsory)	20	
				Total Marks	100	

.

G0,	change	the	world
-----	--------	-----	-------

Credits L-T-P I: 14L + 28P (Coding / Skill Laboratory) SEE Marks I: 50 Hours I: 14L + 28P (Coding / Skill Laboratory) SEE Durations I: 3 Hrs Faculty Coordinator: Dr. B. Roja Redy 28 Hrs SEE Durations I: 3 Hrs Object Oriented Programming: Concepts of Classes, Constructors, Overloading, Inheritance, Polymorphism, Virtual Classes, Templates, Exceptions using C++. ML Algorithms: Concepts of KNN, Naive Bayes, SVM, decision trees, ensemble learning and random forest.convolution neural network using python. Course Outcomes: After going through this course the student will be able to: CO1 : Exhibit program design and implementation competence through the choice of appropriate object-oriented concepts CO2 : Envision the solutions for real-time problems using Object Oriented concepts CO3 : CO3 : Analyze the challenges of ML implementation to various applications. CO4 : CO4 : Analyze the challenges of ML implementation to various applications. CO4 : CommanyLid, LSBN.0070539620. CommanyLid, LSBN.0070532465 S. 3. Eric Matthes, Python Crash Course: A Hands-On, Project-Based Introduction to Programming, 2nd Edition, May 2019, ISBN-13: 978 I593279288. Scheme of Continuous Internal Evaluation (CIE-Laboratory): Only LAB Course: 30 + 10 + 10 = 50. The Laboratory session is held every week as per the timetable and the performance of	Course Code	e : 2	22MDC14L	OBJECT ORIE	ENTED	PROGRAMMING AND	CIE Mark	.s	: 50	
Hours [:] [4L + 28P (Coding / Skill Laboratory) SEE Durations [:] 3 Hrs Faculty Coordinator: Dr. B. Roja Reddy 28 Hrs Object Oriented Programming: Concepts of Classes, Constructors, Overloading, Inheritance, Polymorphism, Vitrual Classes, Templates, Exceptions using C++. ML Algorithms: Concepts of KNN, Naive Bayes, SVM, decision trees, ensemble learning and random forest, convolution neural network using python. Concepts 28 Hrs Concepts Object-Oriented Concepts Coll Exhibit program design and implementation competence through the choice of appropriate object-oriented concepts CO3 : Apply ML agorithms in real-time problems using Object Oriented concepts CO3 : Apply ML agorithms in real-time applications. CO4 : Analyze the challenges of ML implementation to various applications. Reference Books 1 1. Object Oriented Programming with C++, E. Balaguruswamy, 4th edition, 2012, McGraw Hill, CompanyLtd., ISBN:00705393620. 1 1 2. The Complete Reference C++, Herbert Schildt, McGrawHill, 4th Edition, 2011, ISBN:9780070532465 3 3 3. Eric Matthes, Python Crash Course: A Hands-On, Project-Based Introduction to Programming, 2nd Edition, May 2019, ISBN 13: 9781593279288. 4 4 4. Sudeep Tanwar, Anang Nayar, Rudra Rameshwar, "Machine Learning in Signal Processing -Applications, Challenges, And the Road Ahead", CRC Press Taylor & Francis Group, 2022 Scheme of Continuous Internal Evaluation (CIE-	Credits L-T-	P :	1 - 0 - 1	MACHINE	LEARNI	ING LABORATORY	SEE Marl	٤S	: 50	
Faculty Coordinator: Dr. B. Roja Reddy Content 28 Hrs Object Oriented Programming: Concepts of Classes, Constructors, Overloading, Inheritance, Polymorphism, Virtual Classes, Templates, Exceptions using C++. ML Algorithms: Concepts of KNN, Naive Bayes, SVM, decision trees, ensemble learning and random forest, convolution neural network using python. Course Outcomes: After going through this course the student will be able to: CO1: Exhibit program design and implementation competence through the choice of appropriate object-oriented concepts CO2 : Envision the solutions for real-time problems using Object Oriented concepts CO3: Apply ML agorithms in real-time applications. Reference Books 1. Object Oriented Programming with C++, E. Balaguruswamy, 4th edition, 2012, McGraw Hill, CompanyLid, ISBN:070593620. 2. The Complete Reference C++, Herbert Schildt, McGrawHill, 4th Edition, 2011, ISBN:9780070532465 Strick atthes, Python Crash Course: A Hands-On, Project-Based Introduction to Programming, 2nd Edition, May 2019, ISBN-13: 9781593279288. A ducep Tanwar, Anand Nayar, Rudra Rameshwar, "Machine Learning in Signal Processing -Applications, Challenges, And the Road Ahead", CRC Press Taylor & Francis Group ,2022 Scheme of Continuous Internal Evaluation (CIE- Laboratory) : Only LAB Course 30 + 10 + 10 = 50. The Laboratory session is held every wee	Hours	:	14L + 28P	(Codi	ng / Ski	ill Laboratory)	SEE Dura	ations	: 3 Hrs	
Content [28 Hrs] Object Oriented Programming: Concepts of Classes, Constructors, Overloading, Inheritance, Polymorphism, Virtual Classes, Templates, Exceptions using C++. ML Algorithms: Concepts of KNN, Naive Bayes, SVM, decision trees, ensemble learning and random forest, convolution neural network using python. Course Outcomes: Alter going through this course the student will be able to: CO11: Course Outcomes: Alter going through this course the student will be able to: CO21: CO21: Exhibit program design and implementation competence through the choice of appropriate object-oriented concepts CO32: CO31: Apply ML agorithms in real-time applications. CO41: CO41: I Analyze the challenges of ML implementation to various applications. CO42: CompanyLtd.JSBN:0070593620. Contented Programming with C++, E. Balaguruswamy, 4th edition, 2011, ISBN:9780070532465 S. S. Brie Matthes, Python Crash Course: A Hands-On, Project-Based Introduction to Programming, 2nd Edition, May 2019, ISBN:13: 9781593279288. Content Course: A Hands-On, Project-Based Introduction to Programming, 2nd Edition, May 2019, ISBN:13: 9781593279288. Scheme of Continuous Internal Evaluation (CIE- Laboratory) : Only LAB Course 30 + 10 + 10 = 50. The Laboratory session is held every week as per the timetable and the performance of the student is evaluated in every session. The average of marks over number of experimentic conducted ver the weeks is considered for 30	Faculty Coordinator: Dr. B. Roja Reddy						-			
Object Oriented Programming: Concepts of Classes, Constructors, Overloading, Inheritance, Polymorphism, Virtual Classes, Templates, Exceptions using C++. ML Algorithms: Concepts of KNN, Naive Bayes, SVM, decision trees, ensemble learning and random forest, convolution neural network using python. Course Outcomes: After going through this course the student will be able to: CO1 : Exhibit program design and implementation competence through the choice of appropriate object-oriented concepts CO2 : Envision the solutions for real-time applications. CO4 : Analyze the challenges of ML implementation to various applications. CO4 : Analyze the challenges of ML implementation to various applications. CO4 : Omplete Reference C++, Herbert Schildt, McGrawHill, 4th Edition, 2012, McGraw Hill, CompanyLtd., JSBN:0070593620. 2. The Complete Reference C++, Herbert Schildt, McGrawHill, 4th Edition, 2011, ISBN:9780070532465 3. Eric Matthes, Python Crash Course: A Hands-On, Project-Based Introduction to Programming, 2nd Edition, May 2019, ISBN:13: 9781593279288. 4. Sudeep Tanwar, Anand Nayyar, Rudra Rameshwar, "Machine Learning in Signal Processing –Applications, Challenges, And the Road Ahead', CRC Press Taylor & Francis Group ,2022 Scheme of Continuous Internal Evaluation (CIE- Laboratory) : Only LAB Course 30 + 10 + 10 = 50. The Laboratory session is held every week as per the timetable and the performance of the student is evaluated in every session. The average of marks over number of experiments conducted over the weeks is considered for 30 Marks i.e (Lab Report, Observation & A		Content 28 Hrs							28 Hrs	
Virtual Classes, Templates, Exceptions using C++. ML Algorithms: Concepts of KNN, Naive Bayes, SVM, decision trees, ensemble learning and random forest, convolution neural network using python. Course Outcomes: After going through this course the student will be able to: CO1 :: Exhibit program design and implementation competence through the choice of appropriate object-oriented concepts CO2 : Envision the solutions for real-time applications. CO4 :: Analyze the challenges of ML implementation to various applications. Reference Books 1. 1. Object Oriented Programming with C++, E. Balaguruswamy, 4th edition, 2012, McGraw Hill, CompanyLtd., ISBN:0070593620. 2. The Complete Reference C++, Herbert Schildt, McGrawHill, 4th Edition, 2011, ISBN:9780070532465 3. Eric Matthes, Python Crash Course: A Hands-On, Project-Based Introduction to Programming, 2nd Edition, May 2019, ISBN-13: 9781593279288. 4. Sudeep Tanwar, Anand Nayyar, Rudra Rameshwar, "Machine Learning in Signal Processing –Applications, Challenges, And the Road Ahead', CRC Press Taylor & Francis Group, 2022 Scheme of Continuous Internal Evaluation (CIE- Laboratory) : Only LAB Course 30 + 10 + 10 = 50. The Laboratory session. The average of marks over number of experiments conducted over the weeks is considered for 30 Marks i. (Lab Report, Observation & Analysis). The students are encouraged to implement additional innovative experiments in the lab [10 marks]. At the end of the semester a test is conducted for 10 Marks (Lab Test). This adds	Object Orier	Diject Oriented Programming: Concepts of Classes, Constructors, Overloading, Inheritance, Polymorphism.								
ML Algorithms: Concepts of KIN, Naive Bayes, SVM, decision trees, ensemble learning and random forest, convolution neural network using python. Course Outcomes: After going through this course the student will be able to: CO1 : Exhibit program design and implementation competence through the choice of appropriate object-oriented concepts CO2 : Envision the solutions for real-time problems using Object Oriented concepts CO3 : Apply ML agorithms in real-time applications. CO4 : Analyze the challenges of ML implementation to various applications. Reference Books	Virtual Classes, Templates, Exceptions using C++.									
forest,convolution neural network using python. Course Outcomes: After going through this course the student will be able to: CO1 Exhibit program design and implementation competence through the choice of appropriate object-oriented concepts CO2 Envision the solutions for real-time problems using Object Oriented concepts CO3 Apply ML agorithms in real-time applications. Reference Books 1. Object Oriented Programming with C++, E. Balaguruswamy, 4th edition, 2012, McGraw Hill, CompanyLtd., JSBN:0070593620. 2. The Complete Reference C++, Herbert Schildt, McGrawHill, 4th Edition, 2011, ISBN:9780070532465 3. Eric Matthes, Python Crash Course: A Hands-On, Project-Based Introduction to Programming, 2nd Edition, May 2019, ISBN 13: 9781593279288. 4. Sudeep Tanwar, Anand Nayyar, Rudra Rameshwar, "Machine Learning in Signal Processing –Applications, Challenges, And the Road Ahead", CRC Press Taylor & Francis Group, 2022 Scheme of Continuous Internal Evaluation (CIE- Laboratory): Only LAB Course 30 + 10 + 10 = 50. The Laboratory session is held every week as per the timetable and the performance of the student is evaluated in innovative experiments in the lab (10 marks). At the end of the semester a test is conducted for 10 Marks (Lab Test). This adds to 50 Marks. Only LAB Course 40 + 10 = 50. Students will be evaluated for Write-up, Experimental Setup, Experiment Conduction with Results, Analysis & Discussions for 40 Marks and Viva will be conducted for 10 Marks adding to 50 Marks.	ML Algorith	ns: C	oncepts of KN	IN, Naive Bayes, SV	/M, deci	sion trees, ensemble learn	ing and ra	andom		
Course Outcomes: After going through this course the student will be able to: CO1 : Exhibit program design and implementation competence through the choice of appropriate object-oriented concepts CO2 : Envision the solutions for real-time problems using Object Oriented concepts CO3 : Apply ML agorithms in real-time applications. CO4 : Analyze the challenges of ML implementation to various applications. Reference Books 1. Object Oriented Programming with C++, E. Balaguruswamy, 4th edition, 2012, McGraw Hill, CompanyLtd., ISBN:0070593620. 2. The Complete Reference C++, Herbert Schildt, McGrawHill, 4th Edition, 2011, ISBN:9780070532465 3. Eric Matthes, Python Crash Course: A Hands-On, Project-Based Introduction to Programming, 2nd Edition, May 2019, ISBN-13: 9781593279288. 4. Sudeep Tanwar, Anand Nayyar, Rudra Rameshwar, "Machine Learning in Signal Processing -Applications, Challenges, And the Road Ahead", CRC Press Taylor & Francis Group, 2022 Scheme of Continuous Internal Evaluation (CIE- Laboratory) : Only LAB Course 30 + 10 + 10 = 50. The Laboratory session is held every week as per the timetable and the performance of the student is evaluated in every session. The average of marks over number of experiments conducted over the weeks is considered for 30 Marks i.e (Lab Report, Observation & Analysis). The students are encouraged to implement additional innovative experiments in the lab (10 marks). At the end of the semester a test is conducted for 10 Marks (Lab Test). This adds to 50 Marks. Scheme of Semester End Examination (SEE- Laboratory) : Only LAB Course 40 + 10 = 50. Students will be evaluated for Write-up, Experimental Setup, Experiment Conduction wit	forest,convo	lutior	neural netwo	ork using python.			0			
Course Outcomes: After going through this course the student will be able to: C01 Exhibit program design and implementation competence through the choice of appropriate object-oriented concepts C02 Envision the solutions for real-time applications. C04 Analyze the challenges of ML implementation to various applications. C04 Analyze the challenges of ML implementation to various applications. Reference Books 1. Object Oriented Programming with C++, E. Balaguruswamy, 4th edition, 2012, McGraw Hill, CompanyLtd., ISBN:0070593620. 2. The Complete Reference C++, Herbert Schildt, McGrawHill, 4th Edition, 2011, ISBN:9780070532465 3.Eric Matthes, Python Crash Course: A Hands-On, Project-Based Introduction to Programming, 2nd Edition, May 2019, ISBN-13: 9781593279288. 4. Sudeep Tanwar, Anand Nayyar, Rudra Rameshwar, "Machine Learning in Signal Processing -Applications, Challenges, And the Road Ahead", CRC Press Taylor & Francis Group ,2022 Scheme of Continuous Internal Evaluation (CIE- Laboratory) : Only LAB Course 30 + 10 + 10 = 50. The Laboratory session is held every week as per the timetable and the performance of the student is evaluated in every session is held every week as per the timetable and the performance of the student is considered for 30 Marks is (Lab Report, Observation & Analysis). The students are encouraged to implement additional innovative experiments in the lab (10 marks). At the end of the semester a test is conducte										
After going through this course the student will be able to: C01 Exhibit program design and implementation competence through the choice of appropriate object-oriented concepts C02 1: Envision the solutions for real-time problems using Object Oriented concepts C03 1: Apply ML agorithms in real-time applications. C04 1: Analyze the challenges of ML implementation to various applications. Reference Books 1. Object Oriented Programming with C++, E. Balaguruswamy, 4th edition, 2012, McGraw Hill, CompanyLtd.,ISBN:0070593620. 2. The Complete Reference C++, Herbert Schildt, McGrawHill, 4th Edition, 2011, ISBN:9780070532465 3.Eric Matthes, Python Crash Course: A Hands-On, Project-Based Introduction to Programming, 2nd Edition, May 2019, ISBN-13: 9781593279288. 4. Sudeep Tanwar, Anand Nayyar, Rudra Rameshwar, "Machine Learning in Signal Processing -Applications, Challenges, And the Road Ahead", CRC Press Taylor & Francis Group, 2022 Scheme of Continuous Internal Evaluation (CIE- Laboratory) : Only LAB Course 30 + 10 + 10 = 50. The Laboratory session is held every week as per the timetable and the performance of the student is evaluated in every seesion. The average of marks over number of experiments conducted over the weeks is considered for 30 Marks i.e (Lab Report, Observation & Analysis). The students are encouraged to implement additional innovative experiments in the lab (10 marks). At the end of the semester a test is conducted for 10 Marks (Lab Test). This adds to 50 Marks. Scheme of Semester End Examination	Course Out	come	s:							
CO1 Exhibit program design and implementation competence through the choice of appropriate object-oriented concepts CO2 Exhibit program design and implementation competence through the choice of appropriate object-oriented concepts CO3 Apply ML agorithms in real-time applications. CO4 Analyze the challenges of ML implementation to various applications. Reference Books 1. Object Oriented Programming with C++, E. Balaguruswamy, 4th edition, 2012, McGraw Hill, CompanyLtd., ISBN:0070593620. 2. The Complete Reference C++, Herbert Schildt, McGrawHill, 4th Edition, 2011, ISBN:9780070532465 3.Eric Matthes, Python Crash Course: A Hands-On, Project-Based Introduction to Programming, 2nd Edition, May 2019, ISBN-13: 9781593279288. 4. Sudeep Tanwar, Anand Nayyar, Rudra Rameshwar, "Machine Learning in Signal Processing -Applications, Challenges, And the Road Ahead", CRC Press Taylor & Francis Group ,2022 Scheme of Continuous Internal Evaluation (CIE- Laboratory) : Only LAB Course 30 + 10 + 10 = 50. The Laboratory session is held every week as per the timetable and the performance of the student is evaluated in every session. The average of marks over number of experiments conducted over the weeks is considered for 30 Marks ic (Lab Report, Observation & Analysis). At the end of the semester a test is conducted for 10 Marks (Lab Test). This adds to 50 Marks. Oly LAB Course with 50 Marks Scheme of Semester End Examination (SEE- Laboratory) : Only LAB Course 40 + 10 = 50. Students will be evaluated for	After going t	hroug	gh this course	the student will be	e able to):				
object-oriented concepts CO2 : Envision the solutions for real-time applications. CO4 : Analyze the challenges of ML implementation to various applications. Reference Books	CO	D1 : 1	Exhibit progra	am design and imp	lementa	tion competence through t	the choice	of appr	opriate	
CO2 Envision the solutions for real-time applications. CO3 i Apply ML agorithms in real-time applications. CO4 i Analyze the challenges of ML implementation to various applications. Reference Books 1. Object Oriented Programming with C++, E. Balaguruswamy, 4th edition, 2012, McGraw Hill, CompanyLtd.,ISBN:0070593620. 2. The Complete Reference C++, Herbert Schildt, McGrawHill, 4th Edition, 2011, ISBN:9780070532465 3.Eric Matthes, Python Crash Course: A Hands-On, Project-Based Introduction to Programming, 2nd Edition, May 2019, ISBN-13: 9781593279288. 4. Sudeep Tanwar, Anand Nayyar, Rudra Rameshwar, "Machine Learning in Signal Processing –Applications, Challenges, And the Road Ahead", CRC Press Taylor & Francis Group ,2022 Scheme of Continuous Internal Evaluation (CIE- Laboratory) : Only LAB Course 30 + 10 + 10 = 50. The Laboratory session is held every week as per the timetable and the performance of the student is evaluated in every session. The average of marks over number of experiments conducted over the weeks is considered for 30 Marks is (Lab Report, Observation & Analysis). The students are encouraged to implement additional innovative experiments in the lab (10 marks). At the end of the semester a test is conducted for 10 Marks (Lab Test). This adds to 50 Marks. Scheme of Semester End Examination (SEE- Laboratory) : Only LAB Course 40 + 10 = 50. Students will be evaluated for Write-up, Experimental Setup, Experiment Conduction with Results, Analysis & Discussions for 40 Marks and Viva will be conducted for 10 Marks adding to 50 Marks. <			object-oriente	d concepts						
CO3 : Apply ML agorithms in real-time applications. CO4 : Analyze the challenges of ML implementation to various applications. Reference Books 1. Object Oriented Programming with C++, E. Balaguruswamy, 4th edition, 2012, McGraw Hill, CompanyLtd.,ISBN:0070593620. 2. The Complete Reference C++, Herbert Schildt, McGrawHill, 4th Edition, 2011, ISBN:9780070532465 3. Eric Matthes, Python Crash Course: A Hands-On, Project-Based Introduction to Programming, 2nd Edition, May 2019, ISBN-13: 9781593279288. 4. Sudcep Tanwar, Anand Nayyar, Rudra Rameshwar, "Machine Learning in Signal Processing –Applications, Challenges, And the Road Ahead", CRC Press Taylor & Francis Group ,2022 Scheme of Continuous Internal Evaluation (CIE- Laboratory) : Only LAB Course 30 + 10 + 10 = 50. The Laboratory session is held every week as per the timetable and the performance of the student is evaluated in revery session. The average of marks over number of experiments conducted over the weeks is considered for 30 Marks i.e (Lab Report, Observation & Analysis). The students are encouraged to implement additional innovative experiments in the lab (10 marks). At the end of the semester a test is conducted for 10 Marks (Lab Test). This adds to 50 Marks. Scheme of Semester End Examination (SEE- Laboratory) : Only LAB Course 40 + 10 = 50. Students will be evaluated for Write-up, Experimental Setup, Experiment Conduction with Results, Analysis & Discussions for 40 Marks and Viva will be conducted for 10 Marks adding to 50 Marks. Scheme of Semester End Examination (SEE- Laboratory) : Only LAB Course 40 + 10 = 50. Students will be evaluated for Write-	CO	D2 : 1	Envision the s	solutions for real-ti	me prob	olems using Object Oriente	ed concept	s		
CO4 Industry the challenges of ML implementation to various applications. Reference Books 1. Object Oriented Programming with C++, E. Balaguruswamy, 4th edition, 2012, McGraw Hill, CompanyLtd., ISBN:0070593620. 2. The Complete Reference C++, Herbert Schildt, McGrawHill, 4th Edition, 2011, ISBN:9780070532465 3.Eric Mathes, Python Crash Course: A Hands-On, Project-Based Introduction to Programming, 2nd Edition, May 2019, ISBN-13: 9781593279288. 4. Sudeep Tanwar, Anand Nayyar, Rudra Rameshwar, "Machine Learning in Signal Processing –Applications, Challenges, And the Road Ahead", CRE Press Taylor & Francis Group, 2022 Scheme of Continuous Internal Evaluation (CIE- Laboratory) : Only LAB Course 30 + 10 + 10 = 50. The Laboratory session is held every week as per the timetable and the performance of the student is evaluated in every session. The average of marks over number of experiments conducted over the weeks is considered for 30 Marks i. (Lab Report, Observation & Analysis). The students are encouraged to implement additional innovative experiments in the lab (10 marks). At the end of the semester a test is conducted for 10 Marks (Lab Test). This adds to 50 Marks. Scheme of Semester End Examination (SEE- Laboratory) : Only LAB Course 40 + 10 = 50. Students will be evaluated for Write-up, Experimental Setup, Experiment Conduction with Results, Analysis & Discussions for 40 Marks and Viva will be conducted for 10 Marks adding to 50 Marks. Scheme of Semester End Examination (SEE- Laboratory) : Only LAB Course 40 + 10 = 50. Students will be evaluated for Write-up, Experimental Setup, Experiment, Conduction with Results, Analysis & Dis	CO)3	Apply ML ago	rithms in real-time	applica	tions.				
Reference Books 1. Object Oriented Programming with C++, E. Balaguruswamy, 4th edition, 2012, McGraw Hill, CompanyLtd., ISBN:0070593620. 2. The Complete Reference C++, Herbert Schildt, McGrawHill, 4th Edition, 2011, ISBN:9780070532465 3.Eric Matthes, Python Crash Course: A Hands-On, Project-Based Introduction to Programming, 2nd Edition, May 2019, ISBN-13: 9781593279288. 4. Sudeep Tamwar, Anand Nayyar, Rudra Rameshwar, "Machine Learning in Signal Processing -Applications, Challenges, And the Road Ahead", CRC Press Taylor & Francis Group ,2022 Scheme of Continuous Internal Evaluation (CIE- Laboratory) : Only LAB Course 30 + 10 + 10 = 50. The Laboratory session is held every week as per the timetable and the performance of the student is evaluated in every session. The average of marks over number of experiments conducted over the weeks is considered for 30 Marks i.e (Lab Report, Observation & Analysis). The students are encouraged to implement additional innovative experiments in the lab (10 marks). At the end of the semester a test is conducted for 10 Marks (Lab Test). This adds to 50 Marks. Scheme of Semester End Examination (SEE- Laboratory) : Only LAB Course 40 + 10 = 50. Students will be evaluated for Write-up, Experimental Setup, Experiment Conduction with Results, Analysis & Discussions for 40 Marks and Viva will be conducted for 10 Marks adding to 50 Marks. Only LAB Courses with 50 Marks. <tr< td=""><td colspan="6">CO4 : Analyze the challenges of ML implementation to various applications.</td><td></td></tr<>	CO4 : Analyze the challenges of ML implementation to various applications.									
Reference Books 1. Object Oriented Programming with C++, E. Balaguruswamy, 4th edition, 2012, McGraw Hill, CompanyLtd.,ISBN:0070593620. CompanyLtd.,ISBN:0070593620. 2. The Complete Reference C++, Herbert Schildt, McGrawHill, 4th Edition, 2011, ISBN:9780070532465 Stric Matthes, Python Crash Course: A Hands-On, Project-Based Introduction to Programming, 2nd Edition, May 2019, ISBN-13: 9781593279288. 4. Sudeep Tanwar, Anand Nayyar, Rudra Rameshwar, "Machine Learning in Signal Processing – Applications, Challenges, And the Road Ahead", CRC Press Taylor & Francis Group, 2022 Scheme of Continuous Internal Evaluation (CIE- Laboratory) : Only LAB Course 30 + 10 + 10 = 50. The Laboratory session is held every week as per the timetable and the performance of the student is evaluated in every session. The average of marks over number of experiments conducted over the weeks is considered for 30 Marks i.e (Lab Report, Observation & Analysis). The students are encouraged to implement additional innovative experiments in the lab (10 marks). At the end of the semester a test is conducted for 10 Marks (Lab Test). This adds to 50 Marks. Scheme of Semester End Examination (SEE- Laboratory) : Only LAB Course 40 + 10 = 50. Students will be evaluated for Write-up, Experimental Setup, Experiment Conduction with Results, Analysis & Discussions for 40 Marks and Viva will be conducted for 10 Marks adding to 50 Marks. Only LAB Courses with 50 Marks 1 81. Write Up, Setup, Conduction Results, Analysis & Discussions 40 1 Write Up, Setup, Conduction Results, Analysis & Discussions 40 2 Innovative										
1. Object Oriented Programming with C++, E. Balaguruswamy, 4th edition, 2012, McGraw Hill, CompanyLtd., ISBN:0070593620. 2. The Complete Reference C++, Herbert Schildt, McGrawHill, 4th Edition, 2011, ISBN:9780070532465 3. Eric Matthes, Python Crash Course: A Hands-On, Project-Based Introduction to Programming, 2nd Edition, May 2019, ISBN-13: 9781593279288. 4. Suddep Tanwar, Anand Nayyar, Rudra Rameshwar, "Machine Learning in Signal Processing –Applications, Challenges, And the Road Ahead", CRC Press Taylor & Francis Group ,2022 Scheme of Continuous Internal Evaluation (CIE- Laboratory) : Only LAB Course 30 + 10 + 10 = 50. The Laboratory session is held every week as per the timetable and the performance of the student is evaluated in every session. The average of marks over number of experiments conducted over the weeks is considered for 30 Marks i.e (Lab Report, Observation & Analysis). The students are encouraged to implement additional innovative experiments in the lab (10 marks). At the end of the semester a test is conducted for 10 Marks (Lab Test). This adds to 50 Marks. Scheme of Semester End Examination (SEE- Laboratory) : Only LAB Course 40 + 10 = 50. Students will be evaluated for Write-up, Experimental Setup, Experiment Conduction with Results, Analysis & Discussions for 40 40 Marks and Via will be conducted for 10 Marks adding to 50 Marks. Scheme of Semester End Examination (SEE- Laboratory) : Only LAB Course 40 + 10 = 50. Students wil	Reference E	Books	1	61		12				
CompanyLtd.,ISBN:0070593620. 2. The Complete Reference C++, Herbert Schildt, McGrawHill, 4th Edition, 2011, ISBN:9780070532465 3.Eric Matthes, Python Crash Course: A Hands-On, Project-Based Introduction to Programming, 2nd Edition, May 2019, ISBN-13: 9781593279288. 4. Sudeep Tanwar, Anand Nayyar, Rudra Rameshwar, "Machine Learning in Signal Processing –Applications, Challenges, And the Road Ahead", CRC Press Taylor & Francis Group ,2022 Scheme of Continuous Internal Evaluation (CIE- Laboratory) : Only LAB Course 30 + 10 + 10 = 50. The Laboratory session is held every week as per the timetable and the performance of the student is evaluated in every session. The average of marks over number of experiments conducted over the weeks is considered for 30 Marks i.e (Lab Report, Observation & Analysis). The students are encouraged to implement additional innovative experiments in the lab (10 marks). At the end of the semester a test is conducted for 10 Marks (Lab Test). This adds to 50 Marks. Scheme of Semester End Examination (SEE- Laboratory) : Only LAB Course 40 + 10 = 50. Students will be evaluated for Write-up, Experimental Setup, Experiment Conduction with Results, Analysis & Discussions for 40 Marks and Viva will be conducted for 10 Marks adding to 50 Marks. Only LAB Courses with 50 Marks I Write Up, Setup, Conduction Results, Analysis & Discussions 40 2 Innovative Experiment/Concept Design & Implementation 10 Viva Voce 10 3 Laboratory Internal 10 Viva Voce 10	1. Object Or	ienteo	1 Programmin	ig with C++, E. Bal	agurusv	vamy, 4th edition, 2012, M	IcGraw Hi	11,		
2. The Complete Reference C++, Herbert Schildt, McGrawHill, 4th Edition, 2011, ISBN:9780070532465 3.Eric Matthes, Python Crash Course: A Hands-On, Project-Based Introduction to Programming, 2nd Edition, May 2019, ISBN-13: 9781593279288. 4. Sudeep Tanwar, Anand Nayyar, Rudra Rameshwar, "Machine Learning in Signal Processing –Applications, Challenges, And the Road Ahead", CRC Press Taylor & Francis Group ,2022 Scheme of Continuous Internal Evaluation (CIE- Laboratory): Only LAB Course 30 + 10 + 10 = 50. The Laboratory session. The average of marks over number of experiments conducted over the weeks is considered for 30 Marks i.e (Lab Report, Observation & Analysis). The students are encouraged to implement additional innovative experiments in the lab (10 marks). At the end of the semester a test is conducted for 10 Marks (Lab Test). This adds to 50 Marks. Scheme of Semester End Examination (SEE- Laboratory) : Only LAB Course 40 + 10 = 50. Students will be evaluated for Write-up, Experimental Setup, Experiment Conduction with Results, Analysis & Discussions for 40 Marks and Viva will be conducted for 10 Marks adding to 50 Marks. Only LAB Courses with 50 Marks RUBRIC FOR CIE RUBRIC FOR SEE Sl.No Content Marks 40 1 Write Up, Setup, Conduction 2. Results, Analysis & Discussions 40 2 Innovative Experiment/Concept 10 2. Results, Analysis & Discussions 2 Innovative Experiment/Concept 10 2. Results, Analysis & Discussions	CompanyLtd.,ISBN:0070593620.									
3.Eric Matthes, Python Crash Course: A Hands-On, Project-Based Introduction to Programming, 2nd Edition, May 2019, ISBN-13: 9781593279288. 4. Sudeep Tanwar, Anand Nayyar, Rudra Rameshwar, "Machine Learning in Signal Processing –Applications, Challenges, And the Road Ahead". CPress Tarvier Sorop 2022 Scheme of Continuous Internal Evaluation (CIE- Laboratory) : Only LAB Course 30 + 10 + 10 = 50. The Laboratory session is held every week as per the timetable and the performance of the student is evaluated in every session. The average of marks over number of experiments conducted over the weeks is considered for 30 Marks i.e (Lab Report, Observation & Analysis). The students are encouraged to implement additional innovative experiments in the lab (10 marks). At the end of the semester a test is conducted for 10 Marks (Lab Test). This adds to 50 Marks. Scheme of Semester End Examination (SEE- Laboratory) : Only LAB Course 40 + 10 = 50. Students will be evaluated for Write-up, Experimental Setup, Experiment Conduction with Results, Analysis & Discussions for 40 Marks and Viva will be conducted for 10 Marks adding to 50 Marks. Scheme of Semester End Examination (SEE- Laboratory) : Only LAB Course 40 + 10 = 50. Students will be evaluated for Write-up, Experimental Setup, Experiment Conduction with Results, Analysis & Discussions for 40 Marks and Viva will be conducted for 10 Marks adding to 50 Marks. Scheme of Content Marks Content Marks 1 Write Up, Setup, Conduction Results, Analysis & Discussions 30 2 Innovative Experiment/Concept 10 3 Laboratory Internal 10 Viva Voce 10 3 Laboratory Internal 10 Viva Voce 10 5 Total Marks 50 Total Marks 50	2. The Complete Reference C++, Herbert Schildt, McGrawHill, 4th Edition, 2011, ISBN:9780070532465									
May 2019, ISBN-13: 9781593279288. 4. Sudeep Tanwar, Anand Nayyar, Rudra Rameshwar, "Machine Learning in Signal Processing –Applications, Challenges, And the Road Ahead", CRC Press Taylor & Francis Group, 2022 Scheme of Continuous Internal Evaluation (CIE- Laboratory) : Only LAB Course $30 + 10 + 10 = 50$. The Laboratory session is held every week as per the timetable and the performance of the student is evaluated in every session. The average of marks over number of experiments conducted over the weeks is considered for 30 Marks i.e (Lab Report, Observation & Analysis). The students are encouraged to implement additional innovative experiments in the lab (10 marks). At the end of the semester a test is conducted for 10 Marks (Lab Test). This adds to 50 Marks. Scheme of Semester End Examination (SEE- Laboratory) : Only LAB Course $40 + 10 = 50$. Students will be evaluated for Write-up, Experimental Setup, Experiment Conduction with Results, Analysis & Discussions for 40 Marks and Viva will be conducted for 10 Marks adding to 50 Marks. Scheme of Semester End Examination (SEE- Laboratory) : Only LAB Course $40 + 10 = 50$. Students will be evaluated for Write-up, Experimental Setup, Experiment Conduction with Results, Analysis & Discussions for 40 Marks and Viva will be conducted for 10 Marks adding to 50 Marks. Scheme of Content Marks Quarks and Viva will be conduction 30 1 Write Up, Setup, Conduction 2 2 RUBRIC FOR CIE Sl.No Content Marks 2 Innovative Experiment/Concept Design & Implementation 10	3.Eric Matthes, Python Crash Course: A Hands-On, Project-Based Introduction to Programming, 2nd Edition,									
4. Sudeep Tanwar, Anand Nayyar, Rudra Rameshwar, "Machine Learning in Signal Processing –Applications, Challenges, And the Road Ahead", CRC Press Taylor & Francis Group ,2022 Scheme of Continuous Internal Evaluation (CIE- Laboratory) : Only LAB Course 30 + 10 + 10 = 50. The Laboratory session is held every week as per the timetable and the performance of the student is evaluated in every session. The average of marks over number of experiments conducted over the weeks is considered for 30 Marks i.e (Lab Report, Observation & Analysis). The students are encouraged to implement additional innovative experiments in the lab (10 marks). At the end of the semester a test is conducted for 10 Marks (Lab Test). This adds to 50 Marks. Scheme of Semester End Examination (SEE- Laboratory) : Only LAB Course 40 + 10 = 50. Students will be evaluated for Write-up, Experimental Setup, Experiment Conduction with Results, Analysis & Discussions for 40 Marks and Viva will be conducted for 10 Marks adding to 50 Marks.	May 2019, ISBN-13: 97815932 <mark>79288</mark> .									
Challenges, And the Road Ahead", CRC Press Taylor & Francis Group ,2022 Scheme of Continuous Internal Evaluation (CIE- Laboratory) : Only LAB Course 30 + 10 + 10 = 50. The Laboratory session is held every week as per the timetable and the performance of the student is evaluated in every session. The average of marks over number of experiments conducted over the weeks is considered for 30 Marks i.e (Lab Report, Observation & Analysis). The students are encouraged to implement additional innovative experiments in the lab (10 marks). At the end of the semester a test is conducted for 10 Marks (Lab Test). This adds to 50 Marks. Scheme of Semester End Examination (SEE- Laboratory) : Only LAB Course 40 + 10 = 50. Students will be evaluated for Write-up, Experimental Setup, Experiment Conduction with Results, Analysis & Discussions for 40 Marks and Viva will be conducted for 10 Marks adding to 50 Marks. Only LAB Courses with 50 Marks Only LAB Courses with 50 Marks 10 Write Up, Setup, Conduction 10 Write Up, Setup, Conduction 2 Innovative Experiment/Concept 10 Viva Voce 10 Content Marks Content Marks Only LAB Courses with 50 Marks Scheme of Setup, Conduction 10 <th colspan<="" td=""><td colspan="7">4. Sudeep Tanwar, Anand Nayyar, Rudra Rameshwar, "Machine Learning in Signal Processing – Applications,</td></th>	<td colspan="7">4. Sudeep Tanwar, Anand Nayyar, Rudra Rameshwar, "Machine Learning in Signal Processing – Applications,</td>	4. Sudeep Tanwar, Anand Nayyar, Rudra Rameshwar, "Machine Learning in Signal Processing – Applications,								
Scheme of Continuous Internal Evaluation (CIE- Laboratory) : Only LAB Course 30 + 10 + 10 = 50. The Laboratory session is held every week as per the timetable and the performance of the student is evaluated in every session. The average of marks over number of experiments conducted over the weeks is considered for 30 Marks i.e (Lab Report, Observation & Analysis). The students are encouraged to implement additional innovative experiments in the lab (10 marks). At the end of the semester a test is conducted for 10 Marks (Lab Test). This adds to 50 Marks. Scheme of Semester End Examination (SEE- Laboratory) : Only LAB Course 40 + 10 = 50. Students will be evaluated for Write-up, Experimental Setup, Experiment Conduction with Results, Analysis & Discussions for 40 Marks and Viva will be conducted for 10 Marks adding to 50 Marks. Only LAB Courses with 50 Marks Nong LAB Courses with 50 Marks Volume 10 Write-up, Experimental Setup, Experiment Conduction with Results, Analysis & Discussions for 40 Marks and Viva will be conducted for 10 Marks adding to 50 Marks. Scheme of Content Marks Wite Up, Experimental Setup, Experiment Conduction with Results, Analysis & Discussions for 40 Marks and Viva will be conducted for 10 Marks adding to 50 Marks. Volume Vite Up, Setup, Conduction 1 RUBRIC FOR CIE RUBRIC FOR SEE 1 2 Not Content Marks 40 40 40 40 40 40 40 40 40	Challenges,	And t	he Road Ahea	ad", CRC Press Tay	lor & Fr	ancis Grou <mark>p ,2022</mark>				
Scheme of Continuous Internal Evaluation (CIE- Laboratory) : Only LAB Course $30 + 10 + 10 = 50$. The Laboratory session is held every week as per the timetable and the performance of the student is evaluated in every session. The average of marks over number of experiments conducted over the weeks is considered for 30 Marks i.e (Lab Report, Observation & Analysis). The students are encouraged to implement additional innovative experiments in the lab (10 marks). At the end of the semester a test is conducted for 10 Marks (Lab Test). This adds to 50 Marks. Scheme of Semester End Examination (SEE- Laboratory) : Only LAB Course $40 + 10 = 50$. Students will be evaluated for Write-up, Experimental Setup, Experiment Conduction with Results, Analysis & Discussions for 40 Marks and Viva will be conducted for 10 Marks adding to 50 Marks. Only LAB Courses with 50 Marks RUBRIC FOR CIE RUBRIC FOR SEE Sl.No Content Marks 1. Write Up, Setup, Conduction 2. Results, Analysis & Discussions 1. Write Up, Setup, Conduction 40 Advarter total Marks Content Marks Note: RUBRIC FOR CIE RUBRIC FOR CIE Note: 10 1. Write Up, Setup, Conduction 2 Innovative Experi			_							
Laboratory session is held every week as per the timetable and the performance of the student is evaluated in every session. The average of marks over number of experiments conducted over the weeks is considered for 30 Marks i.e (Lab Report, Observation & Analysis). The students are encouraged to implement additional innovative experiments in the lab (10 marks). At the end of the semester a test is conducted for 10 Marks (Lab Test). This adds to 50 Marks. Scheme of Semester End Examination (SEE- Laboratory) : Only LAB Course 40 + 10 =50. Students will be evaluated for Write-up, Experimental Setup, Experiment Conduction with Results, Analysis & Discussions for 40 Marks and Viva will be conducted for 10 Marks adding to 50 Marks.	Scheme of	Conti	nuous Intern	al Evaluation (CII	E- Labo	ratory) : Only LAB Course	e 30 + 10 ·	+ 10 = 5	50. The	
every session. The average of marks over number of experiments conducted over the weeks is considered for 30 Marks i.e (Lab Report, Observation & Analysis). The students are encouraged to implement additional innovative experiments in the lab (10 marks). At the end of the semester a test is conducted for 10 Marks (Lab Test). This adds to 50 Marks. Scheme of Semester End Examination (SEE- Laboratory) : Only LAB Course 40 + 10 =50. Students will be evaluated for Write-up, Experimental Setup, Experiment Conduction with Results, Analysis & Discussions for 40 Marks and Viva will be conducted for 10 Marks adding to 50 Marks.	Laboratory s	sessio	n is held ever	y week as per the t	imetabl	e and the performance of t	he studen	t is eva	luated in	
Marks 1.e (Lab Report, Observation & Analysis). The students are encouraged to implement additional innovative experiments in the lab (10 marks). At the end of the semester a test is conducted for 10 Marks (Lab Test). This adds to 50 Marks. Scheme of Semester End Examination (SEE- Laboratory) : Only LAB Course 40 + 10 =50. Students will be evaluated for Write-up, Experimental Setup, Experiment Conduction with Results, Analysis & Discussions for 40 Marks and Viva will be conducted for 10 Marks adding to 50 Marks. Only LAB Courses with 50 Marks Students will be conducted for 10 Marks adding to 50 Marks. Only LAB Courses with 50 Marks Students adding to 50 Marks. USUBSIDE Students adding to 50 Marks. Only LAB Courses with 50 Marks Only LAB Courses with 50 Marks Students adding to 50 Marks. Image: Students adding to 50 Marks. Only LAB Courses with 50 Marks Students adding to 50 Marks Image: Students adding to 50 Marks Only LAB Courses with 50 Marks 10 2. RUBRIC FOR CIE Students adding to 50 Marks 1 Write Up, Setup, Conduction 40 40 40 40 4	every session	n. The	e average of m	arks over number	of expe	riments conducted over the	e weeks is	conside	ered for 30	
Innovative experiments in the lab (10 marks). At the end of the semester a test is conducted for 10 Marks (Lab Test). This adds to 50 Marks. Scheme of Semester End Examination (SEE- Laboratory) : Only LAB Course 40 + 10 =50. Students will be evaluated for Write-up, Experimental Setup, Experiment Conduction with Results, Analysis & Discussions for 40 Marks and Viva will be conducted for 10 Marks adding to 50 Marks. Only LAB Courses with 50 Marks Still C FOR CIE RUBRIC FOR CIE RUBRIC FOR CIE Sl.No Content Marks 1 Write Up, Setup, Conduction 30 1. Write Up, Setup, Conduction 40 2 Innovative Experiment/Concept Design & Implementation 10 2. Results, Analysis & Discussions 40 3 Laboratory Internal 10 Viva Voce 10 10 4 Total Marks 50 Total Marks 50 50	Marks 1.e (La	ab Re	port, Observa	tion & Analysis). T	he stude	ents are encouraged to imp	plement ac	lditiona		
Scheme of Semester End Examination (SEE- Laboratory) : Only LAB Course 40 + 10 =50. Students will be evaluated for Write-up, Experimental Setup, Experiment Conduction with Results, Analysis & Discussions for 40 Marks and Viva will be conducted for 10 Marks adding to 50 Marks. Only LAB Courses with 50 Marks Only LAB Courses with 50 Marks. Only LAB Courses Only LAB Courses <th colspan<="" td=""><td>innovative ex</td><td>xperii</td><td>nents in the la</td><td>ab (10 marks). At t</td><td>he end</td><td>of the semester a test is co</td><td>nducted to</td><td>or 10 M</td><td>arks (Lab</td></th>	<td>innovative ex</td> <td>xperii</td> <td>nents in the la</td> <td>ab (10 marks). At t</td> <td>he end</td> <td>of the semester a test is co</td> <td>nducted to</td> <td>or 10 M</td> <td>arks (Lab</td>	innovative ex	xperii	nents in the la	ab (10 marks). At t	he end	of the semester a test is co	nducted to	or 10 M	arks (Lab
Scheme of Semester End Examination (SEE- Laboratory): Only LAB Course 40 + 10 = 50. Students will be evaluated for Write-up, Experimental Setup, Experiment Conduction with Results, Analysis & Discussions for 40 Marks and Viva will be conducted for 10 Marks adding to 50 Marks. Only LAB Courses with 50 Marks Only LAB Courses with 50 Marks Students will be conducted for 10 Marks adding to 50 Marks. Only LAB Courses with 50 Marks Students Will be conducted for 10 Marks adding to 50 Marks. Only LAB Courses with 50 Marks Students Will be conducted for 10 Marks adding to 50 Marks. Only LAB Courses with 50 Marks Students Will be conducted for 10 Marks adding to 50 Marks. Only LAB Courses with 50 Marks Students Key Conduction No Content Marks Image: Students Key Conduction 1 Write Up, Setup, Conduction 30 1. Write Up, Setup, Conduction 40 2 Innovative Experiment/Concept 10 2. Results, Analysis & Discussions 40 10 3 Laboratory Internal 10 Viva Voce 10 10 Total Marks <th colspan<="" td=""><td>Testj. This a</td><td></td><td>o 50 Marks.</td><td>mination (SEE L</td><td>herete</td><td></td><td>10 -FO</td><td>Studen</td><td></td></th>	<td>Testj. This a</td> <td></td> <td>o 50 Marks.</td> <td>mination (SEE L</td> <td>herete</td> <td></td> <td>10 -FO</td> <td>Studen</td> <td></td>	Testj. This a		o 50 Marks.	mination (SEE L	herete		10 -FO	Studen	
Experimental Setup, Experiment Conduction with Results, Analysis & Discussions for 40 Marks and Viva will be conducted for 10 Marks adding to 50 Marks. Only LAB Courses with 50 Marks Sile RUBRIC FOR CIE RUBRIC FOR SEE Sile Write Up, Setup, Conduction Results, Analysis & Discussions Marks 1 Write Up, Setup, Conduction Results, Analysis & Discussions 30 1. Write Up, Setup, Conduction 2 Innovative Experiment/Concept Design & Implementation 10 2. Results, Analysis & Discussions 40 3 Laboratory Internal 10 Viva Voce 10 50 Total Marks 50 Total Marks 50	scheme of a	r Writ	ster Ellu Exa	mental Setup Evpe	riment	Conduction with Pesults	+ 10 -50. Apolysis &	Discut	nis will be	
Silling to conducted for 10 marks database to colmarks. Only LAB Courses with 50 Marks. RUBRIC FOR CIE RUBRIC FOR SEE Silling Content Marks Content Marks 1 Write Up, Setup, Conduction Results, Analysis & Discussions 30 1. Write Up, Setup, Conduction 40 2 Innovative Experiment/Concept Design & Implementation 10 2. Results, Analysis & Discussions 40 3 Laboratory Internal 10 Viva Voce 10 10 Marks 50 Total Marks 50 Total Marks 50	40 Marks ar	nd Viv	a will be cond	fucted for 10 Mark	s adding	g to 50 Marks	allalysis a	, Discus	3510115 101	
RUBRIC FOR CIERUBRIC FOR SEESl.NoContentMarksContentMarks1Write Up, Setup, Conduction Results, Analysis & Discussions301. Write Up, Setup, Conduction 2. Results, Analysis & Discussions402Innovative Experiment/Concept Design & Implementation102. Results, Analysis & Discussions403Laboratory Internal10Viva Voce104Total Marks50Total Marks50	TO Marks ar			Only LAB		with 50 Marks				
SI.NoContentMarksContentMarks1Write Up, Setup, Conduction Results, Analysis & Discussions301. Write Up, Setup, Conduction 2. Results, Analysis & Discussions402Innovative Experiment/Concept Design & Implementation10102. Results, Analysis & Discussions403Laboratory Internal10Viva Voce10			DI		0001000		OD SEE			
SI.NoContentMarksContentMarks1Write Up, Setup, Conduction Results, Analysis & Discussions301. Write Up, Setup, Conduction 2. Results, Analysis & Discussions402Innovative Experiment/Concept Design & Implementation102. Results, Analysis & Discussions403Laboratory Internal10Viva Voce10		OL N.	K		Moelro	ROBRIC F	OK SEE	Mortra		
1Write Up, Setup, Conduction Results, Analysis & Discussions301. Write Up, Setup, Conduction402Innovative Experiment/Concept Design & Implementation102. Results, Analysis & Discussions403Laboratory Internal10Viva Voce10		SI.No	0	Content	Marks	Content		Marks		
Results, Analysis & Discussions1. write Op, Setup, Conduction402Innovative Experiment/Concept Design & Implementation102. Results, Analysis & Discussions403Laboratory Internal10Viva Voce10Total Marks50Total Marks50		1	Write Up, Set	up, Conduction	30	1 Waite Up Cate C 1	+:			
2 Innovative Experiment/Concept Design & Implementation 10 2. Results, Analysis & Discussions 3 Laboratory Internal 10 Viva Voce 10 Image: State of the s			Kesuits, Anal	ysis & Discussions		1. write Up, Setup, Conduc	uon	40		
3 Laboratory Internal 10 Viva Voce 10 Total Marks 50 Total Marks 50		2	Design & Imp	lementation	10	2. Results, Analysis & Discu	15810118			
3Laboratory Internal10Viva Voce10Total Marks50Total Marks50				nementation						
Total Marks 50 Total Marks 50		3	Laboratory In	ternal	10	Viva Voce		10		
				Total Marks	50	Т	otal Marks	50		

SEMESTER: I

Iarks Marks Durations Durations Durations Durations protocols discovery oals of a l s, Conten ; Mechanis routing p	: 100 : 100 : 3 Hrs 9 Hrs ks, Issues i , Pricing r, Energy 9 Hrs MAC Protoc tion based sms, Other 8 Hrs
farks Marks Durations Dura	i 100 i 100 i 3 Hrs 9 Hrs ks, Issues i s, Pricing r, Energy 9 Hrs MAC Protoc tion based sms, Other 8 Hrs
Marks Durations Durations Durations Durations Durations protocols discovery oals of a Market s, Conten ; Mechanis routing p	 i 100 i 3 Hrs 9 Hrs ks, Issues i ks, Issues i pricing r, Energy 9 Hrs MAC Protoction based sms, Other 8 Hrs
Durations Doc networl protocols discovery oals of a l s, Conten ; Mechanis routing p	: 3 Hrs 9 Hrs ks, Issues i , Pricing r, Energy 9 Hrs MAC Protoc tion based sms, Other 8 Hrs
oc networl protocols discovery oals of a l s, Conten ; Mechanis routing p	9 Hrs ks, Issues i , Pricing r, Energy 9 Hrs MAC Protoc tion based sms, Other 8 Hrs
oc networl protocols discovery oals of a l s, Conten ; Mechanis routing p	9 Hrs ks, Issues i , Pricing r, Energy 9 Hrs MAC Protoc tion based sms, Other 8 Hrs
oc networl protocols discovery oals of a l s, Conten ; Mechanis routing p	ks, Issues i s, Pricing r, Energy 9 Hrs MAC Protoc tion based sms, Other 8 Hrs
protocols discovery oals of a l s, Conten ; Mechanis routing p	s, Pricing r, Energy 9 Hrs MAC Protoc tion based sms, Other 8 Hrs
discovery oals of a l s, Conten ; Mechanis routing p	7, Energy 9 Hrs MAC Protoc tion based sms, Other 8 Hrs
oals of a l s, Conten ; Mechanis routing p	9 Hrs MAC Protoc tion based sms, Other 8 Hrs
oals of a l s, Conten ; Mechani routing p	9 Hrs MAC Protoc tion based sms, Other 8 Hrs
oals of a l s, Conten g Mechani routing p	MAC Protoc tion based sms, Other
routing p	8 Hrs
routing p	
ng protoc	protocols.
	ol
	8 Hrs
Classifica	tion,
uality of S	bervice
-	
	8 Hrs
	1
ar networ	KS.
networks	
ols, 2012,	, 1st Editio
ols, 2012, Prentice H	, 1st Editio Iall, New
ols, 2012, Prentice H press, Flo	, 1st Editio Iall, New rida. ISBN
	tion of Qo power ma r networ

EXPERIENTIAL LEARNING: Students will be evaluated for their creativity and practical implementation of the problem. Case study-based teaching learning and Program specific requirements (15), Video based seminar/presentation/demonstration (25) adding upto 40 marks.

Autonomous Institution Affiliated U Visvesvaraya Technological University, Belegavi

Rubric for CIE & SEE Theory courses						
	RUBRIC for CIE	1	RUBRIC for SEE			
SLNo	Content	Marks	Q. No	Contents	Marks	
1	Quizzes - Q1 & Q2	20	Each u	nit consists of TWO questions of 20 Marks each. Answ	er FIVE	
2	Tests - T1 & T2	40		full questions selecting ONE from each unit (1 to 5).		
3	Experiential Learning - EL1 & EL2	40	1&2	Unit-1: Question 1 or 2	20	
	Total Marks	100	3&4	Unit-2: Question 3 or 4	20	
			5&6	Unit-3: Question 5 or 6	20	
			7&8	Unit-4: Question 7 or 8	20	
			9 & 10	Unit-5: Question 9 or 10	20	
				Total Marks	100	





G0,	change	the	world
-----	--------	-----	-------

University, Be	elagavi		<u> </u>				
		SEMESTER: I					
Course Code	: 22MDC1A2T	Multimedia Communications	CIE Marks	: 100			
Credits L-T-P	: 3 - 0 - 0	Multimedia Communications	SEE Marks	: 100			
Hours	: 42L	Elective A (Professional Elective)	SEE Durations	: 3 Hrs			
Facu	lty Coordinator:	Prof. P. Nagaraju, Dr Bhagya R	I				
	9	UNIT - I		9 Hrs			
Multimedia Co	mmunications: N	Aultimedia information representation, multimedia	a networks, multin	nedia			
applications, n	etwork OoS and	application OoS.					
	<u> </u>	UNIT - II		9 Hrs			
Standards and	Protocols: JPEG	(image compression) JPEG 2000 compression st		ent process			
features, archit	tecture, bit strea	m. Audio coding standards for Multimedia: Dolby.	AA3. Vorbis. MPE	G – 21			
multimedia fra	me work. Protoc	ols - RTP. RTCP. RTSP. RSVP.		~			
		UNIT - III		8 Hrs			
Video compres	sion: Video comr	ression principles video compression standards:	H 261 H 263 MPI	$rac{1}{2}$			
2 and MPEG 4	L DivX Flash Vi	deo Avi WMV	11.201, 11.200, MI	20 I, MI 20			
_,		IINIT - IV		8 Hre			
Multimedia En	tertoinment Net	works: Introduction Cable TV networks Satellite 7	W networks Terre	striol TV			
networks High	a speed PSTN acc	vorks. Infroduction, Cable 1V networks, Satemite 1	. v networks, rene	Stilai I V			
networks. mgn	i specu i Sin acc			Q U#0			
Distal Wilso D	un a dan atim m DV	D Internet ilitics DVD Contern Deschard and	Disital Talas	0 115			
Digital video B	D based metropy	B Interoperabilities, DVB System, Baseband proces	sing, Digital Televi	lsion,			
DVP and Inter	P-Dased network	s, Services, Authentication, Authorization.					
DVB and milen	net.ip municast,	Audio/ video streaming.					
0 0 1							
Course Outcon	mes:	the start of 11 he ship to					
After going thro	ough this course	the student will be able to:					
C01	CO1 : Explain multimedia information representation, networks and compression techniques						
CO2 : Analyze applications like interpersonal communication, interactive communication over the							
	internet and e	ntertainment networks.					
CO3	: Apply various	coding methods and compression techniques.					
CO4	: Analyze and e	xplain the various broadcasting systems.					
Reference Boo	oks						
1.Data Commu	inications and N	etworking, Behrouz A Forouzan, 2015, 4 th Edition	n, Mc Graw Hill pu	blication,			
ISBN-13:978-0	-07-063414-5.						
2. Multimedia	Communications	s, Fred Halsall, 2001, Pearson education, ISBN: 97	8-81-317-0994-8.				
3. Introduction	to Multimedia C	Communications, K. R. Rao, Zoran S. Bojkovic, Dra	agorad A. Milovanc	vic, 2014,			
Wiley, ISBN 13	978-0-471-4674	42-7.					
4. Multimedia	Communication	Systems, K. R. Rao, Zoran S. Bojkovic, Dragorad A	A. Milovanovic,, 20	04, Pearson			
education, ISB	N: 013031398X.			·			
Scheme of Co	ntinuous Intern	al Evaluation (CIE): 20 + 40 + 40 = 100					
OUIZZES: Ouiz	zzes will be cond	ucted in online/offline mode. Two quizzes will be c	conducted & Each	Ouiz will be			
evaluated for 1	0 Marks. The su	m of two quizzes will be the Final Quiz marks.		C			
TESTS: Studer	nts will be evalua	ated in test, descriptive questions with different con	mplexity levels (Re	vised			
Bloom's Taxon	omy Levels: Rem	embering, Understanding, Applying, Analyzing, Ev	valuating, and Crea	ating). Two			
tests will be co	nducted. Each te	est will be evaluated for 50 Marks, adding upto 100	0 Marks. Final test	marks will			
be reduced to 4	40 Marks.						
EXPERIENTIA	L LEARNING: S	tudents will be evaluated for their creativity and p	ractical implement	ation of the			
problem. Case	problem. Case study-based teaching learning and Program specific requirements (15). Video based						
seminar/prese	ntation/demons	tration (25) adding upto 40 marks.					
Scheme of Ser	mester End Exa	mination (SEE) for 100 marks: The question pan	er will have FIVE	nuestions			

Scheme of Semester End Examination (SEE) for 100 marks: The question paper will have FIVE questions with internal choice from each unit. Each question will carry 20 marks. Student will have to answer one full question from each unit.

Rubric for CIE & SEE Theory courses

Go, change l	the	world
--------------	-----	-------

Autonomous Institution Affiliated to Visvesvaraya Technological University, Belagavi		RUBRIC for CIE
	A DIMINI	Autonomous Approved by AICTE, Institution Affiliated New Deihi to Visvesvaraya Technological University, Belagavi

	RUBRIC for CIE			RUBRIC for SEE		
SLNo	Content	Marks	Q. No	Contents	Marks	
1	Quizzes - Q1 & Q2	20	Each u	nit consists of TWO questions of 20 Marks each. Answ	ver FIVE	
2	Tests - T1 & T2	40		full questions selecting ONE from each unit (1 to 5).		
3	Experiential Learning - EL1 & EL2	40	1&2	Unit-1: Question 1 or 2	20	
	Total Marks	100	3&4	Unit-2: Question 3 or 4	20	
			5&6	Unit-3: Question 5 or 6	20	
			7&8	Unit-4: Question 7 or 8	20	
			9 & 10	Unit-5: Question 9 or 10	20	
				Total Marks	100	



G0,	change	the	world
-----	--------	-----	-------

University, Be	elagavi						
			SEMESTER: I				
Course Code	: 22MDC1	A3T		CIE Marks :	100		
Credits L-T-P	: 3 - 0 - 0		IMAGE PROCESSING AND COMPUTER VISION	SEE Marks :	100		
Hours	: 42L		Elective A (Professional Elective)	SEE Durations :	3 Hrs		
Facu	lty Coordin	nator:	Dr. K. Viswavardhan Reddy, Prof. P. Nagaraju	•			
	0		UNIT - I		9 Hrs		
Introduction: N	Iotivation, o	challer	nges, Image representation and analysis tasks. The	image and its prop	perties:		
Image represer	ntation, digi	itizatio	n, digital image properties, color images. Mathema	tical and physical			
background: Li	inearity, Lir	near Ir	tegral transforms (1D, 2D FT, DCT, WT, SVD, PCA	etc.)			
	5 .		UNIT - II	/	9 Hrs		
Data structure	s for image	analy	sis: levels, matrices, chains, topological, relational,	Hierarchical: Pyra	mids and		
quad trees.Ima	ge pre-proc	cessing	g: Pixel brightness transformations, Geometric tran	sformations, Local			
pre-processing	and Image	e restor	ationSegmentation I: Thresholding and edge-based	l, Region based, Ma	atching,		
Mean shift, and	d Graph-cu	ıt segn	entation, Evaluation issues in segmentation.				
			UNIT - III		8 Hrs		
Shape Represe	ntation: Re	egion ic	lentification, Contour-based shape representation a	and description,			
Region-based s	hape repres	esentat	ion and description, shape classes. Object recognit	ion: Knowledge			
representation	, Statistical	l patter	n recognition, Neural Nets, Syntactic pattern recog	gnition, Recognition	n as graph		
matching, Boos	sting in pat	ttern re	ecognition, and Random forests				
		1.1	UNIT - IV		8 Hrs		
3D geometry, c	orresponde	ence, 3	D from intensities: 3D vision tasks, Basics of proje	ctive geometry, A s	ingle		
perspective car	nera, Scene	e recor	ist <mark>ruc</mark> tion from multiple views, Two <mark>cam</mark> eras, stered	opsis, Three camer	as and		
trifocal tensor,	3D informa	ation f	c <mark>om ra</mark> diometric measurements.Use <mark>of 3D</mark> vision: S	hape from X, Full 3	3D objects,		
2D view-based	representat	tions o	o <mark>f a 3D</mark> scene, 3D reconstruction fro <mark>m an u</mark> norganiz	zed set of 2D views	, and		
Structure from	Motion						
	10	2	UNIT - V		8 Hrs		
Texture: Statis	tical texture	e des <mark>c</mark>	r <mark>iption</mark> , Syntactic texture descriptio <mark>n metho</mark> ds.Moti	ion analysis: Differ	ential		
motion analysi	s methods,	Analy	sis based on correspondence of interest points, Det	tection of specific n	notion		
patterns, Video	o tracking a	and Mc	tion models to aid tracking.				
Course Outcon	mes:						
After going three	ough this co	ourse	the student will be able to:	_			
CO1	: Analyze t	the fur	idamental concepts of image processing and variou	is transforms.			
CO2	: Analyze a	and ap	ply va <mark>rious pre-processing, segmen</mark> tation and featu	ure extraction tech	niques for		
image analysis and recognition.							
CO3	: Design a	ind dev	velop various techniques for recognizing patterns, o	bjects in digital im	ages.		
CO4	: Design a	l comp	uter vision system for a specific problem				
Reference Boo	oks						
1.Milan Sonka	, Vaclav Hla	avac R	oger Boyle,Image Processing, Analysis, and Machin	e Vision with Mind	Tap, 4th		
edition, Cengag	ge Engineer	ring, 2	015, ISBN: 9789386858146	D D 1 1	2212		
2. Rafael C. Go ISBN-13 978-9	nzalez and 353062989	. Richa 9	rd E. Woods, Digital Image Processing,4th edition,	Pearson Education	, 2018.		
10DIN-10 9/0-9303002989 3 Scott F. Umbaugh Digital Image Processing and Analysis: Human and Computer Vision Applications with							
CVIPtools.2nd	edition. 201	11. CF	C Press, ISBN-13 978-1439802052	r vioion ripplicatio			
4. David Forsv	th.Compute	er Visi	on: A Modern Approach, 2nd edition, Pearson, 201	2. ISBN-13 978-01	36085928		
			FF,	,			

Autonomous Institution Affiliated to Visvesvaraya Tactinological University, Belegavi

Scheme of Continuous Internal Evaluation (CIE): 20 + 40 + 40 = 100

QUIZZES: Quizzes will be conducted in online/offline mode. Two quizzes will be conducted & Each Quiz will be evaluated for 10 Marks. The sum of two quizzes will be the Final Quiz marks.

TESTS: Students will be evaluated in test, descriptive questions with different complexity levels (Revised Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating). Two tests will be conducted. Each test will be evaluated for 50 Marks, adding upto 100 Marks. Final test marks will be reduced to 40 Marks.

EXPERIENTIAL LEARNING: Students will be evaluated for their creativity and practical implementation of the problem. Case study-based teaching learning and Program specific requirements (15), Video based seminar/presentation/demonstration (25) adding upto 40 marks.

RUBRIC for CIE			RUBRIC for SEE				
SLNo Content Marks		Q. No	Contents	Marks			
1	Quizzes - Q1 & Q2	20	Each unit consists of TWO questions of 20 Marks each. Answer FI		swer FIVE		
2	Tests - T1 & T2	40		full questions selecting ONE from each unit (1 to 5).			
3	Experiential Learning - EL1 & EL2	40	1&2	Unit-1: Question 1 or 2	20		
	Total Marks	100	3&4	Unit-2: Question 3 or 4	20		
			5&6	Unit-3: Question 5 or 6	20		
			78.8	Unit-4: Question 7 or 8	20		
			9 & 10	Unit-5: Question 9 or 10	20		
				Total Mar	cs 100		



University, Be	adgavi i			······					
		SEMESTER: I							
Course Code	: 22MDC1B1T	Artificial Intelligence and Deep Learning	CIE Marks	: 100					
Credits L-T-P	its L-T-P : 3 - 0 - 0 Interference and Deep Dearming SEE Marks : 's : 42L Elective B (Professional Elective) SEE Durations :								
Hours	: 42L	Elective B (Professional Elective)	SEE Durations	: 3 Hrs					
Facu	lty Coordinator:	Dr. K. Viswavardhan Reddy,Dr. B. Roja Reddy							
		UNIT - I		8 Hrs					
Introduction to	Python Program	nming: Variables, Datatypes (string, list, tuple, dicti	onary, set), Condi	tional tests,					
Loops, Functio with APIs.	ns, Data Visuali	zation: Matplotlib, plotting a simple line graph, Dow	vnloading data and	d working					
		UNIT - II		9 Hrs					
Statistics for M Tendencies & M Normal Distrib Degrees Of Fre Fundamentals get the data, di performance m	IL:Inferential Sta Measures of Disp ution, Poisson D edom, Confidence of Machine Lear iscover and visua leasures, fine tur	atistics & Descriptive Statistics, Data Type, Populati bersion, Relationships in variables (covariance, ANO Distribution, Binomial Distribution, Hypothesis Test ce Interval, P-value cning (ML) - I: Introduction to ML, Types of ML syste alize the data to gain insights, prepare the data, sele ne the model. Training the models: Linear discrimin	on and Sample, C VA, Correlation, K ing, Central Limit ems, main challeng ect and train the r ant functions, line	entral Curtosis), Theorem, ges of ML, nodel, ear and					
logistic regress	ions.			O Hero					
Fundamental	of Machine Las	ming (MI) II: KNN Noire David SVM desision to	a anamhla las	ing and					
random forest. feed-forward no Softmax outpu algorithm, test	Introduction to eural networks a t layers, gradien sets, validation	Neural Networks: Neural networks, neurons, linear and their limitations, Activation units: Sigmoid, Tan t descent, stochastic and Minibatch gradient descen sets, overfitting, preventing overfitting in deep neur	perceptrons as ne h, and ReLU Neur h, backpropagatic al networks	eurons, rons, on					
	1 49	UNIT - IV		8 Hrs					
GoogLeNet, Res Introduction to Challenges with Unit (GRU), De	sNet, DenseNet, RNN, Training h Vanishing grad ep Recurrent Ne	Applications of CNN, Architectures of CNN-Lenet, Arca of RNN, Backpropagation through time (BPTT) illust dients, Bidirectional RNNs, Long Short term Memory eural Networks, Applications of RNN.	ration, RNN, Topo y (LSTM), Gated R	llogy, ecurrent					
		UNIT - V		8 Hrs					
Introduction encoder, Multil autoencoder, R learning with p PyTorch), Role Machine Trans	to Auto I layer autoencode Regularization in bython, scientific of AI in digital c lation, Game Pla	Encoders Features of auto encoders, Types of Auto e er, stacked auto encoder, Deep Auto encoder, denois autoencoder (regularized autoencoder), Applica python (SciPy, NumPy, Matplotlib, Pandas), Frame ommunications, Visual recognition, Self-Driving car aying, Entertainment, Health care, Applications of A	encoders, Vanilla a sing, Convolutiona ations of Auto enco works (Tensorflow rs, Language Trans I in wireless comm	auto al oders. Deep r, Keras, slations, nunication.					
Course Outcom	mes:								
After going three	ough this course	e the student will be able to:							
CO1	: Understand the	he basics of python, its data types and visualization	of data.						
CO2 : Apply various statistical techniques in developing machine learning models									
CO3 : Analyze, design and apply neural networks in real-time applications.									
CO4	: Analyze the o	pen source frameworks, and challenges of AI, ML ar	nd DL in various a	pplications.					
	• •								
Reference Boo	oks								
1.Eric Matthes May 2019, ISB	, Python Crash (N-13: 97815932	Course: A Hands-On, Project-Based Introduction to 279288.	Programming, 2nd	d Edition,					
2. Kothari C.R. International P	, Gaurav Garg, I ublishers. 2020	Research Methodology Methods and techniques, 4th , ISBN: 978-93-86649-22-5	n edition, New Age						
3. Nikhil Budu	ma "Fundament	als of Deep Learning: Designing Next-Generation M	achine Intelligence	e					
Algorithms" 1st Edition,O'Reilly Media Inc, USA, 2017, ISBN: 978-1-491-92561-4.									

4. Navin Kumar Manaswi "Deep Learning with Applications Using Python" 1st Edition, APress, Springer Science Business Media New York, 2018, ISBN: 978-1-4842-3516-4.



Scheme of Continuous Internal Evaluation (CIE): 20 + 40 + 40 = 100

QUIZZES: Quizzes will be conducted in online/offline mode. Two quizzes will be conducted & Each Quiz will be evaluated for 10 Marks. The sum of two quizzes will be the Final Quiz marks.

TESTS: Students will be evaluated in test, descriptive questions with different complexity levels (Revised Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating). Two tests will be conducted. Each test will be evaluated for 50 Marks, adding upto 100 Marks. Final test marks will be reduced to 40 Marks.

EXPERIENTIAL LEARNING: Students will be evaluated for their creativity and practical implementation of the problem. Case study-based teaching learning and Program specific requirements (15), Video based seminar/presentation/demonstration (25) adding upto 40 marks.

	RUBRIC for CIE		RUBRIC for SEE				
SLNo Content Marks		Q. No	Contents	Marks			
1	Quizzes - Q1 & Q2	20 Each unit consists of TWO questions of 20 Marks each. Ans		Each unit consists of TWO questions of 20 Marks each. Answer FIV			
2	Tests - T1 & T2	40	40 full questions selecting ONE from each unit (1 to 5).		full questions selecting ONE from each unit (1 to 5).		
3	Experiential Learning - EL1 & EL2	40	1&2	Unit-1: Question 1 or 2	20		
	Total Marks	100	3&4	Unit-2: Question 3 or 4	20		
	1.5		5&6	Unit-3: Question 5 or 6	20		
			7 & 8	Unit-4: Question 7 or 8	20		
			9 & 10	Unit-5: Question 9 or 10	20		
				Tot	al Marks 100		

		SEMESTER: I		
Course Code	: 22MDC1B2T	Data Standards and Algorithms	CIE Marks	: 100
Credits L-T-P	: 3 - 0 - 0	Data Structures and Algorithms	SEE Marks	: 100
Hours	: 42L	Elective B (Professional Elective)	SEE Durations	: 3 Hrs
Facu	lty Coordinator:	Dr. B. Roja Reddy	·	
		UNIT - I		9 Hrs
Concepts of Ob	ject Oriented Pr	ogramming: Destructors and Constructor, Opera	tor Overloading, Inh	eritance:
Extending Clas	ses, Pointers, V	irtual functions and polymorphism, Exception ha	andling, Class Templa	ates
		UNIT - II		8 Hrs
Data Structure	s - Lists, Linear	lists, Linked list, Matrices - Special Matrices and	l Sparse Matrices.	
		UNIT - III		8 Hrs
Data Structure Routing Queue Labeling.	s - Stacks, Que s using Linear,	ues: Stacks using Linear, Link List , Applications Link List , Applications - Rail Road Car Arrangem	- Towers of Hanoi, S nent, Image Compone	witch Box ent
		UNIT - IV	_	8 Hrs
Data Structure	s -Trees, Graph	s: Hash Tables, Binary Trees and Graphs (Repres	sentation, Class Defir	nitions)
		UNIT - V	0	9 Hrs
Algorithm Desi Algorithms, Ba	gn Techniques: cktracking Algor	Greedy Algorithms, Divide and Conquer, Dynami rithms.	c Programming, Ran	domized
Course Outcom	nes:	2		
After going three	ough this course	e th <mark>e student will be able to:</mark>		
CO1	: Exhibit progra	a <mark>m desi</mark> gn and implementation comp <mark>etence</mark> throu	igh the choice of app	ropriate
	object oriente	d concept and data structures		
CO2	: Design and a	nalyze the applications using Object Oriented App	proach and data stru	ctures.
CO3	: Envision the s	solutions for real-time problems using Object Ori	ented concepts and d	lata
	structures.			
CO4	: Evaluate the	performance of various algorithms built using dif	ferent data structure	s.
Reference Boo	oks			
1. Object Orien Hill,CompanyL	ted Programmir td.,ISBN:007059	ng with C++, E. Balaguruswamy, 4th edition, 201 93620.	2, McGraw	
2. Data Structu ISBN:978-0929	ares, Algorithms 9306322	, and Applications in C++, SartajSahni, 2nd editi	on,2004,Silicon Pres	s,,
3. Big C++, Cay	y S. Horstmann,	Timothy Budd, Wiley India (P.) Ltd, 1st Edition,	2009, ISBN:9788126	509201
4. The Complet	e Reference C++	, Herbert Schildt, McGrawHill, 4th Edition, 2011	., ISBN:97800705324	465
		NUL V		
Scheme of Con	ntinuous Interr	al Evaluation (CIE): 20 + 40 + 40 = 100		
QUIZZES: Quiz	zes will be cond	ucted in online/offline mode. Two quizzes will be	conducted & Each (Quiz will be
evaluated for 1	0 Marks. The su	m of two quizzes will be the Final Quiz marks.		
TESTS: Studer	its will be evaluated	ated in test, descriptive questions with different c	complexity levels (Rev	1sed
Bloom's Taxon	omy Levels: Rem	embering, Understanding, Applying, Analyzing, I	Evaluating, and Crea	ting). Two
tests will be con	nducted. Each t	est will be evaluated for 50 Marks, adding upto 1	00 Marks. Final test	marks will
EXPERIENTIA	L LEARNING: S	tudents will be evaluated for their creativity and	practical implementa	ation of the
problem. Case	study-based tea	ching learning and Program specific requirement	ts (15), Video based	
semmar/prese	mation/demons	minotion (SEE) for 100 marks.		montions
Scheme of Set	nester Ena Exa	unit Each question will corry 20 marks. Student	aper will have to onower	uestions
with michial Cl	TOTCE ITOTIL CACIL	unit. Bach question win carry 20 marks. Studen	t will have to allower	one run
anestion from	ach unit			

RV Educational Institutions RV College of Engineering Autonomous Institution Affiliated to Vsvesvaraya Technological University, Belagavi

G0,	change	the	world
-----	--------	-----	-------

	Rubri	c for C	IE & S	SEE Theory courses		
Si No Content Nortes			O. No	Contents	Morks	
1	Quizzes - Q1 & Q2	20	20 Each unit consists of TWO questions of 20 Marks each. Answer FIV			
2	Tests - T1 & T2	40	40 full questions selecting ONE from each unit (1 to 5).			
3	Experiential Learning - EL1 & EL2	40	0 1 & 2 Unit-1: Question 1 or 2 20			
	Total Marks	100	3&4	Unit-2: Question 3 or 4	20	
			5&6	Unit-3: Question 5 or 6	20	
				Unit-4: Question 7 or 8	20	
			9 & 10	Unit-5: Question 9 or 10	20	
				Total Marks	100	



University, B	ai Ielagavi					
			SEMESTER: I			
Course Code	: :	22MDC1B3T			CIE Marks	: 100
Credits L-T-P	:::	3 - 0 - 0	BROADBAND NETWOR	(NS	SEE Marks	: 100
Hours	: 4	42L	Elective B (Professional El	ective)	SEE Durations	: 3 Hrs
Faculty Coordi	ina	tor:	Dr. K. Saraswathi, Dr. G. Ranjani	,		
5			UNIT - I			8 Hrs
Background of	LT	E: Introductio	n . ITU Activities. Drivers For LTE.	Standardization	of LTE Overview of	of LTE
Radio Access:	Bas	sic principles,	LTE release 9, LTE release 10 and I	MT-Advanced, 7	Cerminal capabiliti	es
		·	UNIT - II	· · · ·	1	9 Hrs
Radio-Interface	e A	rchitecture: O	verall System Architecture, Radio Pr	cotocol Architect	ture, Control-Plane	e Protocols
			UNIT - III			9 Hrs
Physical Trans	mi	ssion Resourc	es: Overall Time-Frequency Structu	re, Normal Sub	frames and MBSF	'N Sub
frames, Carrier	r A	ggregation, Fr	quency-Domain Location of LTE Ca	arriers, Duplex S	Schemes.	
			UNIT - IV			8 Hrs
Acess Procedu	res	: Acquisition a	nd cell search, PSS structure, SSS	structure, Syste	m-Information blc	ocks,
Random acces	s, I	Paging Spectru	m: Spectrum for LTE, Flexible Spec	trum Use, Flexi	ble Channel Band	width
Operation, Car	rie	r Aggregation	For LTE, Multi-Standard Radio Base	e Stations	2	
			UNIT - V			8 Hrs
RF Characteris	stic	s: Overview of	RF Requirements for LTE, Output H	Power Level Req	uirements, Transn	nitted
Signal Quality,	, U1	nwanted Emis	sions Requirements, Sensitivity and	Dynamic Rang	e, Receiver Suscep	otibility to
Interfering Sign	nal	s.		2.1		
		139				
Course Outco	me	s:				
After going thr	ou	gh this course	the student will be able to:			
CO1	: 1	Review the fu	<mark>dame</mark> ntal of Broadband networks a	nd discuss the s	standardization, re	esources
	1	and requireme	nts of 4G	01		
CO2	: 4	Analyze the R	dio and control plane architectures	of 4G technolog	gies.	
CO3	:]	Recommend t	e Acess procedure and Spectrum to	o design LTE sys	stem	
CO4	:]	Evaluate the p	erformance of Broadband networks	from RF perspe	ective.	
Reference Boo	oks			0-1		
1. Erik Dahlma	an,	Stefan Parkva	ll, a <mark>nd Johan</mark> Sköld ,"4G LTE/ <mark>LTE-</mark>	<mark>Adv</mark> anced for M	obile Broadband",	Elsevier
Ltd,2011		V		~ /		
2. Savo Glisic,	, Ac	lvanced Wirel	ssCommunications-4G Technologie	s, John Wiley &	s Sons Ltd,2004	
3. LTE for UM	rs i	Evolution to L	TE-Advanced, HarriHolma and Antt	i Toskala, 2nd F	Edition, 2011, John	n Wiley &
Sons, Ltd, ISB	N: 9	978-0-47-066	00-3.			
4. Fundamenta	als	of LTE, Aruna	bha Ghosh, Jan Zhang, Jefferey An	drews, Riaz Mol	hammed, 2010, Pr	entice Hall
Communicatio	ns	Engg and Em	erging Technologies, ISBN: 978-9-35	5-306239-2.		
Scheme of Co	nti	nuous Intern	al Evaluation (CIE): 20 + 40 + 40 =	= 100		
QUIZZES: Qui	zze	s will be cond	icted in online/offline mode. Two qu	izzes will be co	nducted & Each Q	uiz will be
evaluated for 1	01	Marks. The su	n of two quizzes will be the Final Qu	liz marks.		
TESTS: Stude	nts	will be evalua	ted in test, descriptive questions wi	th different com	plexity levels (Revi	ised
Bloom's Taxon	om	y Levels: Rem	embering, Understanding, Applying	, Analyzing, Eva	Juating, and Creat	ing). Two
tests will be co	nd	ucted. Each te	st will be evaluated for 50 Marks, a	aaing upto 100	Marks. Final test	marks will
be reduced to	4U	Marks.	adapte will be evolved a few the income	antinite 1 and		tion of 1
EAPERIENTIA	ر بار	LEARNING: S	hing loorning and Program appairs	reativity and pra	icucal implementa	tion of the
problem. Case	SIL	tion /domona	ration (25) adding unto 40 meetro	requirements ()	13), viueo baseu	
ocininai / DICSC	ιιtċ	auon/ uciliolis	$(a_1)_{11} (a_2)$ autilize up to 40 IIIaIKS.			

RV Educational Institutions RV College of Engineering Autonomous Institution Affiliated to Vsvesvaraya Technological University, Belagavi

G0,	change	the	world
-----	--------	-----	-------

Rubric for CIE & SEE Theory courses RUBRIC for CIE RUBRIC for SEE							
SLNo	SLNo Content Marks			Contents	Marks		
1	Quizzes - Q1 & Q2	20	Each u	nit consists of TWO questions of 20 Marks each. Answ	ver FIVE		
2	Tests - T1 & T2	40	1	full questions selecting ONE from each unit (1 to 5).			
3	Experiential Learning - EL1 & EL2	40	1&2	& 2 Unit-1: Question 1 or 2 20			
	Total Marks	100	38:4	Unit-2: Question 3 or 4	20		
			5&6	Unit-3: Question 5 or 6	20		
			78.8	Unit-4: Question 7 or 8	20		
				Unit-5: Question 9 or 10	20		
Total Marks 100							



RV Education RV Collection Autonomous Institution Affilia to Visvesvarage Technological	enal Institutions [®] age of Engineering [®] Approved by AICTE, New Delhi		Go, cha	nge the world
University, Bela	agavi			
~ ~ ~ /		SEMESTER: II		
Course Code	22IM21T	RESEARCH METHODOLOGY	CIE Marks	: 100
Credits L-T-P	: 3-0-0		SEE Marks	: 100
Hours	: 42L	Common Course to all M.Tech Programs	SEE Duration	is : 3 Hrs
Facult	y Coordinator:	Dr. Rajeswara Rao K V S		
		UNIT - I		8 Hrs
Research Proble Creative Approa Problems – App Generation and	em: Problem So ach, Group Prol roaches to Reso Formulation o	lving – General Problem Solving, Logical Ap plem Solving Techniques for Idea Generatio earch Problem, Exploration for Problem Ide f the problem.	proach, Soft Sys n. Formulation on ntification, Hypo	stem Approach, of Research othesis
		UNIT - II		9 Hrs
Research Desig	n: Experimenta	1 Design – Principles of Experiment, Labora	atory Experiment	t, Experimental
Design, Quasi E Experiments. E Field Studies, S	Experimental D x Post Facto Re Survey Research	esign, Action. Research, Validity and Reliab search – Exploratory Research, Historical I a, Qualitative Research Methods.	oility of Experime Research, Descri	ent and Quasi ptive Research,
		UNIT - III		8 Hrs
Data Collection Reliability of da	Procedures – S ta collection pr Exploratory Da	UNIT - IV ta Analysis, Statistical Estimation, Hypothe	lection methods	9 Hrs
Non-Parametric	Tests, Multiple	Regression, Factor Analysis, Cluster Anal	ysis	
	1.2	UNIT - V	0	8 Hrs
Research Propo	sal: Purpose, T	ypes, Development of Proposal, Evaluation	of Research Prop	posal.
Report Writing:	Pre-writing cor	nsideration, Format of Reporting, Briefing, 1	Best practices for	r Journal writing.
Course Outcon	nes:			
After going thr	ough this cou	rse the student will be able to:		
CO1	Recognize the procedures.	principles and concepts of research types,	data types and	analysis
CO2	Apply approp principles.	riate method for data collection and analyz	e the data using	statistical
CO3	Express reseated standards.	urch output in a structured report as per th	e technical and	ethical
CO4	: Develop a res	earch design for the given engineering and	management pro	oblem context.
Reference Boo	ks:			
1. Krishnaswan Integration of P Pvt. Ltd, 2018.	ni, K.N., Sivaku rinciples, Metho ISBN: 978-81-7	mar, A. I. and Mathirajan, M., Managemen ods and Techniques, 17th Impression, Pear 7758-563-6	t Research Meth	odology, ation Services
Dog Publishing,	, 2006, ISBN: 9	78-1592602919	wicuge Dase, SI	a Bartion, Atomic
3. Kothari C.R., Publishers, 201	Research Meth 9, ISBN: 978-9	nodology Methods and Techniques, 4th Edi 3-86649-22-5.	tion, New Age In	ternational
4. Levin, R.I. an 2017, ISBN-13-	d Rubin, D.S., 978-81849574	Statistics for Management, 8th Edition, Pe 195.	arson Education	: New Delhi,

RV	RV Educational In RV College of	nstitutions [⊚] o <mark>f Engineering</mark> [∞]	Go, change the world
Control P	Autonomous Institution Affiliated to Visvesvaraya Technological University, Belagavi	Approved by AICTE, New Delhi	

Scheme of Continuous Internal Evaluation (CIE): 20 + 40 + 40 = 100

QUIZZES: Quizzes will be conducted in online/offline mode. Two quizzes will be conducted & Each Quiz will be evaluated for 10 Marks. The sum of two quizzes will be the Final Quiz marks.

TESTS: Students will be evaluated in test, descriptive questions with different complexity levels (Revised Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating). Two tests will be conducted. Each test will be evaluated for 50 Marks, adding upto 100 Marks. Final test marks will be reduced to 40 Marks.

EXPERIENTIAL LEARNING: Students will be evaluated for their creativity and practical implementation of the problem. Case study-based teaching learning and Program specific requirements (15), Video based seminar/presentation/demonstration (25) adding upto 40 marks.

RUBRIC for CIE			100	RUBRIC for SEE			
SLNo	Content	Marks	Q. No	Contents	Marks		
1	Quizzes - Q1 & Q2	20	Each u	nit consists of TWO questions of 20 Marks each. Answ	ver FIVE		
2	Tests - T1 & T2	40	-	full questions selecting ONE from each unit (1 to 5).			
3	Experiential Learning - EL1 & EL2	40	1 & 2	Unit-1: Question 1 or 2	20		
	Total Marks	100	3&4	Unit-2: Question 3 or 4	20		
			5&6	Unit-3: Questio <mark>n 5 or</mark> 6	20		
			7 & 8	Unit-4: Question 7 or 8	20		
			9 & 10	Unit-5: Question 9 or 10	20		
				Total Marks	100		

Autonomus Institution Affiliated to Visvesvaraya Technological University, Belagavi

SEMESTER: II : 22MDC22TL Course Code **Optical Fiber Communication and Networks CIE Marks** : 100 Credits L-T-P : 3-0-1 SEE Marks 100 (Theory & Practice) : 42L + 28P SEE Durations Hours (Professional Core - 3) 3 Hrs Faculty Coordinator: Dr. Ranjani. G, Dr. B. Roja Reddy UNIT - I 9 Hrs Introduction Introduction to optical fibers, Propagation of signals in optical fiber, Different losses, Effective Length & Area, Stimulated Brillouin Scattering, Stimulated Raman Scattering, Solitons, Propagation in a Nonlinear medium, Self phase modulation, SPM - induced Chirp for Gaussian pulses, Cross phase Modulation, UNIT - II 9 Hrs Optical Components: Optical sources, Detectors. Couplers, Isolators, Circulators, Multiplexers, filters, Gratings, Interferometers, Amplifiers. Modulation & Demodulation: Sequential Decoding and Feedback Decoding, Formats, Ideal Receivers, Practical detection receivers, Optical preamplifier, Noise Considerations, Bit error rates, Coherent detection, Timing Recovery UNIT - III 8 Hrs Transmission System Engineering: System model, Power penalty, Transmitter, Receiver, Different Optical Amplifiers, Dispersion. Optical networks: Client layers of the optical layer, SONET/SDH, Multiplexing, layers, Frame Structure. UNIT - IV 8 Hrs WDM network elements: Optical line terminal, Optical line amplifiers, Optical cross connectors, Wavelength conversion. WDM network Design, Cost trade off, statistical dimensioning model, LTD and RWA problems, Routing and wavelength assignment, UNIT - V 8 Hrs Passive Optical Networks: PON Architectures Review- FTTx Overview, TDM-PON vs WDM-PON, Power-Splitting Strategies, Standard Commercial Infrastructure, APON/BPON and G-PON, EPON, G-PON and EPON Comparison, Super PON, WDM-PON Optical Technologies in Passive Optical Access Networks: Planar Lightwave Circuit (PLC)-Based Optical Power Splitter, Arrayed Waveguide Grating, PON Technologies for Indoor Installation, Field Assembly and Indoor Connectors, Fiber for Indoor Installations, Transmitter Sources at Subscriber Premises, Wavelength-Specific ONUs, Colorless ONUs, Source-Free ONUs Based on Wavelength Reuse Schemes. LABORATORY 28 Hrs Characterization and Performance analysis of analog and digital optical links using kits. Investigate the characteristics of source and receiver, Power budget and Simulation of long haul and P2P optical communication link and analyse the performance using Optisystem. Study of TDM and WDM schemes **Course Outcomes:** After going through this course the student will be able to: CO1 : Justify the use of optical components, transmission techniques and Access technologies. CO2: Analyze the performance characteristics of transmitting and receiving components and systems. CO3 : Deploy of modulation schemes, topologies for WDM and PON network CO4: Develop and demonstrate techniques used in optical communication links. **Reference Books** 1. Rajiv Ramswami, N Sivaranjan, "Optical Networks", 3rd Edition, 2009, M Kauffman Publishers, ISBN-10: 9780123740922. 2. Cedric F. Lam, "Passive Optical Networks Principles and Practice", 1ed, 2007, Academic Press, ISBN-10 : 0123738539, ISBN-13 : 978-0123738530 3. Gerd Keiser, "Optical Fiber Communication", 4th Edition, 2011, McGraw Hill, ISBN-10: 1259006875. 4. G P Agarwal, "Fiber Optics Communication Systems", 3rd Edition, 2002, John Wiley and Sons, New York, ISBN-978-0470505113..

Go, change the world

Autonomous Institution Alfiliated Volvesvaraya Technological University, Belagavi

Scheme of Continuous Internal Evaluation (CIE): 10 + 30 + 30 + 30 = 100

QUIZZES: Quizzes will be conducted in online/offline mode. Two quizzes will be conducted & Each Quiz will be evaluated for 10 Marks. The average of two quizzes will be the Final Quiz marks.

TESTS: Students will be evaluated in test, descriptive questions with different complexity levels (Revised Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating). Two tests will be conducted. Each test will be evaluated for 50 Marks, adding upto 100 Marks. Final test marks will be reduced to 30 Marks.

EXPERIENTIAL LEARNING: Students will be evaluated for their creativity and practical implementation of the problem. Case study-based teaching learning and Program specific requirements (10), Video based seminar /presentation /demonstration (20) adding upto 30 marks.

Laboratory: Conduction of laboratory exercises, Lab report & observation & analysis (30 Marks), Lab Test (10 Marks) & Innovative Experiment/Concept Design & Implementation (10 Marks) adding up to 50 Marks. The final marks will be reduced to 30 Marks.

Scheme of Semester End Examination (SEE) for 100 marks: Each unit consists of TWO Questions of 16 Marks each. Answer FIVE full questions selecting one from each unit (from 1 to 5). Question No. 11 is compulsory (Laboratory component) for 20 Marks.

	RUBRIC of CIE			RUBRIC of SEE				
SLNo	Content	Marks	Q. No	Contents	Marks			
1	Quizzes - Q1 & Q2	10	Each unit consists of TWO questions of 16 Marks each. Answe					
2	Tests - T1 & T2	30	Questi	full questions selecting ONE from each unit (1 to 5). on No. 11 is compulsory (Laboratory component) for 20) Marks.			
3	Experiential Learning - EL1 & EL2	30	1 & 2	Unit-1: Question 1 or 2	16			
4	Laboratory	30	3&4	Unit-2: Question 3 or 4	16			
	To <mark>tal Mar</mark> ks	100	5&6	Unit-3: Question 5 or 6	16			
			7 & 8	Unit-4: Question 7 or 8	16			
			9 & 10	Unit-5: Quest <mark>ion 9 or</mark> 10	16			
NO SEE IOI LADORATORY			11	Laboratory Component (Compulsory)	20			
				Total Marks	100			

Go, change the world

University, B	elagavi		<u> </u>	
Course Code		SEMESTER: II	CIE Montra	1.100
Course Code	22MDC231	Antenna Arrays and Applications	CIE Marks	100
Credits L-I-P	: 3 - 0 - 0		SEE Marks	1:100
Hours]: 42L	(Professional Core - 4)	SEE Durations	: 3 Hrs
Faculty Coordi	nator:	Dr. Shanthi P, Dr. H.V. Kumaraswamy		
.	<u> </u>	UNIT - I		<u>8 Hrs</u>
Introduction to Division Multip Coupling Effect	Smart Antenna ple Access, Archi ts	s: Need for Smart Antennas, Overview, Smart Ante tecture of Smart Antenna System, Benefits, Drawl	enna Configuration backs, Basic Princi	is, Space ples, Mu
		UNIT - II		9 Hrs
Arrays Introdu	ction, Two-Elem	ent Array, N-Element Linear Array: Uniform Ampl	itude and Spacing,	N-Elem
Linear Array: I	Directivity Design	n Procedure, N-Element Linear Array: Three-Dime	nsional Characteris	stics,
Rectangular-to	-Polar Graphica	l Solution, N-Element Linear Array: Uniform Spaci	ing, Planar Array	
		UNIT - III		9 Hrs
Mean-Square I Sample Matrix Conjugate Gra Angle-of-Arriva AOA Estimate,	Error, Maximum Inversion, Recu dient Method, Sp I Estimation: Ar Linear Predictic	Likelihood, Minimum Variance Adaptive Beamforr rsive Least Squares Constant Modulus, Least Squ preading Sequence Array Weights, Description of t UNIT - IV ray Correlation Matrix, AOA Estimation Methods - n AOA Estimate, Maximum Entropy AOA Estimate	ming - Least Mean ares Constant Mod he New SDMA Reco Bartlett AOA Estin e, Pisarenko Harmo	Squares ulus, eiver 8 Hr: nate, Caj onic
Decomposition	AOA Estimate,	Min-Norm AOA Estimate, MUSIC AOA Estimate, F	Coot-MUSIC AOA E	stimate,
	stimate.	IINIT - V		8 Hrs
Concepts ,High Overview of Re communication	n-Gain Antennas configuration Mannes MIMO anten	echanisms for Antennas, UWB planar antennas, P	nnas: Introduction hased array anteni	, Analysi has for 5
After going thr	mes:	the student will be able to:		
	· Fluoidata par	ameters and principles of Adaptive Antonnas App	ligation apositio An	toppoo
C01	· Apply signal r	anieters and principles of Adaptive Antennas, App	neation specific All	thmo
<u> </u>	· Apply signal p	biocessing concepts in analyzing beamonning tech		
03	: Analyze and C	compare various techniques employed in designing	g Adaptive Antenna	is with
004	Beam forming	algorithms		
04	Design and ev	aluate the industry specific Practical afternas		
Deference De	-1	SHUN-		
1 Instantion	DKS	nee Conth Lest Antonnee Delaris C.A. Leansi	$\frac{1}{1}$	75 0007
1. Introduction 0.78150800174	i to Smart Anten	nas. Synth. Lect. Antennas, Balanis, C.A., Ioannio	100, P.1.2(1), 1-17	5,2007,
$\frac{978139829170}{978139829170}$	00. Doog with Motiol	Principles and Applications in Wireless Commu	nightion Front P (
2. Sinart Anter McGrow Hill P	rofessional New	Vorte ISBN 078 0 07 180404 1		1088,20
3 Smart anter	na Ial Chand ($\frac{101R}{101R}$, 10	312069	
4 Eroptions in	Antonnoo: Novt	Concretion Design & Engineering, Frenk P gross	0011 Mogrow Uill	
4. FIOILIEIS III	Antennas: Next	Generation Design & Engineering, Frank B gloss,		
<u> </u>	·· • •			
Scheme of Co	ntinuous Interi	$\begin{array}{c} \text{nal Evaluation (CIE): } 20 + 40 + 40 = 100 \\ \text{nal Evaluation (CIE): } 20 + 40 \\ nal Evaluati$	· · · · 1 · · · · 1 · · · · 1	0: 1
QUIZZES: Qui	Zzes will be cond	ucted in online/online mode. Two quizzes will be o	conducted & Each	Quiz wii
TESTS Stude	nts will be evolution	and or two quizzes will be the rillal Quiz IllalKS.	mnlevity levels (De	vised
Bloom's Taxon tests will be co	omy Levels: Rem nducted. Each t	nembering, Understanding, Applying, Analyzing, E est will be evaluated for 50 Marks, adding upto 10	valuating, and Crea 00 Marks. Final test	ating). To t marks
be reduced to	40 Marks.			
	L LEARNING: S	tudents will be evaluated for their creativity and p	ractical implement	ation of
problem. Case	study-based tea	ching learning and Program specific requirements $(25) = 11$	(15), Video based	
seminar/prese	ntation/demons	tration (25) adding upto 40 marks.		

Autonomous Institution Affiliated U Visvesvaraya Technological University, Belegavi

Rubric for CIE & SEE Theory courses						
	RUBRIC for CIE	1		RUBRIC for SEE	1	
SLNo	Content	Marks	Q. No	Contents	Marks	
1	Quizzes - Q1 & Q2	20	Each u	mit consists of TWO questions of 20 Marks each. Answer FIVE		
2	Tests - T1 & T2	40		full questions selecting ONE from each unit (1 to 5).		
3	Experiential Learning - EL1 & EL2	40	1 & 2	Unit-1: Question 1 or 2	20	
	Total Marks	100	3&4	Unit-2: Question 3 or 4	20	
			5&6	Unit-3: Question 5 or 6	20	
				Unit-4: Question 7 or 8	20	
				Unit-5: Question 9 or 10	20	
				Total Marks	100	



G0,	change	the	world
-----	--------	-----	-------

University, Be	elagavi			
		SEMESTER: II		
Course Code	: 22MDC2C1T	RF and Microwave Circuit Design for Wireless	CIE Marks	: 100
Credits L-T-P	: 3 - 0 - 0	Communication Systems	SEE Marks	: 100
Hours	: 42L	Elective C (Professional Elective)	SEE Durations	: 3 Hrs
Faculty Coordi	nator:	Dr. Shanthi P		
	1141011			Q Hrs
Leterales etiens F) - 1: - f	UNII - I	·	9 1115
Microstrin line	Earmulation of	and microwave circuit applications, component bas	ics, fransinission	a Matahing
microstrip line,	, Formulation a	nd properties of S-parameters. Applications of Sinth	i chart impedanc	
networks: Goal	I of impedance f	natching, Components for matching, Design of Matching	ching Networks - I	Matching
Transmission 1	i using Lumped	lines. Wideband & Nerrowband Matching singuit de	ibuted Elements	
device matchin	a Antenno Mot	ching	sign. Case studie	
	ig, Antenna Mat			0 11=0
Complement T		Desis manustice Trans. Willingen Design disiden en		
Couplers and F	Power dividers: I	Basic properties, Types, Wilkinson Power divider- eq	ual and unequal	types, 90°
Hybrids couple	ers, Directional	Couplers, Circulators/Isolators. RF Filters: Basic filt	er configurations	, Important
Concepts on Fi	Liter Realization	s, Filter Implementation, Lumped Filter Design, Dist	ributed Filter Des	sign,
Microstrip line	Filters, Hairpin	, Edge-Coupled Filter.		
		UNIT - III		8 Hrs
Active RF Com	ponents: RF dio	des -Schottky diode, PIN diode, Varactor diode, Bipe	olar junction tran	sistor - RF
field effect tran	isistors, metal o	xide sem <mark>iconductor transistors, High</mark> electron mobil	ity transistors, (c	onstruction,
functionality, f	requency respon	nse), M <mark>icrowave Amplifier-I: Amplifier cl</mark> asses of oper	ration and biasing	g networks,
characteristic o	of amplifiers, An	nplif <mark>ier p</mark> ower relations, stability cons <mark>ider</mark> ations, and	l constant gain C	ircles and
Noise figure cir	cles			
		UNIT - IV		8 Hrs
Microwave Am	plifier-II: Broadh	o <mark>and amplifiers, High power amplifiers, Multi</mark> stage a	mplifiers, Low no	ise
amplifiers. Osc	cillators: Basic o	scillator models - Feedback oscillator, Negative Resi	stance oscillator,	oscillator
phase noise, fe	edback oscillato	or design, design steps, High frequency oscillator con	nfiguration-Dielec	etric
Resonator osci	llators, and Volt	age controlled oscillator. Introduction to Frequency	synthesizer.	
		UNIT - V		8 Hrs
Mixers: Basic c	consideration of	Mixers- basic concepts, frequency domain consider	ations, single end	ed mixer
design, Balanc	ed (single & Doi	tble) mixers. Integrated active mixers and image reid	ect mixer. Control	Circuits:
Switch Phase	Shifters Attenu	ators		on our our of
RF Front-end /	/ Subsytem Des	ign: Fundamental Concepts & Performance Paramet	ers / Measureme	nts
Case Study- RI	F transceiver De	esign (T/R-Module)		
cuse study id				
Course Outoo	mas			
After going thr	mes.	a the student will be able to:		
	Dugii tins cours	e the student will be able to.	DE aubaratama	
001	Review the co	incepts of RF components and circuits, smith charts	s, RF subsystems	•
CO2	: Analyze the p	performance parameters of RF passive and Active con	mponents and cir	cuits
CO3	: Design RF Pa	ssive and Active circuits for given specifications.		
CO4	: Evaluate the	Performance of RF passive and active circuits throu	gh EDA tools.	
Reference Boo	oks			
1. Reinhold Lu	dwig. Pavel Bret	tchko, RF circuit design, theory and applications, Pe	arson Asia Educa	ation. 2nd
Edition. 2012.	ISBN: 978-81-3	17-6218-9.		
2 Mathew M H	Radmanesh Ra	dio Frequency and Microwaye Electronics, Pearson I	Education Asia 2	001 ISBN ·
0130270587	Naumancon, Na	and i requency and microwave interrollies, i carsoli i	Juucation Asia, 2	
2 Derrid M. Der	zon Mionomono	and PE Design of Winsloss Systems John Wiley & Se	DOOF ISDN	
078 0 471 200	zar, microwave	and M Design of wheless systems, John whey & So	118, 2003, ISBN:	
210-U-4/1-322		Engineering 0011 John Wile 0 Occur 4th Divi	0011 1000	
4. David M. Po	zar, Microwave	Engineering, 2011, John Wiley & Sons, 4th Edition,	2011 ISBN:	
978-0-470-631	55-3,			
Autonomous Institution Affiliard Visvesvaraya Technological University, Belagavi

Scheme of Continuous Internal Evaluation (CIE): 20 + 40 + 40 = 100

QUIZZES: Quizzes will be conducted in online/offline mode. Two quizzes will be conducted & Each Quiz will be evaluated for 10 Marks. The sum of two quizzes will be the Final Quiz marks.

TESTS: Students will be evaluated in test, descriptive questions with different complexity levels (Revised Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating). Two tests will be conducted. Each test will be evaluated for 50 Marks, adding upto 100 Marks. Final test marks will be reduced to 40 Marks.

EXPERIENTIAL LEARNING: Students will be evaluated for their creativity and practical implementation of the problem. Case study-based teaching learning and Program specific requirements (15), Video based seminar/presentation/demonstration (25) adding upto 40 marks.

RUBRIC for CIE			RUBRIC for SEE		
SLNo	Content	Marks	Q. No	Contents	Marks
1	Quizzes - Q1 & Q2	20	Each u	nit consists of TWO questions of 20 Marks each. Ans	wer FIVE
2	Tests - T1 & T2	40		full questions selecting ONE from each unit (1 to 5	L.
3	Experiential Learning - EL1 & EL2	40	1 & 2	Unit-1: Question 1 or 2	20
	Total Marks	100	3&4	Unit-2: Question 3 or 4	20
			5&6	Unit-3: Question 5 or 6	20
			78 8	Unit-4: Question 7 or 8	20
			9 & 10	Unit-5: Question 9 or 10	20
				Total Marl	s 100



Go, chan	ge the	world
----------	--------	-------

University, B	elagavi		<u> </u>	
		SEMESTER: II		
Course Code	: 22MDC2C2T	VEHICULAR COMMUNICATIONS AND	CIE Marks	: 100
Credits L-T-P	: 3 - 0 - 0	NETWORKS	SEE Marks	: 100
Hours	: 42L	Elective C (Professional Elective)	SEE Durations	: 3 Hrs
Faculty Coordi	nator:	Dr Bhagya R, Dr. K. Saraswathi, Dr. Nagamani K		
		UNIT - I		8 Hrs
Introduction: F of DSRC, Layer Link Layer Sta	Basic Principles a red Architecture ndard (MAC and	and Challenges, Past and Ongoing VANET Activitie for VANETs, DSRC Regulations, DSRC Physical La LLC), DSRC Middle Layers, DSRC Message Subla	s Standards and R ayer Standard, DSF yer,	egulations C Data
VANET on oblo	d Active Sofety A	nnligations: Infrastructure to vahiala annligations	Vahiala ta vahiala	<u>9 1115</u>
applications, P Standards Ove Characterizatio	edestrian-to-veh rview, Wireless I on at 5.9 GHz.	pplications. Infrastructure-to-venicle applications icle applications. Physical Layer Considerations fo Propagation Theory, Channel Metrics, Measuremen	r Vehicular Communt Theory, Empirica	าnications: ป Channel
		UNIT - III		9 Hrs
MAC Layer and	d Scalability Asp	ects of Vehicular Communication Networks: Chall	enges and Requirer	nents. MAC
Approaches for	VANETs. Comn	nunication Based on IEEE 802.11p, Performance I	Evaluation and Mod	leling.
		UNIT - IV		8 Hrs
Intra-vehicle co in-vehicle netw inter- vehicle c	ommunication:-I orks Inter-vehic ommunication, I	n-vehicle networks, Automotive bus systems, In-velie communication: Applications, Requirements an Fundamental limit.	ehicle Ethernet, Wi d components, Con	reless cepts for
	180	UNIT - V		8 Hrs
Protection Mec	cations, and Adv hanisms, Impler	nentation Aspects.	phic Protocols, Priv	
Course Outco	mes:			
After going thr	ough this course	the student will be able to:		
C01	: Review and ac	equaint fundamental of wireless vehicular network	s and cellular netw	orks.
CO2	: Analyse the se	ecurity issue and energy management in vehicular	[.] networks.	
CO3	: Design of Phy	sical & MAC layer and routing protocols for vehicu	ılar networks	
CO4	: Evaluate the p networks.	performance of vehicular networks in terms of data	a security and com	munication
Reference Boo	nks			
1. Hannes Har Technologies,	tenstein and Ker John Wiley & So	nneth Laberteaux (eds.), VANET Vehicular Applica ns, 2009	tions and Inter-net	working
2. Christophe	Sommer and Fal	ko Dressler, Vehicular Networking, Cambridge Un	iversity Press, 2014	ł.
3. Claudia Car Solutions, and	npolo, Antonella Research, Sprin	Molinaro and Riccardo Scopigno, Vehicular ad ho ger, 2015.	c Networks: Standa	ırds,
4. Andrea Gold	lsmith, Wireless	Communications, Cambridge University Press, 20	05.	
Scheme of Co	ntinuous Intern	al Evaluation (CIE): 20 + 40 + 40 = 100		
QUIZZES: Quizevaluated for 1	zzes will be cond 0 Marks. The su	ucted in online/offline mode. Two quizzes will be o m of two quizzes will be the Final Quiz marks.	conducted & Each (Quiz will be
TESTS: Studer	nts will be evalua	ated in test, descriptive questions with different co	mplexity levels (Rev	vised
Bloom's Taxon tests will be co	omy Levels: Rem nducted. Each t	embering, Understanding, Applying, Analyzing, Evest will be evaluated for 50 Marks, adding upto 10	valuating, and Crea 0 Marks. Final test	ıting). Two marks wil
be reduced to 4	40 Marks.	tudents will be evaluated for their creativity and n	ractical implement	ation of the
problem. Case seminar/prese	study-based tea ntation/demons	ching learning and Program specific requirements tration (25) adding upto 40 marks.	(15), Video based	
Scheme of Se	mester End Exa	mination (SEE) for 100 marks: The question par	oer will have FIVE c	uestions
with internal c	hoice from each	unit. Each question will carry 20 marks. Student	will have to answer	one full
question from	each unit.	-		

R

G0,	change	the	world
-----	--------	-----	-------

RUBRIC for CIE RUBRIC for SEE					
SLNo	Content	Marks	Q. No	Contents	Marks
1	Quizzes - Q1 & Q2	20	Each u	nit consists of TWO questions of 20 Marks each. Answ	er FIVE
2	Tests - T1 & T2	40	1	full questions selecting ONE from each unit (1 to 5).	
3	Experiential Learning - EL1 & EL2	40	1&2	Unit-1: Question 1 or 2	20
	Total Marks	100	3&4	Unit-2: Question 3 or 4	20
			5&6	Unit-3: Question 5 or 6	20
	7 & 8 Unit-4: Question 7 or 8 20				
			9 & 10	Unit-5: Question 9 or 10	20
				Total Marks	100



University, Be	slaga	1Vi				
			SEMESTER: II			
Course Code	:	22MDC2C3T	O General Notes also in Males and Index	CIE Marks	:	100
Credits L-T-P	:	3 - 0 - 0	Software Defined Networks in Telecom Industry	SEE Marks	:	100
Hours	:	42L	Elective C (Professional Elective)	SEE Durations	:	3 Hrs
Faculty Coordi	ne	ator:	Dr. K. Viswavardhan Reddy, Dr. K. Saraswathi, Dr.	Nagamani K		
5			UNIT - I		Т	8 Hrs
Software Defined Networking: Introduction, Modern Data Center, Traditional Switch Architecture, Layer 2 & 3						
Control, Evolution of switches and control planes, Data Center Innovation & Needs, The Evolution of						
Networking Technology, Forerunners of SDN, Open Source Contributions and Network Virtualization.						
0			UNIT - II		1	9 Hrs
How SDN Work	κs	: Fundamental	Characteristics of SDN, SDN Operation SDN Device	s, SDN Controller	 2, {	SDN
Applications. T	'nε	e Open Flow Sp	pecification: Open Flow Overview, Open Flow 1.0 and	1 Open Flow Basi	cs	, Open
Flow 1.1, 1.2, a	an	d 1.3 Addition	s and Open Flow Limitations.	-		-
			UNIT - III			8 Hrs
Alternative Def	ïn	itions of SDN:	Potential Drawbacks of Open SDN, Alternate SDN M	lethods, Network	Fu	inctions
Virtualization,	A1	lternatives Ove	rlap and Ranking, SDN in the Data Center: Definitio	n, Data Center D	en	nands,
Tunneling Tech	ın	ologies, Path T	Cechnologies, Ethernet Fabrics, SDN Use Cases in th	e Data Center and	d	
Real-World Dat	ta	Center Implen	nentations.			
			UNIT - IV			9 Hrs
SDN in Other B	En	vironments: C	onsistent Policy Configuration, Global Network View	, WANs, Service P	ro	vider and
Carrier Networ	ks	s, Campus Net	works, Hospitality Networks, Mobile Networks, In-Lir	ne Network Funct	io	ns, and
Optical Networ	ks	s. Players in th	e SDN Ecosystem: Academic Research Institutions, I	industry Research	۱I	labs and
Network Equip	m	ent Manufactu	arers.			
		1 65	UNIT - V			8 Hrs
SDN Applicatio)ns	s: Reactive ver	sus Proactive Applications, A Simple Reactive Java A	pplication, Backg	gro	ound on
various Contro	lle	ers like Floodlig	ght Controller, Open Daylight Controller, Cisco XNC	Controller, and		A
Hewlett-Packar	d	Controller. Sw	Atch Considerations, Creating NV Tunnels, Offloadin	ig Flows in the Da	ιta	Center,
Access Control	10	or the Campus	, Traffic Engineering for Service Providers.			
0						
After going thr	m	es:	the student will be able to:			
	Ju L	Apolyzo the or	volution of software defined networks and evplain the	hasia concenta	—	
001	$ \cdot $	architectural	differences of conventional networking approaches a	nd SDN		
CO2	H.	Analyze and a	unierences of conventional networking approaches a	itches		
CO2	CO2. Analyze and apply implementation of SDN unough Open Flow Switches.					ed
000	$ \cdot $	vendors	terpies of 5DA for the design of data centre using 5D	iv cicilicities of rep	u	.cu
CO4	.	Design and im	unlement software defined network application on SI	N-based network	rin	σ
001	$\left \cdot \right $	devicesDesign	and implement software defined network application	n on SDN-based 1	ne	s tworking
		devices				
	ш					
Reference Boo)k	S				
1. Software Det	fir	ned Networks:	A Comprehensive approach, Paul Goransson, Chuck	Black, Timothy (<u>.</u> Cu	lver. 2nd
Edition. Elsevie	er.	. 2014.ISBN-13	3: 978-0128045558. ISBN-10: 0128045558			,
2. Software Det	fir	ned Networking	g design and deployment, Patricia A. Morreale, Jame	s M. Anderson, 1	st	Edition.
CRC Press, 201	15	5, ISBN-10: 148	82238632, ISBN-13: 978-1482238631	· · · · · · · · · · · · · · · · · · ·		,
3. SDN: Softwa	ιre	e Defined Netw	orks: An Authoritative Review of Network, Programm	ability Technolog	ie	s,
Thomas D. Nac	le	au, Ken Gray,	1st Edition, , 2013, ISBN-13: 978-1449342302, ISBN	v-10: 9781449342	23	02.
4. OpenFlow C	00	okbook, S., Kin	gston Smiler, 1st Edition, Packt Publishing, ISBN -	1783987944,		
978178398794	8	, 2015.		· · ·		

Go, change the world

Autonomous Institution Affiliated Visvesvaraya Technological University, Belagavi

Scheme of Continuous Internal Evaluation (CIE): 20 + 40 + 40 = 100

QUIZZES: Quizzes will be conducted in online/offline mode. Two quizzes will be conducted & Each Quiz will be evaluated for 10 Marks. The sum of two quizzes will be the Final Quiz marks.

TESTS: Students will be evaluated in test, descriptive questions with different complexity levels (Revised Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating). Two tests will be conducted. Each test will be evaluated for 50 Marks, adding upto 100 Marks. Final test marks will be reduced to 40 Marks.

EXPERIENTIAL LEARNING: Students will be evaluated for their creativity and practical implementation of the problem. Case study-based teaching learning and Program specific requirements (15), Video based seminar/presentation/demonstration (25) adding upto 40 marks.

RUBRIC for CIE			RUBRIC for SEE		
SLNo	Content	Marks	Q. No	Contents	Marks
1	Quizzes - Q1 & Q2	20	Each u	nit consists of TWO questions of 20 Marks each. Ans	wer FIVE
2	Tests - T1 & T2	40		full questions selecting ONE from each unit (1 to 5	-
3	Experiential Learning - EL1 & EL2	40	1 & 2	Unit-1: Question 1 or 2	20
	Total Marks	100	3&4	Unit-2: Question 3 or 4	20
			5&6	Unit-3: Question 5 or 6	20
			7 & 8	Unit-4: Question 7 or 8	20
			9 & 10	Unit-5: Question 9 or 10	20
				Total Mark	s 100





		SEMESTER: II	
Course Code	: 22MVE2C3	Babatian and Industrial Automation	CIE Marks : 100
Credits L-T-P	: 3 - 0 - 0	Robotics and industrial Automation	SEE Marks : 100
Hours	: 42L	Elective C (Professional Elective)	SEE Durations : 3 Hrs
Faculty Coordi	nator:	Dr. Ranjani G	· · ·
		UNIT - I	8 Hrs
Introduction: A	utomation an	nd Robotics, Historical Development, Definitions, Bas	ic Structure of Robots, Robot
Anatomy, Com	plete Classific	cation of Robots, Fundamentals about Robot Technol	ogy, Factors related to use
Robot Performa	ance, Basic Ro	obot Configurations and their Relative Merits and De	merits, the Wrist & Gripper
Subassemblies	•		
Kinematics of I	Robot Manipu	llator: Introduction, General Mathematical Preliminar	ries on Vectors& Matrices,
Direct Kinemat	cics problem, (Geometry Based Direct kinematics problem, Co-ordin	nate and vector transformation
using matrices	, Rotation ma	trix, Inverse Transformations, Problems.	
		UNIT - II	9 Hrs
Trajectory Plan	ning: – Introd	luction, Trajectory Interpolators, Basic Structure of T	TrajectoryInterpolators, Cubic
Joint Trajector	ies. General L	Design Consideration on Trajectories:- 4-3-4 & 3-5-3	Trajectories. (SLE: Admissible
Motion Trajecto	ories) Dynami	ics of Robotic Manipulators: Introduction, Preliminat	ry Definitions,
Generalized Rol	otic Coordina	ates, Jacobian for a Two link Manipulator, Euler Equ	lations, TheLagrangian
Equations of in	1011011.		9 Urs
Dobot Sonaina	& Vicion Von	tiona Sensora and their Classification, Use of Sensora	o IIIs
Robotics Mach	a vision Sv	stem Description Sensing Digitizing Image Process	sing and Analysis and
Application of 1	Machine Visio	on System, Robotic Assembly Sensors and Intelligent	Sensors Industrial
Applications: C	biectives Aut	tomation in Manufacturing Robot Application in Ind	ustry Task Programming
Robot Intelliger	ice and Task	Planning Modern Robots, Future Application and Cl	astry, rask riogramming,
			nallenges and Case Studies
(SLE: Goals of	AI Research.	AI Techniques)	nallenges and Case Studies.
(SLE: Goals of	AI Research, A	AI Techniques)	9 Hrs
(SLE: Goals of Modeling and c	AI Research, A	AI Techniques) UNIT - IV Description of multi-link flexible robots, Dynamics	s and control of flexible link
(SLE: Goals of Modeling and c manipulators.	AI Research, A control: Kinem Overview of Pl	AI Techniques) UNIT - IV natic modeling of multi-link flexible robots, Dynamics LC Hardware, numeric data handling, system addres	s and control of flexible link ssing, and programming
(SLE: Goals of Modeling and o manipulators. software. Robo	AI Research, A control: Kinem Overview of Pl t Manipulator	AI Techniques) UNIT - IV natic modeling of multi-link flexible robots, Dynamics LC Hardware, numeric data handling, system addres r Control Using PLC with Position Based and Image E	9 Hrs s and control of flexible link ssing, and programming Based Algorithm. Case Study.
(SLE: Goals of Modeling and o manipulators. software. Robo	AI Research, A control: Kinem Overview of Pl t Manipulator	AI Techniques) UNIT - IV natic modeling of multi-link flexible robots, Dynamics LC Hardware, numeric data handling, system addres c Control Using PLC with Position Based and Image E UNIT - V	9 Hrs s and control of flexible link ssing, and programming Based Algorithm. Case Study. 8 Hrs
(SLE: Goals of Modeling and o manipulators. software. Robo Programmable	AI Research, A control: Kinem Overview of Pl t Manipulator Digital Signal	AI Techniques) UNIT - IV matic modeling of multi-link flexible robots, Dynamics LC Hardware, numeric data handling, system address Control Using PLC with Position Based and Image E UNIT - V I Processor Introduction, Evaluation and important for	9 Hrs s and control of flexible link ssing, and programming Based Algorithm. Case Study. 8 Hrs eatures of programmable
(SLE: Goals of Modeling and o manipulators. software. Robo Programmable VLSI-DSP proc	AI Research, A control: Kinem Overview of Pl t Manipulator Digital Signal essor, applica	AI Techniques) UNIT - IV natic modeling of multi-link flexible robots, Dynamics LC Hardware, numeric data handling, system address c Control Using PLC with Position Based and Image E UNIT - V I Processor Introduction, Evaluation and important for ation of VLSI-DSP processor in the field of Wireless C	9 Hrs s and control of flexible link ssing, and programming Based Algorithm. Case Study. 8 Hrs eatures of programmable ommunication, Multimedia
(SLE: Goals of Modeling and o manipulators. software. Robo Programmable VLSI-DSP proc Signal Processi	AI Research, A control: Kinem Overview of Pl t Manipulator Digital Signal essor, applica ing etc.	AI Techniques) UNIT - IV natic modeling of multi-link flexible robots, Dynamics LC Hardware, numeric data handling, system address c Control Using PLC with Position Based and Image E UNIT - V I Processor Introduction, Evaluation and important for ation of VLSI-DSP processor in the field of Wireless C	9 Hrs s and control of flexible link ssing, and programming Based Algorithm. Case Study. 8 Hrs eatures of programmable ommunication, Multimedia
(SLE: Goals of Modeling and o manipulators. software. Robo Programmable VLSI-DSP proc Signal Processi	AI Research, A control: Kinem Overview of Pl t Manipulator Digital Signal essor, applica ing etc.	AI Techniques) UNIT - IV District modeling of multi-link flexible robots, Dynamics LC Hardware, numeric data handling, system address Control Using PLC with Position Based and Image E UNIT - V I Processor Introduction, Evaluation and important for ation of VLSI-DSP processor in the field of Wireless C	9 Hrs s and control of flexible link ssing, and programming Based Algorithm. Case Study. 8 Hrs eatures of programmable ommunication, Multimedia
(SLE: Goals of Modeling and o manipulators. software. Robo Programmable VLSI-DSP proc Signal Processi Course Outco	AI Research, A control: Kinem Overview of Pl t Manipulator Digital Signal essor, applica ing etc. mes:	AI Techniques) UNIT - IV District modeling of multi-link flexible robots, Dynamics LC Hardware, numeric data handling, system address Control Using PLC with Position Based and Image E UNIT - V I Processor Introduction, Evaluation and important for ation of VLSI-DSP processor in the field of Wireless Co	9 Hrs s and control of flexible link ssing, and programming Based Algorithm. Case Study. 8 Hrs eatures of programmable ommunication, Multimedia
(SLE: Goals of Modeling and o manipulators. software. Robo Programmable VLSI-DSP proc Signal Processi Course Outcon After going three	AI Research, A control: Kinem Overview of Pl t Manipulator Digital Signal essor, applica ing etc. mes: pugh this cour	AI Techniques) UNIT - IV District modeling of multi-link flexible robots, Dynamics LC Hardware, numeric data handling, system address Control Using PLC with Position Based and Image E UNIT - V I Processor Introduction, Evaluation and important for ation of VLSI-DSP processor in the field of Wireless C rse the student will be able to:	9 Hrs s and control of flexible link ssing, and programming Based Algorithm. Case Study. 8 Hrs eatures of programmable ommunication, Multimedia
(SLE: Goals of Modeling and o manipulators. software. Robo Programmable VLSI-DSP proc Signal Processi Course Outcon After going thre CO1	AI Research, A control: Kinem Overview of Pl t Manipulator Digital Signal essor, applica ing etc. mes: pugh this cour i Understanc	AI Techniques) UNIT - IV natic modeling of multi-link flexible robots, Dynamics LC Hardware, numeric data handling, system addres Control Using PLC with Position Based and Image E UNIT - V I Processor Introduction, Evaluation and important fo ation of VLSI-DSP processor in the field of Wireless Control VLSI-DSP processor in the	9 Hrs s and control of flexible link ssing, and programming Based Algorithm. Case Study. 8 Hrs eatures of programmable ommunication, Multimedia
(SLE: Goals of Modeling and c manipulators. software. Robo Programmable VLSI-DSP proc Signal Processi Course Outcon After going thre CO1 CO2	AI Research, A control: Kinem Overview of Pl t Manipulator Digital Signal essor, applica ing etc. mes: Dugh this course : Understance : Apply Traje	AI Techniques) UNIT - IV District modeling of multi-link flexible robots, Dynamics LC Hardware, numeric data handling, system address Control Using PLC with Position Based and Image E UNIT - V I Processor Introduction, Evaluation and important for ation of VLSI-DSP processor in the field of Wireless Control of VLSI-DSP processor in the field of Wireless Control of VLSI-DSP processor in the field of Wireless Control of Kinematics of Robot Manipulator Ectory Planning and Dynamics of Robotic Manipulato	9 Hrs s and control of flexible link ssing, and programming Based Algorithm. Case Study. 8 Hrs eatures of programmable ommunication, Multimedia
(SLE: Goals of Modeling and c manipulators. software. Robo Programmable VLSI-DSP proc Signal Processi Course Outcon After going thre CO1 CO2 CO3	AI Research, A control: Kinem Overview of Pl t Manipulator Digital Signal essor, applica ing etc. mes: ough this cour : Understance : Design Rob	AI Techniques) UNIT - IV District modeling of multi-link flexible robots, Dynamics LC Hardware, numeric data handling, system address Control Using PLC with Position Based and Image E UNIT - V I Processor Introduction, Evaluation and important for ation of VLSI-DSP processor in the field of Wireless C rse the student will be able to: d Kinematics of Robot Manipulator ectory Planning and Dynamics of Robotic Manipulato bot Sensing & Vision	9 Hrs s and control of flexible link ssing, and programming Based Algorithm. Case Study. 8 Hrs eatures of programmable ommunication, Multimedia
(SLE: Goals of Modeling and c manipulators. software. Robo Programmable VLSI-DSP proc Signal Processi Course Outcon After going thre CO1 CO2 CO3 CO4	AI Research, A control: Kinem Overview of Pl t Manipulator Digital Signal essor, applica ing etc. mes: Dugh this court : Understance : Apply Traje : Design Rob : Develop Mo	AI Techniques) UNIT - IV natic modeling of multi-link flexible robots, Dynamics LC Hardware, numeric data handling, system address Control Using PLC with Position Based and Image E UNIT - V I Processor Introduction, Evaluation and important fe ation of VLSI-DSP processor in the field of Wireless Control VLSI-DSP processor in the	9 Hrs s and control of flexible link ssing, and programming Based Algorithm. Case Study. 8 Hrs eatures of programmable ommunication, Multimedia
(SLE: Goals of Modeling and c manipulators. software. Robo Programmable VLSI-DSP proc Signal Processi Course Outcon After going thre CO1 CO2 CO3 CO4	AI Research, A control: Kinem Overview of Pl t Manipulator Digital Signal essor, applica ing etc. mes: Dugh this cour : Understance : Design Rob : Develop Mo	AI Techniques) UNIT - IV District modeling of multi-link flexible robots, Dynamics LC Hardware, numeric data handling, system address Control Using PLC with Position Based and Image E UNIT - V I Processor Introduction, Evaluation and important for ation of VLSI-DSP processor in the field of Wireless Control of VLSI-DSP processor in the field of Wireless Control will be able to: Cathematics of Robot Manipulator Dectory Planning and Dynamics of Robotic Manipulato Dot Sensing & Vision Decling and control	9 Hrs s and control of flexible link ssing, and programming Based Algorithm. Case Study. 8 Hrs eatures of programmable ommunication, Multimedia
(SLE: Goals of Modeling and o manipulators. software. Robo Programmable VLSI-DSP proc Signal Processi Course Outcon After going thro CO1 CO2 CO3 CO4 Reference Boo	AI Research, A control: Kinem Overview of Pl t Manipulator Digital Signal essor, applica ing etc. mes: ough this cour : Understance : Design Rob : Develop Mo	AI Techniques) UNIT - IV natic modeling of multi-link flexible robots, Dynamics LC Hardware, numeric data handling, system address Control Using PLC with Position Based and Image E UNIT - V I Processor Introduction, Evaluation and important feation of VLSI-DSP processor in the field of Wireless C rse the student will be able to: d Kinematics of Robot Manipulator ectory Planning and Dynamics of Robotic Manipulato oot Sensing & Vision odeling and control	9 Hrs s and control of flexible link ssing, and programming Based Algorithm. Case Study. 8 Hrs eatures of programmable ommunication, Multimedia
(SLE: Goals of Modeling and omenipulators. software. Robo Programmable VLSI-DSP proc Signal Processi Course Outcon After going three CO1 CO2 CO3 CO4 Reference Boo 1. Fu, Lee and 2007	AI Research, A control: Kinem Overview of Pl t Manipulator Digital Signal essor, applica ing etc. understance : Design Rob : Develop Mo bks Gonzalez. "Ro	AI Techniques) UNIT - IV District modeling of multi-link flexible robots, Dynamics LC Hardware, numeric data handling, system address Control Using PLC with Position Based and Image E UNIT - V I Processor Introduction, Evaluation and important for ation of VLSI-DSP processor in the field of Wireless C rse the student will be able to: d Kinematics of Robot Manipulator ectory Planning and Dynamics of Robotic Manipulato bot Sensing & Vision codeling and control	9 Hrs s and control of flexible link ssing, and programming Based Algorithm. Case Study. 8 Hrs eatures of programmable ommunication, Multimedia
(SLE: Goals of Modeling and c manipulators. software. Robo Programmable VLSI-DSP proc Signal Processi Course Outcon After going thre CO1 CO2 CO3 CO4 Reference Boo 1. Fu, Lee and 2007. 2. John J. Crai	AI Research, A control: Kinem Overview of Pl t Manipulator Digital Signal essor, applica ing etc. mes: Dugh this court : Understance : Design Rob : Develop Mo oks Gonzalez. "Ro	AI Techniques) UNIT - IV natic modeling of multi-link flexible robots, Dynamics LC Hardware, numeric data handling, system address Control Using PLC with Position Based and Image E UNIT - V I Processor Introduction, Evaluation and important fe ation of VLSI-DSP processor in the field of Wireless Control VLSI-DSP processor in the	9 Hrs s and control of flexible link ssing, and programming Based Algorithm. Case Study. 8 Hrs eatures of programmable ommunication, Multimedia rs International, 2nd edition, on. 2010.
(SLE: Goals of Modeling and comanipulators. software. Robo Programmable VLSI-DSP procession Signal Procession After going three CO1 CO2 CO3 CO4 Reference Boo 1. Fu, Lee and 2007. 2. John J. Crain 3. Ghosal A. "F	AI Research, A control: Kinem Overview of Pl t Manipulator Digital Signal essor, applica ing etc. understance : Design Rob : Develop Mo bks Gonzalez. "Ro g,"Introductio undamental of	Al Techniques) UNIT - IV natic modeling of multi-link flexible robots, Dynamics LC Hardware, numeric data handling, system addres Control Using PLC with Position Based and Image E UNIT - V I Processor Introduction, Evaluation and important fo ation of VLSI-DSP processor in the field of Wireless Control VLSI-DSP processor in the	9 Hrs s and control of flexible link ssing, and programming Based Algorithm. Case Study. 8 Hrs eatures of programmable ommunication, Multimedia rs International, 2nd edition, on, 2010. d edition, 2008.
(SLE: Goals of Modeling and c manipulators. software. Robo Programmable VLSI-DSP proc Signal Processi Course Outcon After going thre CO1 CO2 CO3 CO4 Reference Boo 1. Fu, Lee and 2007. 2. John J. Crai 3. Ghosal A, "F	AI Research, A control: Kinem Overview of Pl t Manipulator Digital Signal essor, applica ing etc. mes: ough this cour : Apply Traje : Design Rob : Develop Mo oks Gonzalez. "Ro undamental of	AI Techniques) UNIT - IV natic modeling of multi-link flexible robots, Dynamics LC Hardware, numeric data handling, system address Control Using PLC with Position Based and Image E UNIT - V I Processor Introduction, Evaluation and important fration of VLSI-DSP processor in the field of Wireless C rse the student will be able to: d Kinematics of Robot Manipulator ectory Planning and Dynamics of Robotic Manipulato bot Sensing & Vision odeling and control Dobotics, control vision and intelligence"-McGraw Hill on to Robotics"- Addison Wesley Publishing, 3rd editic concepts and Analysis" - Oxford University Press, 2mon to Robotics Mechanics and Control" -Pearson Public	9 Hrs s and control of flexible link ssing, and programming Based Algorithm. Case Study. 8 Hrs eatures of programmable ommunication, Multimedia rs International, 2nd edition, on, 2010. d edition, 2008. lication- Fourth Edition, 2021
(SLE: Goals of Modeling and comanipulators. software. Robo Programmable VLSI-DSP proc Signal Processi Course Outcon After going three CO1 CO2 CO3 CO4 Reference Boo 1. Fu, Lee and 2007. 2. John J. Crai 3. Ghosal A, "F 4. John J. Crai	AI Research, A control: Kinem Overview of Pl t Manipulator Digital Signal essor, applica ing etc. mes: ough this cour : Understance : Design Rob : Develop Mo bks Gonzalez. "Ro g, "Introductio undamental of g, Introductio	AI Techniques) UNIT - IV natic modeling of multi-link flexible robots, Dynamics LC Hardware, numeric data handling, system address Control Using PLC with Position Based and Image E UNIT - V I Processor Introduction, Evaluation and important fration of VLSI-DSP processor in the field of Wireless C rse the student will be able to: d Kinematics of Robot Manipulator ectory Planning and Dynamics of Robotic Manipulato oot Sensing & Vision odeling and control bobotics, control vision and intelligence"-McGraw Hill on to Robotics"- Addison Wesley Publishing, 3rd editi concepts and Analysis" - Oxford University Press, 2n on to Robotics Mechanics and Control",-Pearson Publishing	9 Hrs s and control of flexible link ssing, and programming Based Algorithm. Case Study. 8 Hrs eatures of programmable ommunication, Multimedia rs International, 2nd edition, on, 2010. d edition, 2008. lication- Fourth Edition, 2021.

Autonomous Institution Affiliard Visvesvaraya Technological University, Belagavi

Scheme of Continuous Internal Evaluation (CIE): 20 + 40 + 40 = 100

QUIZZES: Quizzes will be conducted in online/offline mode. Two quizzes will be conducted & Each Quiz will be evaluated for 10 Marks. The sum of two quizzes will be the Final Quiz marks.

TESTS: Students will be evaluated in test, descriptive questions with different complexity levels (Revised Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating). Two tests will be conducted. Each test will be evaluated for 50 Marks, adding upto 100 Marks. Final test marks will be reduced to 40 Marks.

EXPERIENTIAL LEARNING: Students will be evaluated for their creativity and practical implementation of the problem. Case study-based teaching learning and Program specific requirements (15), Video based seminar/presentation/demonstration (25) adding upto 40 marks.

RUBRIC for CIE			RUBRIC for SEE		
SLNo	Content	Marks	Q. No	Contents	Marks
1	Quizzes - Q1 & Q2	20	Each u	nit consists of TWO questions of 20 Marks each. Ans	wer FIVE
2	Tests - T1 & T2	40		full questions selecting ONE from each unit (1 to 5	L.
3	Experiential Learning - EL1 & EL2	40	1 & 2	Unit-1: Question 1 or 2	20
	Total Marks	100	3&4	Unit-2: Question 3 or 4	20
			5&6	Unit-3: Question 5 or 6	20
			7 & 8	Unit-4: Question 7 or 8	20
			9 & 10	Unit-5: Question 9 or 10	20
				Total Marl	s 100



Semester: II ADVANCED 5G						
						Course Code
Credits: L:T:P	:	3:0:0	SEE	:	100 Marks	
Total Hours	:	36	SEE	:	3Hours	
			Duration			
Faculty Coordinator: Dr. Nethravathi K A						

Unit-I	8Hrs
Introduction of Wireless Communications: Introduction to 3GPP Specs	. Introduction
to wireless communications; Evolution: 1G, 2G, 3G, 4G and 5G. Fundam	ientals of mm
Wave and cm Wave. List of 3GPP. Road map for 5G.	
4th Generations: Basics to Advanced LTE concepts. History and Future	es of wireless
communications. Multiple access, Duplexing techniques. Functionality or	f SIM. Access
and Non-Access Stratum, LTE Evaluation and network architecture, Inter-	rfaces, Basics
of eNB, MME, gateway, policy and charging rules, HSS, User plane and (Control Plane,
LTE protocol stack. LTE mobility, definition of cell, tracking area, cell id	dentifications,
NAS procedures, EMM and ESM procedure. EMM and RRC states. UE Id	entifiers. LTE
use cases and features, Carrier aggregation, multiple antenna technique	es, support of
relay nodes. LTE with MIMO.	1
Unit – II	07 Hrs
5G Fundamentals Use cases of 5G: Use cases of 5G as per standards, ex	cample eMBB,
mMTC, URLLC,V2X.Network Architecture; Reference Point System Archite	cture, Service
Based System Architecture and Network Functions.	
5G Fundamentals Base Station: Base Station Architecture, CU-DU Split	: Base Station
and CP-UP, Standalone Base Station and Non-Standalone Base Statio	on. Basics of
antennas in bases stations and Base station classes; Antenna Architectu	re basics and
Base Station Classes.	
Network Interfaces: Xn interface, F1 interface, E1 interface, NG inter	rface and X2
interface.	
Protocol stack: Protocol Stacks, User Plane and Control Plane.	1
Unit –III	07 Hrs
RRC states: RRC Idle, RRC Connected and RRC Inactive.	
Call Management in NR & 5G Signalling: Call Management; Registration	Management,
Connection Management, Access Control.	
5G Signalling; Signalling Radio Bearers, PDU Sessions, QoS	
MIMO & Beam: Introduction to MIMO and Beam forming, ABF, DBF.	Beam Types
Analog, digital and hybrid beamforming.	1
Unit –IV	07 Hrs
5G Beamforming Antenna: Active Antenna, Passive Antenna, polarisation	ıs, what is an
Antenna, Antenna arrays. Power Splitter fundamentals, Antenna Bas	ics – Dipole,
Antenna arrays	
5G Beamforming L1 Concepts: SS/PBCH based Beamforming Cod	lebook based
Beamforming SRS based Beamforming Eigenmode Beamforming	
5G Beamforming Functionality: Static Beamforming Dynamic Beamfor	ming – Beam
Steering Dynamic Beamforming - Beam Switching Digital Beamformin	ng vs. Analog
Beamforming Pilot Signals	- -
Unit –V	07 Hrs
5G Beamforming Massive MIMO, SU MIMO and MU MIMO: Spatial	Multiplexing
Spatial Multiplexing vs Beamforming. Creating a Beam. Narrow Beam	is and Beam
Steering Massive MIMO Antennas. MIMO in a Handset. Multiple Panel An	ntenna. Beam

Forming Evolution Massive MI MO vs SU-MIMO vs. MU-MIMO. **5G Beamforming Principle:** Beamforming Principle DL MU-MIMO SRS based Downlink MU-MIMO Definition of basic sets of SSB Azimuthal angle

Course Ou	Course Outcomes: After completing the course, the students will be able to				
CO1:	Illustrate the fundamental concepts of various technologies in wireless which are used in Communication systems.				
CO2:	Derive the solution by applying the acquired knowledge of wireless technologies				
CO3:	Evaluate the solution of the problems using wireless techniques to the real- world problems arising in many practical situations				
CO4:	Design and development of wireless techniques for 5G communication and gain knowledge to apply and engage in life – long learning.				

Re	ference Books
1.	Long Term Evolution IN BULLETS, by Chris Johnson 2nd Edition, July 2012, ISBN-13: 978-1478166177.
2.	5G New Radio IN BULLETS by Chris Johnson, Independently published 2019, ISBN, 1077484356, 9781077484351.
3.	Wireless Communications: From Fundamentals to Beyond 5G,Andreas F. Molisch ,IEEE Press 3rd Edition 2022. ISBN 10: 1119117208, ISBN 13: 9781119117209.
4 .	RF Antenna Beam Forming: Focusing and Steering in Near and Far Field. Shun- Ping Chen and Heinz Schmiedel,1st Edition ,2023, ISBN-13:978-3031217647.
5.	Massive MIMO Systems Kazuki Maruta and Francisco Falcone ,Mdpi AG, 3 rd July 2020,ISBN-10 : 3039360167, ISBN-13:978-3039360161

Scheme of Continuous Internal Evaluation (CIE): 20 + 40 + 40 = 100 QUIZZES: Quizzes will be conducted in online/offline mode. Two quizzes will be conducted & Each Quiz will be evaluated for 10 Marks. The sum of two quizzes will be the Final Quiz marks.

TESTS: Students will be evaluated in test, descriptive questions with different complexity levels (Revised Bloom's Taxonomy Levels:

Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating). Two tests will be conducted. Each test will be evaluated for 50 Marks, adding upto 100 Marks. Final test marks will be reduced to 40 Marks.

EXPERIENTIAL LEARNING: Students will be evaluated for their creativity and practical implementation of the

problem. Case study-based teaching learning and Program specific requirements (15), Video based seminar/presentation/demonstration (25) adding upto 40 marks.

full question from each unit.

	RUBRIC for CIE			RUBRIC for SEE	
SLNo	Content	Marks	Q. No	Contents	Marks
1	Quizzes - Q1 & Q2	20	Each u	nit consists of TWO questions of 20 Marks each. Answ	er FIVE
2	Tests - T1 & T2	40		full questions selecting ONE from each unit (1 to 5).	
3	Experiential Learning - EL1 & EL2	40	1&2	Unit-1: Question 1 or 2	20
	Total Marks	100	3&4	Unit-2: Question 3 or 4	20
			5&6	Unit-3: Question 5 or 6	20
			7&88	Unit-4: Question 7 or 8	20
			9 & 10	Unit-5: Question 9 or 10	20
				Total Marks	100



University, Belagavi				
	SEMESTI	ER: II		
Course Code : 22BT2D0	BIOINSPIRED	ENGINEERING	CIE Marks	: 100
Credits L-T-P : 3-0-0		ENGINEERING	SEE Marks	: 100
Hours : 42L	Elective D (Gl	lobal Elective)	SEE Durations	s : 3 Hr
Faculty Coordina	tor: Dr Nagashree Rao and Dr Ashwar	ni Sharma		
	UNIT - I			8 Hrs
Introduction to Bio-inspire	1 Engineering: Macromolecules, Stem	cells; types and application	s. Synthetic Biology; I	Bottom-up
and 'top-down' engineering	approaches. Synthetic/ artificial life.	Biological Clock, Genetic Al	gorithms.	
	UNIT - II			9 Hrs
Principles of bioinspired m	aterials: Biological and synthetic mate	rials, Self-assembly, hierard	chy and evolution. Bic	polymers,
Bio-steel, Bio-composites,	nulti-functional biological materials. 7	Thermal Properties. Antirefle	ection and photo-ther	mal
biomaterials, Microfluidics	in biology, Invasive and non-invasive	thermal detection inspired h	by skin	
	UNIT - III			9 Hrs
Lessons from Nature:Bioin	spired Materials and mechanism: Fire	fly-Bioluminescence, Cockle	eburs –Velcro, Lotus le	eaf -
Self-cleaning materials, Ge	cko - Gecko tape, Whale fins - Turbine	e blades, Box Fish / Bone -	Bionic car, Shark skir	n - Friction
reducing swim suits, King	sher beak - Bullet train, Coral - Caler	a cement, Forest floor / Eco	osystem functioning -	Flooring
tiles, Morpho butterfly- St	uctural color, Namib beetle- Water col	lecting, Termite mound pas	sive cooling, Birds/In	sects-
flights/ aerodynamics, Mo	quito inspired micro needle.			
	UNIT - IV		21	8 Hrs
Biomedical Inspiration-Co	cept and applications: Organ system-	Circulatory- artificial blood	l, artificial heart, pace	maker.
Respiratory- artificial lung	. Excretory- Artificial kidney and skin	Artificial Support and repl	acement of human or	gans:
artificial liver and pancrea	. Total joint replacements- artificial lin	mbs. Visual prosthesis -arti	ficial eye/ bionic eye.	
	UNIT - V	1/4		8 Hrs
Biomimetics: Inventions in	nature for Human Innovation: Photos	ynthesis and Photovoltaic c	ells, Bionic/Artificial	leaf.
Bio-ink and 3D-Bioprintin	Cellular automata, Biosensors: Artif	icial tongue and nose. Biom	imetic echolation. Ins	sect foot
adaptations for adhesion (bormal insulation and storage materi	als Doos and Honoyoomh S	tructure Artificial Int	olligonoo
	inclination and storage materi	als. Dees and Honeycould S	di ucture. Ai unciai int	emgence,
Neural Networking and bio	rodotics.			
Course Outcomesu	60			
After going through this co	urse the student will be able to:			
CO1 · Flugidata	the concepts and phonomonon of not			
	ne concepts and phenomenon of nate	inal processes		
	basic principles for design and develop	Sment of bioinspired structu	ares	
CO3 : Analyse at	d append the concept of bio-mimetics	for diverse applications		
CO4 : Designing	technical solutions by utilization of bi	o-inspiration modules.		
Reference Books:				
1. D. Floreano and C. Matt	ussi, Bio-Inspired Artificial Intelligence	ce: The <mark>ories, Me</mark> thods and T	'echnologies, 1st editio	on, MIT
Press, 2008, ISBN: 978020		taniala Osianas and Englisha		. W 7:1
2. Guang Yang, Lin Xiao, a	nd Lallepak Lamboni. Bioinspired Mai	terials Science and Engineer	ring. 1st edition, John	i wiley,
2018, ISBN: 978-1-119-39	03362			
3. M.A. Meyers and P.Y. C	en. Biological Materials, Bioinspired	Materials, and Biomaterials,	, 1st edition, Cambrid	ge
University Press, 2014, ISI	<u>N 978-1-107-01045.</u>	1		
4. Tao Deng. Bioinspired E	ngineering of Thermal Materials, 1st e	dtion, Wiley-VCH Press, 20	18. ISBN: 978-3-527-3	33834-4.
Scheme of Continuous Ir	ternal Evaluation (CIE): 20 + 40 + 4	0 = 100		
QUIZZES: Quizzes will be	onducted in online/offline mode. Two	quizzes will be conducted a	& Each Quiz will be ev	aluated fo
10 Marks. The sum of two	juizzes will be the Final Quiz marks.		1 (D : 1 D) :	—
TESTS: Students will be e	aluated in test, descriptive questions	with different complexity lev	vels (Revised Bloom's	Taxonomy
Levels: Remembering, Und	erstanding, Applying, Analyzing, Evalu	lating, and Creating). Two t	ests will be conducted	I. Each te
will be evaluated for 50 Ma	rks, adding upto 100 marks. Final tes	t marks will be reduced to 4	40 Marks.	
EXPERIENTIAL LEARNIN	3: Students will be evaluated for their	creativity and practical imp	plementation of the pr	oblem.
Case study-based teaching	learning and Program specific require	ements (15), Video based		
seminar/presentation/den	onstration (25) adding upto 40 marks	\$.		

	Rub	ric for (CIE & S	SEE Theory courses				
	RUBRIC for CIE	1		RUBRIC for SEE				
SLNo	Content	Marks	Q. No	Contents	Marks			
1	Quizzes - Q1 & Q2	20	Each unit consists of TWO questions of 20 Marks each. Answer FIVE					
2	Tests - T1 & T2	40		full questions selecting ONE from each unit (1 to 5).				
3	Experiential Learning - EL1 & EL2	40	1&2	Unit-1: Question 1 or 2	20			
	Total Marks	100	3&4	Unit-2: Question 3 or 4	20			
			5&6	Unit-3: Question 5 or 6	20			
			7&-8	Unit-4: Question 7 or 8	20			
			9 & 10	Unit-5: Question 9 or 10	20			
				Total Marks	100			





		SEMESTER: II		
Course Code	: 22BT2D02T	HEALTH INFORMATICS	CIE Marks	: 100
Credits L-T-P	: 3-0-0	HEALTH INFORMATICS	SEE Marks	: 100
Hours	: 42L	Elective D (Global Elective)	SEE Durations	: 3 Hrs
Facı	ulty Coordinator:	Dr A H Manjunatha Reddy		
		UNIT - I		8 Hrs
Introduction,	Healthcare data,	information and knowledge: Data types, data conversion, clinical d	lata warehouse, d	ata
analytics, cha	llenges, role of in	formatics in analytics, future trends		
		UNIT - II		8 Hrs
Electronic hea	alth records: Intro	oduction, scope for the e health records, challenges, examples, logic	cal steps to selecti	ing and
implementing	EHR			
		UNIT - III		8 Hrs
Data standard	ls and medical co	oding: Introduction, medical content standards, termonology stand	ards, transport sta	andards,
medical codin	g and reimburse	nent, future trends,		
		UNIT - IV		9 Hrs
Healthcare En	terprise: Overvie	w of Health Informatics: Introduction, Key players in HI, organizati	ons involved, barr	riers,
programs, org	anizations and c	areer, HI Resoruces		
		UNIT - V		9 Hrs
Health Inform	ation privacy and	l security: Introduction, basic security principles, authentication a	nd identity manag	gement,
data security	in the cloud and	client/server management		
		1.10 - 94		
Course Outco	mes:	the student will be able to:		
		e hesis principles of Health information		
		a data transformation and to analyzic		
C02	Data capture	o data transformation and to analysis		
003	Creation of E	health records, identify the challenges		
C04	: Improvise the	significant factors as per the spatio-temporal requirements		
Reference Bo	oks:			
1. Robert E. H	loyt Ann K. Yoshi	hashi, Health Informatics, Practical guide for Healthcare and Infor	mation Technolog	У
Professionals,	Usersch Marian	Inalics Education, 2014, ISBN: 978-0-9887529-2-4	ICDN. 1 05022 0	206 1
2. Katiliyii J.	Langh Llogith Laf	J. Ball, Health Informatics, Springer Series eutlion, Springer, 2005,	, ISDN: 1-03233-0	20-1
3. William R F	· M 1: 1:	officiality, a Practical guide, 8th edition. 2022, ISBN 978-1-387-854	15-2	
4. Pentti Niem	inen. Medical ini	ormatics and data analysis 1st edition, MDPI AG, 2021, ISBN-13 :	978-3036500980)
Scheme of Co	ontinuous Interi	al Evaluation (CIE): 20 + 40 + 40 = 100	1 0 1 111	1 . 1 .
QUIZZES: Qui	izzes will be conc	ucted in online/offline mode. Two quizzes will be conducted & Eac	h Quiz will be eva	luated for
TO Marks. The	e sum of two quiz	zes will be the Final Quiz marks.	Derriged Disons's T	
Louolo: Domon	chis will be evalu-	area in rest, descriptive questions with different complexity levels (i	vill be conducted	Each toot
will be evaluat	ted for 50 Maria	adding up to 100 marks. Final test marks will be reduced to 40 Mg	viii be conducted.	Bach test
will be evaluat	ted for 50 Marks,	adding upto 100 marks. Final test marks will be reduced to 40 Ma	arks.	

EXPERIENTIAL LEARNING: Students will be evaluated for their creativity and practical implementation of the problem. Case study-based teaching learning and Program specific requirements (15), Video based

seminar/presentation/demonstration (25) adding upto 40 marks.

	Rub	ric for (CIE & S	SEE Theory courses				
	RUBRIC for CIE	1		RUBRIC for SEE				
SLNo	Content	Marks	Q. No	Contents	Marks			
1	Quizzes - Q1 & Q2	20	Each unit consists of TWO questions of 20 Marks each. Answer FIVE					
2	Tests - T1 & T2	40		full questions selecting ONE from each unit (1 to 5).				
3	Experiential Learning - EL1 & EL2	40	1&2	Unit-1: Question 1 or 2	20			
	Total Marks	100	3&4	Unit-2: Question 3 or 4	20			
			5&6	Unit-3: Question 5 or 6	20			
			7&-8	Unit-4: Question 7 or 8	20			
			9 & 10	Unit-5: Question 9 or 10	20			
				Total Marks	100			





Chirdiney,		SEMESTER: II		
Course Code	: 22CS2D03T		CIE Marks	: 100
Credits L-T-P	: 3-0-0	BUSINESS ANALYTICS	SEE Marks	: 100
Hours	: 42L	Elective D (Global Elective)	SEE Durations	: 3 Hrs
Fact	alty Coordinator:	Dr. Azra Nasreen and Dr. Badarinath K		
·	<u>y</u>	UNIT - I		9 Hrs
Overview of B	usiness analytics	, Scope of Business analytics, Business Analytics Process, Relation	nship of Business	Analytics
Process and o Statistical me	rganization, com thods, Review of	petitive advantages of Business Analytics. Statistical Tools: Statisti probability distribution and data modelling.	cal Notation, Des	scriptive
	,	UNIT - II		9 Hrs
Trendiness ar Resources, Bu Exploring Dat	nd Regression An usiness Analytics a, Business Anal	alysis Modelling Relationships and Trends in Data, simple Linear F Personnel, Data and models for Business analytics, problem solvin ytics Technology.	egression. Impor ng, Visualizing an	rtant nd
		UNIT - III		8 Hrs
Organization	Structures of Bu	siness analytics Team management, Management Issues, Designin	g Information Pol	icy,
Outsourcing,	Ensuring Data Q	uality, Measuring contribution of Business analytics, Managing Ch	langes. Descriptiv	ve
Analytics, Pre	dictive Analytics,	Predicative Modelling, Predictive analytics analysis.		
		UNIT - IV		8 Hrs
Forecasting T Stationary Tir	echniques Qualit ne Series, Foreca	ative and Judgmental Forecasting, Statistical Forecasting Models, sting Models for Time Series with a Linear Trend, Forecasting Time	Forecasting Mode Series with Seas	els for sonality,
Regression Fo	recasting with C	asual Variables, Selecting Appropriate Forecasting Models.		
		UNIT - V		8 Hrs
Decision Anal Trees, The Va	ysis Formulating lue of Information	Decision Problems, Decision Strategies with and without Outcome n, Utility and Decision Making.	, Probabilities, D	ecision
	/ .			
Course Outco	omes:			
After going t	hrough this cou	rse the student will be able to:		
CO1	: Apply the con-	cepts and methods of business analytics to solve business problem	.S	
CO2	: Analyse, mode	el and solve decision problems in different settings		
CO3	: Interpret resul	ts/solutions and identify appropriate courses of action for a given	business scenari	0
CO4	: Demonstrate s ethical practic	skills like investigation, effective communication, working in team/	Individual and fo	llowing
Defense as Be	alter			
1. Business a	nalytics Principle	s, Concepts, and Applications FT Press Analytics, Marc J. Schnied	erjans, Dara G.	
2 The Volue	of Business Analy	starkey, 1st Edition, 2014, ISBN-15. 978-0155989405, ISBN-10.	8 Sons	
	0/078111808388	1 1st Edition 2014 ISBN:978111898388	0.50115,	
3. Business A	nalytics, James 1	Evans, Pearsons Education 2nd Edition, ISBN-13: 978-032199782	1 ISBN-	
4 Predictive F	Rusiness Analytic	s Forward Looking Canabilities to Improve Business, Gary Cokins	and	
Lawrence Mai	sel, Wiley; 1st Ec	lition, 2013, ISBN: 978-1-118-17556-9.		
Scheme of C	ntinuous Intom	121 = 100		
QUIZZES: Qu 10 Marks. The TESTS: Stude Levels: Remer	izzes will be conc e sum of two quiz ents will be evalu nbering, Underst ted for 50 Marks	lucted in online/offline mode. Two quizzes will be conducted & Eac izes will be the Final Quiz marks. ated in test, descriptive questions with different complexity levels (anding, Applying, Analyzing, Evaluating, and Creating). Two tests adding upto 100 marks. Final test marks will be reduced to 40 M	h Quiz will be eva Revised Bloom's 7 will be conducted	aluated for Faxonomy Each tes
EXPERIENTI Case study-ba	AL LEARNING: Sased teaching lea	Students will be evaluated for their creativity and practical implementing and Program specific requirements (15), Video based	entation of the pro	oblem.
seminar/pres	entation/demons	tration (25) adding upto 40 marks.		

	Rub	ric for (CIE & S	SEE Theory courses			
	RUBRIC for CIE		RUBRIC for SEE				
SLNo	Content	Marks	Q. No	Contents	Marks		
1	Quizzes - Q1 & Q2	20	Each unit consists of TWO questions of 20 Marks each. Answer FIVE				
2	Tests - T1 & T2	40	1	full questions selecting ONE from each unit (1 to 5).			
3	Experiential Learning - EL1 & EL2	40	1&2	Unit-1: Question 1 or 2	20		
	Total Marks	100	3&4	Unit-2: Question 3 or 4	20		
			5&6	Unit-3: Question 5 or 6	20		
			7&-8	Unit-4: Question 7 or 8	20		
			9 & 10	Unit-5: Question 9 or 10	20		
				Total Marks	100		





	SEMESTER: II		
Course Code : 22CV2D04T	INDUSTRIAL AND OCCUPATIONAL HEALTH AND SAFETY	CIE Marks	: 100
Credits L-T-P : 3-0-0		SEE Marks	: 100
Hours : 42L	Elective D (Global Elective)	SEE Durations	: 3 Hrs
Faculty Coordinator:	Dr.V.AnanthaRam		
	UNIT - I		08Hrs
Industrial safety: Accident, cau	uses, types, results and control, mechanical and electrical hazards,	types, causes and	f
preventive steps/procedure, de	scribe salient points of factories act 1948 for health and safety, wa	ish rooms, drinkin	ng water
layouts, light, cleanliness, life,	guarding, pressure vessels, etc., Safety color codes. Fire prevention	i and fire fighting,	
equipment and methods.	IINIT - II		00Hrs
Occupational health and safety	v: Introduction, Health, Occupational health; definition, Interaction	between work an	d health.
Health hazards, workplace, eco	phomy and sustainable development. Work as a factor in health pro-	omotion. Health p	rotection
and promotion Activities in the	workplace: National governments, Management, Workers, Worker	s' representatives	and
unions, Communities, Occupa	tional health professionals. Potential health hazards: Air contamination	ants, Chemical ha	zards,
Biological hazards, Physical ha	zards, Ergonomic hazards, Psychosocial factors, Evaluation of hea	lth hazards: Expo	sure
measurement techniques, Inte	rpretation of findings recommended exposure limits. Controlling ha	azards: Engineerin	1g
controls, Work practice control	s, Administrative controls. Occupational diseases: Definition, Char	racteristics of occu	ipational
uiscases, i revention or occupa	IINIT - III		09Hrs
Hazardous Materials character	istics and effects on health: Introduction Chemical Agents Organi	ic Liquids Gases	Metals
and Metallic Compounds, Part	iculates and Fibers, Alkalies and Oxidizers, General Manufacturing	g Materials, Chemi	ical
Substitutes, Allergens, Carcino	ogens, Mutagens, Reproductive Hazards, Sensitizers and Teratogen	s, Recommended	Chemical
Exposure Limits. Physical Agen	nts, Noise and Vibration, Temperature and Pressure, Carcinogenici	ty, Mutagenicity a	nd
Teratogenicity. Ergonomic Stre	sses: Stress-Related Health Incidents, Eyestrain, Repetitive Motion	i, Lower Back Pair	ı, Video
Display Terminals.			00.77
Ween and Compaign and their	UNIT - IV	hibricanta traca a	U8 Hrs
applications Lubrication meth	ods general sketch working and applications i Screw down great	se cun ii Pressure	nu e grease
gun, iii. Splash lubrication, iv.	Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication	on, vii. Ring lubric	ation.
Definition, principle and factor	a officiating the correction. Types of correction correction provention i	, 0	
	s anecting the corrosion. Types of corrosion, corrosion prevention i	methods.	,
	UNIT - V	methods.	08 Hrs
Periodic and preventive mainte	UNIT - V nance: Periodic inspection-concept and need, degreasing, cleaning	methods. and repairing sch	08 Hrs nemes,
Periodic and preventive mainter overhauling of mechanical com	UNIT - V nance: Periodic inspection-concept and need, degreasing, cleaning iponents, over hauling of electrical motor, common troubles and re	and repairing sch medies of electric	08 Hrs nemes, motor,
Periodic and preventive mainter overhauling of mechanical com repair complexities and its use	UNIT - V enance: Periodic inspection-concept and need, degreasing, cleaning iponents, over hauling of electrical motor, common troubles and re , definition, need, steps and advantages of preventive maintenance	and repairing sch medies of electric Steps/procedure	08 Hrs nemes, motor, e for
Periodic and preventive mainter overhauling of mechanical com- repair complexities and its use periodic and preventive mainter Program and schedule of preventive	UNIT - V enance: Periodic inspection-concept and need, degreasing, cleaning iponents, over hauling of electrical motor, common troubles and re , definition, need, steps and advantages of preventive maintenance nance of: I. Machine tools, ii. Pumps, iii. Air compressors, iv. Diese ptive maintenance of mechanical and electrical equipment, advant	and repairing sch medies of electric Steps/procedure el generating (DG)	08 Hrs nemes, motor, e for sets,
Periodic and preventive mainter overhauling of mechanical com- repair complexities and its use periodic and preventive mainter Program and schedule of preve- maintenance. Repair cycle con-	UNIT - V enance: Periodic inspection-concept and need, degreasing, cleaning aponents, over hauling of electrical motor, common troubles and re , definition, need, steps and advantages of preventive maintenance enance of: I. Machine tools, ii. Pumps, iii. Air compressors, iv. Diese ntive maintenance of mechanical and electrical equipment, advant cept and importance.	methods. and repairing sch medies of electric . Steps/procedure el generating (DG) rages of preventive	08 Hrs nemes, motor, e for sets,
Periodic and preventive mainter overhauling of mechanical com- repair complexities and its use periodic and preventive mainter Program and schedule of preve- maintenance. Repair cycle com-	UNIT - V enance: Periodic inspection-concept and need, degreasing, cleaning iponents, over hauling of electrical motor, common troubles and re , definition, need, steps and advantages of preventive maintenance enance of: I. Machine tools, ii. Pumps, iii. Air compressors, iv. Diese entive maintenance of mechanical and electrical equipment, advant cept and importance.	methods. and repairing sch medies of electric steps/procedure el generating (DG) cages of preventive	08 Hrs nemes, motor, e for sets,
Periodic and preventive mainter overhauling of mechanical com- repair complexities and its use periodic and preventive mainter Program and schedule of preve- maintenance. Repair cycle com-	UNIT - V enance: Periodic inspection-concept and need, degreasing, cleaning aponents, over hauling of electrical motor, common troubles and re , definition, need, steps and advantages of preventive maintenance enance of: I. Machine tools, ii. Pumps, iii. Air compressors, iv. Diese entive maintenance of mechanical and electrical equipment, advant cept and importance.	methods. and repairing sch medies of electric s. Steps/procedure el generating (DG) ages of preventive	08 Hrs nemes, motor, e for sets,
Periodic and preventive mainter overhauling of mechanical com- repair complexities and its user periodic and preventive mainter Program and schedule of preven- maintenance. Repair cycle com- Course Outcomes: After going through this cour	UNIT - V enance: Periodic inspection-concept and need, degreasing, cleaning aponents, over hauling of electrical motor, common troubles and re , definition, need, steps and advantages of preventive maintenance enance of: I. Machine tools, ii. Pumps, iii. Air compressors, iv. Diese entive maintenance of mechanical and electrical equipment, advant cept and importance.	methods. and repairing sch emedies of electric Steps/procedure el generating (DG) cages of preventive	08 Hrs nemes, motor, e for sets,
Periodic and preventive mainter overhauling of mechanical com- repair complexities and its use periodic and preventive mainter Program and schedule of preve- maintenance. Repair cycle com- Course Outcomes: After going through this cour- CO1 : Explain the In-	UNIT - V enance: Periodic inspection-concept and need, degreasing, cleaning iponents, over hauling of electrical motor, common troubles and re , definition, need, steps and advantages of preventive maintenance enance of: I. Machine tools, ii. Pumps, iii. Air compressors, iv. Diese entive maintenance of mechanical and electrical equipment, advant cept and importance. :se the student will be able to: dustrial and Occupational health and safety and its importance.	methods. and repairing sch emedies of electric steps/procedure el generating (DG) cages of preventive	08 Hrs hemes, motor, e for sets,
Periodic and preventive mainter overhauling of mechanical com- repair complexities and its use periodic and preventive mainter Program and schedule of preve- maintenance. Repair cycle com- Course Outcomes: After going through this cour CO1 : Explain the Im- CO2 : Demonstrate t	UNIT - V enance: Periodic inspection-concept and need, degreasing, cleaning iponents, over hauling of electrical motor, common troubles and re , definition, need, steps and advantages of preventive maintenance enance of: I. Machine tools, ii. Pumps, iii. Air compressors, iv. Diese entive maintenance of mechanical and electrical equipment, advant cept and importance.	methods. and repairing sch medies of electric s. Steps/procedure el generating (DG) ages of preventive	08 Hrs nemes, motor, e for sets, can
Periodic and preventive mainter overhauling of mechanical com- repair complexities and its use periodic and preventive mainter Program and schedule of preve- maintenance. Repair cycle com- Course Outcomes: After going through this cour- CO1 : Explain the In- CO2 : Demonstrate t expose in the in-	UNIT - V enance: Periodic inspection-concept and need, degreasing, cleaning iponents, over hauling of electrical motor, common troubles and re , definition, need, steps and advantages of preventive maintenance enance of: I. Machine tools, ii. Pumps, iii. Air compressors, iv. Diese entive maintenance of mechanical and electrical equipment, advant cept and importance.	methods. and repairing sch medies of electric s. Steps/procedure el generating (DG) rages of preventive	08 Hrs nemes, motor, e for sets, can
Periodic and preventive mainter overhauling of mechanical com- repair complexities and its use periodic and preventive mainter Program and schedule of preve- maintenance. Repair cycle con- Course Outcomes: After going through this cour- CO1 : Explain the In- CO2 : Demonstrate to expose in the in- CO3 : Characterize to	UNIT - V enance: Periodic inspection-concept and need, degreasing, cleaning iponents, over hauling of electrical motor, common troubles and re , definition, need, steps and advantages of preventive maintenance mance of: I. Machine tools, ii. Pumps, iii. Air compressors, iv. Diese entive maintenance of mechanical and electrical equipment, advant cept and importance. rse the student will be able to: dustrial and Occupational health and safety and its importance. he exposure of different materials, occupational environment to wh ndustries. he different type materials, with respect to safety and health hazard	methods. and repairing sch medies of electric Steps/procedure el generating (DG) cages of preventive nich the employee ds of it.	08 Hrs nemes, motor, e for sets, can
Periodic and preventive mainter overhauling of mechanical com- repair complexities and its use periodic and preventive mainter Program and schedule of preve- maintenance. Repair cycle com- Course Outcomes: After going through this cour- CO1 : Explain the In CO2 : Demonstrate to expose in the in CO3 : Characterize t CO4 : Analyze the di	UNIT - V enance: Periodic inspection-concept and need, degreasing, cleaning iponents, over hauling of electrical motor, common troubles and re , definition, need, steps and advantages of preventive maintenance enance of: I. Machine tools, ii. Pumps, iii. Air compressors, iv. Diese entive maintenance of mechanical and electrical equipment, advant cept and importance. rse the student will be able to: dustrial and Occupational health and safety and its importance. he exposure of different materials, occupational environment to whindustries. he different type materials, with respect to safety and health hazard fferent processes with regards to safety and health and the mainten- mind environment.	methods. and repairing sch medies of electric . Steps/procedure el generating (DG) ages of preventive nich the employee ds of it. nance required in	08 Hrs hemes, motor, for sets, can
Periodic and preventive mainter overhauling of mechanical com- repair complexities and its use periodic and preventive mainter Program and schedule of preve- maintenance. Repair cycle com- Course Outcomes: After going through this cour- CO1 : Explain the In- CO2 : Demonstrate to expose in the in- CO3 : Characterize to CO4 : Analyze the di industries to a	UNIT - V enance: Periodic inspection-concept and need, degreasing, cleaning iponents, over hauling of electrical motor, common troubles and re , definition, need, steps and advantages of preventive maintenance enance of: I. Machine tools, ii. Pumps, iii. Air compressors, iv. Diese entive maintenance of mechanical and electrical equipment, advant cept and importance. rse the student will be able to: dustrial and Occupational health and safety and its importance. he exposure of different materials, occupational environment to wh industries. he different type materials, with respect to safety and health hazard fferent processes with regards to safety and health and the mainten void accidents.	methods. and repairing sch medies of electric e. Steps/procedure el generating (DG) ages of preventive nich the employee ds of it. nance required in	08 Hrs nemes, motor, e for sets, can
Periodic and preventive mainter overhauling of mechanical com- repair complexities and its use periodic and preventive mainter Program and schedule of preve- maintenance. Repair cycle con- Course Outcomes: After going through this cour- CO1 : Explain the In CO2 : Demonstrate t expose in the in CO3 : Characterize t CO4 : Analyze the di industries to a Reference Books:	UNIT - V enance: Periodic inspection-concept and need, degreasing, cleaning aponents, over hauling of electrical motor, common troubles and re , definition, need, steps and advantages of preventive maintenance mance of: I. Machine tools, ii. Pumps, iii. Air compressors, iv. Diese entive maintenance of mechanical and electrical equipment, advant cept and importance. rse the student will be able to: dustrial and Occupational health and safety and its importance. he exposure of different materials, occupational environment to whindustries. he different type materials, with respect to safety and health hazard fferent processes with regards to safety and health and the mainten void accidents.	methods. and repairing sch medies of electric e. Steps/procedure el generating (DG) ages of preventive nich the employee ds of it. nance required in	08 Hrs nemes, motor, e for sets, can the
Periodic and preventive mainter overhauling of mechanical com- repair complexities and its use periodic and preventive mainter Program and schedule of preve- maintenance. Repair cycle con- Course Outcomes: After going through this cour- CO1 : Explain the In CO2 : Demonstrate t expose in the i CO3 : Characterize t CO4 : Analyze the di industries to a Reference Books: 1.Maintenance Engineering Ha McGraw-Hill Education. Da International con- ternation of the second	UNIT - V enance: Periodic inspection-concept and need, degreasing, cleaning aponents, over hauling of electrical motor, common troubles and re , definition, need, steps and advantages of preventive maintenance mance of: I. Machine tools, ii. Pumps, iii. Air compressors, iv. Diese entive maintenance of mechanical and electrical equipment, advant cept and importance. rse the student will be able to: dustrial and Occupational health and safety and its importance. he exposure of different materials, occupational environment to wh industries. he different type materials, with respect to safety and health hazard fferent processes with regards to safety and health and the mainten void accidents.	methods. and repairing sch medies of electric s. Steps/procedure el generating (DG) cages of preventive nich the employee ds of it. nance required in	08 Hrs nemes, motor, e for sets, can the ished by
Periodic and preventive mainter overhauling of mechanical com- repair complexities and its use periodic and preventive mainter Program and schedule of preve- maintenance. Repair cycle com- Course Outcomes: After going through this cour- CO1 : Explain the In- CO2 : Demonstrate to expose in the in- CO3 : Characterize t CO4 : Analyze the di industries to a Reference Books: 1.Maintenance Engineering Ha McGraw-Hill Education. Da Int 2. H. P. Garg, Maintenance En	UNIT - V enance: Periodic inspection-concept and need, degreasing, cleaning aponents, over hauling of electrical motor, common troubles and re , definition, need, steps and advantages of preventive maintenance enance of: I. Machine tools, ii. Pumps, iii. Air compressors, iv. Diese entive maintenance of mechanical and electrical equipment, advant cept and importance. rse the student will be able to: dustrial and Occupational health and safety and its importance. he exposure of different materials, occupational environment to wh industries. he different type materials, with respect to safety and health hazard fferent processes with regards to safety and health and the mainten woid accidents. ndbook, Higgins & Morrow, SBN 10: 0070432015 / ISBN 13: 9780 formation Services. gineering Principles, Practices & Management, 2009,S. Chand and	methods. and repairing sch medies of electric . Steps/procedure el generating (DG) ages of preventive nich the employee ds of it. nance required in 0070432017, Publ Company, New D	08 Hrs nemes, motor, for sets, can the ished by elhi,
Periodic and preventive mainter overhauling of mechanical com- repair complexities and its use periodic and preventive mainter Program and schedule of preve- maintenance. Repair cycle com- Course Outcomes: After going through this cour- CO1 : Explain the In- CO2 : Demonstrate to expose in the in- CO3 : Characterize t CO4 : Analyze the di industries to a Reference Books: 1.Maintenance Engineering Ha McGraw-Hill Education. Da In- 2. H. P. Garg, Maintenance En- ISBN:9788121926447	UNIT - V enance: Periodic inspection-concept and need, degreasing, cleaning aponents, over hauling of electrical motor, common troubles and re , definition, need, steps and advantages of preventive maintenance enance of: I. Machine tools, ii. Pumps, iii. Air compressors, iv. Diese entive maintenance of mechanical and electrical equipment, advant cept and importance. rse the student will be able to: dustrial and Occupational health and safety and its importance. he exposure of different materials, occupational environment to wh industries. he different type materials, with respect to safety and health hazard fferent processes with regards to safety and health and the mainten void accidents. ndbook, Higgins & Morrow, SBN 10: 0070432015 / ISBN 13: 9780 formation Services. gineering Principles, Practices & Management, 2009,S. Chand and	methods. and repairing sch medies of electric e. Steps/procedure el generating (DG) ages of preventive nich the employee ds of it. nance required in 0070432017, Publ Company, New D	08 Hrs nemes, motor, e for sets, can the ished by
Periodic and preventive mainter overhauling of mechanical com- repair complexities and its use periodic and preventive mainter Program and schedule of preve- maintenance. Repair cycle con- Course Outcomes: After going through this cour- CO1 : Explain the In- CO2 : Demonstrate t expose in the i- CO3 : Characterize t CO4 : Analyze the di industries to a Reference Books: 1.Maintenance Engineering Ha McGraw-Hill Education. Da Inf 2. H. P. Garg, Maintenance En ISBN:9788121926447 3.Fundamental Principles of O	UNIT - V enance: Periodic inspection-concept and need, degreasing, cleaning aponents, over hauling of electrical motor, common troubles and re , definition, need, steps and advantages of preventive maintenance enance of: I. Machine tools, ii. Pumps, iii. Air compressors, iv. Diese entive maintenance of mechanical and electrical equipment, advant cept and importance. rse the student will be able to: dustrial and Occupational health and safety and its importance. he exposure of different materials, occupational environment to wh industries. he different type materials, with respect to safety and health hazard fferent processes with regards to safety and health and the mainten ivoid accidents. indbook, Higgins & Morrow, SBN 10: 0070432015 / ISBN 13: 9780 formation Services. gineering Principles, Practices & Management, 2009,S. Chand and ccupational Health and Safety, Benjamin O. ALLI, Second edition,2	methods. and repairing sch medies of electric s. Steps/procedure el generating (DG) rages of preventive hich the employee ds of it. nance required in 0070432017, Publ Company, New D	08 Hrs nemes, motor, efor sets, can the ished by elhi, Labour
Periodic and preventive mainter overhauling of mechanical com- repair complexities and its use periodic and preventive mainter Program and schedule of preve- maintenance. Repair cycle com- Course Outcomes: After going through this cour- CO1 : Explain the In- CO2 : Demonstrate t expose in the i- CO3 : Characterize t CO4 : Analyze the di industries to a Reference Books: 1.Maintenance Engineering Ha McGraw-Hill Education. Da Int 2. H. P. Garg, Maintenance En ISBN:9788121926447 3.Fundamental Principles of O Office – Geneva: ILO, ISBN 978	UNIT - V mance: Periodic inspection-concept and need, degreasing, cleaning aponents, over hauling of electrical motor, common troubles and re , definition, need, steps and advantages of preventive maintenance mance of: I. Machine tools, ii. Pumps, iii. Air compressors, iv. Diese entive maintenance of mechanical and electrical equipment, advant cept and importance. rse the student will be able to: dustrial and Occupational health and safety and its importance. he exposure of different materials, occupational environment to whindustries. he different type materials, with respect to safety and health hazard fferent processes with regards to safety and health and the mainten woid accidents. ndbook, Higgins & Morrow, SBN 10: 0070432015 / ISBN 13: 9780 formation Services. gineering Principles, Practices & Management, 2009,S. Chand and ccupational Health and Safety, Benjamin O. ALLI, Second edition,2 i-92-2-120454-1	methods. and repairing sch medies of electric s. Steps/procedure el generating (DG) ages of preventive nich the employee ds of it. nance required in 0070432017, Publ Company, New D	08 Hrs nemes, motor, efor sets, can the ished by elhi, Labour



Scheme of Continuous Internal Evaluation (CIE): 20 + 40 + 40 = 100

QUIZZES: Quizzes will be conducted in online/offline mode. Two quizzes will be conducted & Each Quiz will be evaluated for 10 Marks. The sum of two quizzes will be the Final Quiz marks.

TESTS: Students will be evaluated in test, descriptive questions with different complexity levels (Revised Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating). Two tests will be conducted. Each test will be evaluated for 50 Marks, adding upto 100 marks. Final test marks will be reduced to 40 Marks.

EXPERIENTIAL LEARNING: Students will be evaluated for their creativity and practical implementation of the problem. Case study-based teaching learning and Program specific requirements (15), Video based

seminar/presentation/demonstration (25) adding upto 40 marks.

	RUBRIC for CIE			RUBRIC for SEE			
SLNo	Content	Marks	Q. No	Contents	Marks		
1	Quizzes - Q1 & Q2	20	Each u	nit consists of TWO questions of 20 Marks each. Answ	er FIVE		
2	Tests - T1 & T2	40]	full questions selecting ONE from each unit (1 to 5).			
3	Experiential Learning - EL1 & EL2	40	1&2	Unit-1: Question 1 or 2	20		
	Total Marks	100	3&4	Unit-2: Question 3 or 4	20		
	10	t KS	5&6	Unit-3: Question 5 or 6	20		
			7 & 8	Unit-4: Question 7 or 8	20		
			9 & 10	Unit-5: Question 9 or 10	20		
				Total Marks	100		



RV Educational Institutions * RV College of Engineering	3 ^m	Go, change	the world
Approved by AICTE Instituton Affiliared to Visvesvaraya Technological Universky, Belegavi			
	SEMESTER: II		
Course Code : 22CV2D05T	INTELLIGENT TRANSPORTATION SYSTEMS	CIE Marks	: 100
Credits L-T-P : 3-0-0	INTELLIGENT TRANSFORTATION STSTEMS	SEE Marks	: 100
Hours : 42L	Elective D (Global Elective)	SEE Durations	: 3 Hrs
Faculty Coordinator:	Dr.Sunil S		
	UNIT - I		8 Hrs
Introduction: –Historical Bac Fundamentals of Traffic Flow signalization and control prin	kground, Definition, Future prospectus, ITS training and educationa and Control- Traffic flow elements, Traffic flow models, Shock wave nciples, Ramp metering, Traffic simulation	al needs. s in Traffic stream	ns, Traffic
	UNIT - II		9 Hrs
ITS User services-User servic Payment, Commercial Vehicl Information Management, M Architecture, Need of ITS arc	es bundles, Travel and Traffic management, Public Transportation (es Operations, Emergency Management, Advanced Vehicle Control a aintenance and construction Management. ITS Architecture-Regiona hitecture, concept of Operations, National ITS Architecture, Architec	Derations, Electr and safety systems and Project ITS cture development	onic s, t tool
	UNIT - III		9 Hrs
Technology Building Blocks Information. Various detection and incident management sy Multimodal Traveller Information	for ITS-Introduction, Data acquisition, Communication Tools, Data A on, identification and collection methods for ITS. ITS Applications an estems, Advanced arterial traffic control systems, Advanced Public Tr ation systems	nalysis, and Trav d their benefits-Fr cansportation Sys	'eller reeway tems,
	UNIT - IV		8 Hrs
into Transportation Planning and standards, ITS standard testing	s, relevant case studies. ITS Standards-Standard development process application areas, National Transportation Communications for IT	ss, National ITS and S Protocol, Stands	rchitecture ards
ITS Evolution Droigot colo	UNIT - V	t Donofita by ITS	8 Hrs
components, Evaluation Gui support the enforcement traf	delines, Challenges and Opportunities. ITS for Law Enforcement: Int fic rules and regulations, ITS Funding options and ITS case studies	roduction, Enhan	ice and
Course Outcomes: After going through this co	urse the student will be able to:		
CO1 : Identify and	apply ITS applications at different levels		
CO2 : Illustrate ITS	S architecture for planning process		
CO3 : Examine the	e significance of ITS for various levels		
CO4 : Compose the	e impo <mark>rtance of ITS in implimentions</mark>		
Reference Books:			
1. Pradip Kumar Sarkar and ISBN-9789387472068	Amit Kumar Jain, "Intelligent Transport Systems", PHI Learning Pri	vate Limited, Delł	ıi,2018,
2. Choudury M A and Sadek March 2003); ISBN-10: 1580	A, "Fundamentals of Intelligent Transportation Systems Planning" A 531601	rtech House publ	lishers (31
3. Bob Williams, "Intelligent	transportation systems standards", Artech House, London, 2008. IS	BN-13: 978-1-596	593-291-3
4. Asier Perallos, Unai Herna Technologies and Application	ndez-Jayo, Enrique Onieva, Ignacio Julio García Zuazola "Intelligen ns" Wiley Publishing ©2015, ISBN:1118894782 9781118894781	t Transport Syster	ms:
Scheme of Continuous Inte QUIZZES: Quizzes will be co 10 Marks. The sum of two qu TESTS: Students will be eva Levels: Remembering, Under will be evaluated for 50 Mark EXPERIENTIAL LEARNING Case study-based teaching le seminar/presentation/demo	ernal Evaluation (CIE): 20 + 40 + 40 = 100 nducted in online/offline mode. Two quizzes will be conducted & Eac aizzes will be the Final Quiz marks. luated in test, descriptive questions with different complexity levels (standing, Applying, Analyzing, Evaluating, and Creating). Two tests as, adding upto 100 marks. Final test marks will be reduced to 40 M a Students will be evaluated for their creativity and practical implemen- earning and Program specific requirements (15), Video based nstration (25) adding upto 40 marks.	ch Quiz will be eva Revised Bloom's 7 will be conducted arks. entation of the pro	aluated for laxonomy . Each test oblem.
Scheme of Semester End E choice from each unit. Each	xamination (SEE) for 100 marks: The question paper will have FIV question will carry 20 marks. Student will have to answer one full q	E questions with uestion from each	internal unit.

	Rub	ric for (CIE & S	SEE Theory courses				
	RUBRIC for CIE	1		RUBRIC for SEE	1			
SLNo	Content	Marks	Q. No	Contents	Marks			
1	Quizzes - Q1 & Q2	20	Each unit consists of TWO questions of 20 Marks each. Answer FIVE					
2	Tests - T1 & T2	40	1	full questions selecting ONE from each unit (1 to 5).				
3	Experiential Learning - EL1 & EL2	40	1&2	Unit-1: Question 1 or 2	20			
	Total Marks	100	3&4	Unit-2: Question 3 or 4	20			
			5&6	Unit-3: Question 5 or 6	20			
			7&-8	Unit-4: Question 7 or 8	20			
			9 & 10	Unit-5: Question 9 or 10	20			
				Total Marks	100			





University, Di	sagavi i	SEMESTER: II		
Course Code	: 22EC2D06T		CIE Marks	: 100
Credits L-T-P	: 3-0-0	ELECTRONIC SYSTEM DESIGN	SEE Marks	: 100
Hours	: 42L	Elective D (Global Elective)	SEE Durations	: 3 Hrs
Facu	lty Coordinator:	Prof. Ravishankar Holla		• •
		UNIT - I		9 Hrs
Design Process	& its Fundame	ntals: Life Cycle of Electronic Products, Design and Development Pr	ocess, Guidance	for
Product Planni	ng, Design and	Development, Technical Drawings, Circuit Diagrams, Computer-Aid	ed Design (CAD)	1
		UNIT - II		9 Hrs
System Archite Structures, Sys Experiential Le Calculation Pri Reliability Anal	ecture and Prote stems Design Ar earning: (4 quizz nciples, Expone lysis of Electron	ction Requirements: Introduction - Terminology, Functions and chitecture, Electronic System Levels, System Protection es on the below mentioned topics other than CIE) Reliability Analys: ntial Distribution, Failure of Electronic, Components, Failure of Ele ic Systems, Recommendations for Improving Reliability of Electronic	is: Introduction, ctronic Systems, c Systems	,
U		UNIT - III		8 Hrs
Thermal Mana Heat Transfer, Thermal Mana	gement and Coc Methods to Incr gement of Electr	ling: Introduction - Terminology, Temperatures and Power Dissipative rease Heat Transfer, Application Examples in Electronic Systems, Re ronic Systems, Cooling systems, liquid, air and non cooling systems	on, Calculation ecommendations	Principles, for
		UNIT - IV		8 Hrs
Electromagneti Introduction, C Discharge (ESI	ic Compatibility Coupling Betwee D), Recommenda	(EMC): n System Components, Grounding Electronic Systems, Shielding fro ations for EMC-compliant Systems Design	om Fields, Electr	ostatic
		UNIT - V		8 Hrs
Course Outcon	mes:			
After going th	rough this cou	rse the student will be able to:		
CO1	: Realize the fun Electronic Sys	ndamentals of Design, Architecture, thermal management, EMC and tem Design	l Recycling requi	rements o
CO2	: Analyze the va concepts of im	rious application wise design requirements in Electronic systems al plementations, standards and Compliances.	ong with the rela	ated
CO3	Use modern o	pen s <mark>ource tools</mark> to realize the various concepts of Electronic system	ı design	
CO4	Engage in self	-study through assignments, simulations, case studies and projects	5	
Reference Boo	oks:			
1. Fundamenta 978-3-319-558	als of Electronic 39-4, DOI:10.1	Systems Design, Jens Lienig, Hans Brümmer 2017, Springer Interr 007/978-3-319-55840-0	ational Publishi	ng, ISBN
2. "Embedded	System Design"	Marwedel, Peter, Springer Nature, 10.1007/978-3-030-60910-8		
3. "Electromag	netic Compatibi	lity Engineering", Henry W. Ott, WILEY Publication, ISBN: 978-0-47	0-18930-6	
4. "Handbook o	of Electronic Sys	stems Design" by Charles A. Harper, McGraw-Hill Inc.,US , 0070266	832, 978-00702	66834
Scheme of Co	ntinuous Inter	nal Evaluation (CIE): 20 + 40 + 40 = 100	0	
QUIZZES: Quiz	zzes will be cond	iucted in online/oilline mode. Two quizzes will be conducted & Each	i Quiz will be eva	nuated fo
TO Marks. The	sum or two quiz	zes will be the Final Quiz marks.	evised Bloom's 7	avonom
Levels: Remem	hering Underst	accum rest, descriptive questions with unterent complexity levels (R anding Annlying Analyzing Evaluating and Creating) Two tests w	ill he conducted	Each tee
will be evaluate	ed for 50 Marks	adding up to 100 marks. Final test marks will be reduced to 40 Ma	rks.	
EXPERIENTIA	L LEARNING: S	Students will be evaluated for their creativity and practical implement	ntation of the pro	oblem.
Case study-bas	sed teaching lea	rning and Program specific requirements (15), Video based	inter proprie	
seminar/prese	ntation/demons	stration (25) adding upto 40 marks.		
Scheme of Ser	mester End Exa	amination (SEE) for 100 marks: The question paper will have FIVE	questions with	internal
choice from eac	ch unit. Each qu	uestion will carry 20 marks. Student will have to answer one full qu	estion from each	unit.

	Rub RUBRIC for CIE	oric for (CIE & SEE Theory courses			
SLNo	Content	Marks	Q. No	Contents	Marks	
1	Quizzes - Q1 & Q2	20	Each u	nit consists of TWO questions of 20 Marks each. Answ	er FIVE	
2	Tests - T1 & T2	40		full questions selecting ONE from each unit (1 to 5).		
3	Experiential Learning - EL1 & EL2	40	1&2	Unit-1: Question 1 or 2	20	
	Total Marks	100	3&4	Unit-2: Question 3 or 4	20	
			5&6	Unit-3: Question 5 or 6	20	
			7&8	Unit-4: Question 7 or 8	20	
			9 & 10	Unit-5: Question 9 or 10	20	
				Total Marks	100	





	SEMESTER: II							
Course Code : 22EC2D07T		CIE Marks : 100)					
Credits L-T-P : 3-0-0	EVOLUTION OF WIRELESS TECHNOLOGIES	SEE Marks : 100	5					
Hours : 42L	Elective D (Global Elective)	SEE Durations : 3 H	Irs					
Faculty Coordinator:	Dr. Mahesh A							
	UNIT - I	9 н	Irs					
Introduction to cellular system	s: Overview of Cellular Systems and evolution 2G/3G/4G/5G, C	ellular Concepts – Freque	ency					
reuse, Co			Ū					
channel and Adjacent channel	Interference, C/I, Handoff, Blocking, Erlang Capacity, Bluetooth	, WiFi, WWAN and PAN.						
	UNIT - II	9 H	Irs					
Fundamentals of wireless com	munication: Wireless Channel, Wireless propagation, Link budge	t, Free-space path loss, N	√oise					
figure of receiver, Multipath fac	ding, Shadowing, Fading margin, Shadowing margin, Wireless Ch	annel Capacity, OFDM						
and LTE, Large Scale Propagat	ion effects and Channel Models							
	UNIT - III	8 H	Irs					
Fundamentals of 5G architectu	are: Difference between 4G and 5G, 5G Architecture, Planning of	5G Network, Quality of						
Service, Radio								
Network, Requirements, Security, SIM in 5G Era, Specifications, Standardization, Terminal States								
	UNIT - IV	8 H	Irs					
mmWave and Visible Light Cor	nmunications: Back ground and concept of mmWave Communication	ations, Frequency bands,	,					
propagation characteristics, ch	annel models, applications and challenges in 5G							
	UNIT - V	8 H	Irs					
Future Generations: Future Ge	enerations(where is the 6G?), Health Considerations, Identifiers, I	nterfaces, ,Key Derivation	n,					
Location Based Services, Mass	ive Internet of Things, Measurements, Network Functions Virtual	ization,						
Network Slicing, Open Source,	, User Equipment, Venicle-to-Venicle communications (V2V), Virt	ual Reality						
(VR/AR/AR). Case study- Brian								
Course Outcomes								
After going through this cour	rse the student will be able to:							
CO1 · Demonstrate t	beir understanding on functioning of wireless communication sy	stem and evolution of						
different wirele	ess communication systems and standards							
CO2 : Compare diffe	rent technologies used for wireless communication systems.							
CO3 : Demonstrate a	an ability explain recent techniques for Wireless Communication	systems						
CO4: Update the lat	est trends in wireless communications	5,500,000						
Reference Books:								
1 Theodore S Rannaport "Wil	reless Communications: Principles and Practice" Pearson 2nd E	dition						
Adity & Logennethem "Principles of Medern Wireless Communications" McCrew Hill 0017								
2. Autya Koagainathani, 111	"Massive MIMO Systems for 5G and bound Networks . Overview	Percent Trands Challens						
and Future Research Direction	" Sensors May 2020	, Recent Henus, Chaneng	ges,					
4 A N Uwaechia and N M M	abyuddin A Comprehensive Survey on Millimeter Wave Commu	nications for						
Fifth-Generation Wireless Netw	vorks: Feasibility and Challenges in IEEE Access vol 8 pp 623	67-62414 2020						
Scheme of Continuous Intern	nal Evaluation (CIE): $20 + 40 + 40 = 100$							
OUIZZES: Ouizzes will be cond	lucted in online/offline mode. Two ouizzes will be conducted & E	ach Ouiz will be evaluated	d for					
10 Marks. The sum of two quiz	zzes will be the Final Quiz marks.							

TESTS: Students will be evaluated in test, descriptive questions with different complexity levels (Revised Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating). Two tests will be conducted. Each test will be evaluated for 50 Marks, adding upto 100 marks. Final test marks will be reduced to 40 Marks.

EXPERIENTIAL LEARNING: Students will be evaluated for their creativity and practical implementation of the problem. Case study-based teaching learning and Program specific requirements (15), Video based

seminar/presentation/demonstration (25) adding upto 40 marks.

Rubric for CIE & SEE Theory courses								
	RUBRIC for CIE			RUBRIC for SEE				
SL.No	Content	Marks	Q. No	Contents	Marks			
1	Quizzes - Q1 & Q2	20	Each u	Each unit consists of TWO questions of 20 Marks each. Answer FIVE				
2	Tests - T1 & T2	40	1	full questions selecting ONE from each unit (1 to 5).				
3	Experiential Learning - EL1 & EL2	40	1&2	Unit-1: Question 1 or 2	20			
	Total Marks	100	3&4	Unit-2: Question 3 or 4	20			
			5&6	Unit-3: Question 5 or 6	20			
			7&-8	Unit-4: Question 7 or 8	20			
			9 & 10	Unit-5: Question 9 or 10	20			
				Total Marks	100			





University,	Belagav	d			
			SEMESTER: II		
Course Code	: 2	22ET2D08T	TRACIZING AND NAMICATION SYSTEMS	CIE Marks	: 100
Credits L-T-P	: 3	3-0-0	TRACKING AND NAVIGATION SISTEMS	SEE Marks	: 100
Hours	: 4	12L	Elective D (Global Elective)	SEE Durations	: 3 Hrs
Faculty Coord	lina	tor:	Prof. Shambulinga .M, Dr. B. Roja Reddy		
			UNIT - I		9 Hrs
An Introductio	on t	o Radar: Basi	c Radar, The simple form of the Radar Equation, Radar Block Diagra	am, Radar Freq	uencies,
Application of of Detection a	'rao nd	lar, Types of F False alarm, I	Radars. Detection of signals in Noise, Receiver Noise and the Signal-1 ntroduction to Doppler, MTI, UWB Radars	to Noise Ratio, I	Probability
			UNIT - II		8 Hrs
Terrestrial Net	two	rk based posi	tioning and navigation: General Issues of wireless positions location,	, Fundamentals	,
positioning in	cel	lular network	s, positioning in WLANs, Positioning in Wireless sensor networks.		
			UNIT - III		8 Hrs
Satellite-based	d na	avigation syste	ems: Global Navigation satellite systems (GNSS), GNSS receivers.		
			UNIT - IV		9 Hrs
LiDAR: Introd	uct	ion to LiDAR.	context and conceptual discussion of LiDAR, Types of LiDARS, LiDA	ARS Detection m	nodes,
Flash LiDAR v	vers	us Scanning	LiDAR, Monostatic versus Bistatic LiDAR, Major Devices in a LiDAR,	, LiDAR remote	sensing,
Basic compon	ent	s and physica	l principles of LiDAR, LiDAR accuracy and data formats.		0.
			UNIT - V		8 Hrs
SONAR: Unde	rwa	ater acoustics.	applications, comparison with radar, submarine detection and war	fare, overcomin	g the
effects of the o	ocea	an, sonar and	information processing. Transmission of the acoustic signal: Introdu	ction, detection	contrast
and detection	ind	lex, transmiss	ion equation, equation of passive and active sonar.		
Course Outco	me	es:	S		
After going the	hro	ugh this cour	se the student will be able to:		
CO1	: t	Understand th	e conce <mark>pts of Radar, LiDAR, Sonar, terrestria<mark>l and</mark> satellite based na</mark>	avigation system	1
CO2	: A	Apply the cond	epts <mark>of rad</mark> ars, LiDAR, Sonar, cellular networ <mark>ks, W</mark> LAN, sensor netw	vorks and satell	ites in
	0	letermining th	e us <mark>er posi</mark> tion and navigation.		
CO3	: 1	Analyze the di	ferent parameters of satellite and terrestrial networks for navigation	ı systems.	
CO4	: I	Evaluate the R	adar, LiDAR, Sonar systems and satellite and terrestrial network ba	ased navigation	and
	t	racking system	ns		
Reference Bo	ok	s:			
1. M. L Skolni	k,Iı	ntroduction to	RADAR Systems, 3rd edition, 2017, TATA Mcgraw-Hill, ISBN: 978-00	070445338	
2. Mark A Ric	har	ds, James A S	cheer, William A Holam, Principles of Modern Radar Basic Principles	s, 2010, 1st	
edition,SciTec	h P	ublishing Inc,	ISBN:978-1891121524.		
3. Davide dare	lari	i, Emanuela F	alletti, Marco Luise, Satellite and Terrestrial Radio Positioning techn	iques- A signal	processin
perspective, 1	st E	Edition, 2012,	Elsevier Academic Press, ISBN: 978-0-12-382084-6.		
4. Paul McMa	nar	non,LiDAR Te	chnologies and Systems, SPIE press, 2019.		
5. Pinliang Do	ng	and Qi Chen,	LiDAR Remote Sensing and Applications, CRC Press, 2018, ISBN: 97	78-1-4822-4301	7
6. Jean-Paul I	Mar	age, Yvon Mo	ri, Sonar and Underwater Acoustics, Wiley, 2013, ISBN: 978111860	0658	
Scheme of Co	ont	inuous Interr	al Evaluation (CIE): 20 + 40 + 40 = 100		
QUIZZES: Ou	izze	es will be cond	ucted in online/offline mode. Two quizzes will be conducted & Each	Quiz will be eva	aluated fo
10 Marks. The	e su	um of two quiz	zes will be the Final Quiz marks.	-	
TESTS: Stude	ents	s will be evalua	ated in test, descriptive questions with different complexity levels (Re	evised Bloom's 7	Гахопоту
	-				

Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating). Two tests will be conducted. Each test will be evaluated for 50 Marks, adding upto 100 marks. Final test marks will be reduced to 40 Marks.

EXPERIENTIAL LEARNING: Students will be evaluated for their creativity and practical implementation of the problem. Case study-based teaching learning and Program specific requirements (15), Video based

seminar/presentation/demonstration (25) adding upto 40 marks.

	RUBRIC for CIE			RUBRIC for SEE			
SLNo	Content	Marks	Q. No	Contents	Marks		
1	Quizzes - Q1 & Q2	20	Each u	nit consists of TWO questions of 20 Marks each. Answ	ver FIVE		
2	Tests - T1 & T2	40	1	full questions selecting ONE from each unit (1 to 5).			
3	Experiential Learning - EL1 & EL2	40	1&2	Unit-1: Question 1 or 2	20		
	Total Marks	100	3&4	Unit-2: Question 3 or 4	20		
			5&6	Unit-3: Question 5 or 6	20		
			7868	Unit-4: Question 7 or 8	20		
			9 & 10	Unit-5: Question 9 or 10	20		
				Total Marks	100		





Universey,	Dela	javi			
			SEMESTER: II		
Course Code	:	22IM2D09T	CIE Marks	:	100
Credits L-T-P	:	3-0-0	SEE Marks	:	100
Hours	:	42L	Elective D (Global Elective) SEE Durations	:	3 Hrs
Faci	ىت 1t	v Coordinator:	Dr. Vikram N Bahadurdesai	<u> </u>	
1 400	110	<i>y</i> c ooramator.	IINIT - I	-	8 Hrs
Introduction	Р	roject Planning	x Need of Project Planning Project Life Cycle Roles Responsibility and Team Work	$\frac{\Gamma}{Pr}$	oiect
Planning Proc	-s	s Work Break	down Structure (WBS) Introduction to Agile Methodology	11	bjeet
1 laining 110c	00	5, WOIK DICAR		T	Q Ure
Canital Budg	_ +i	na: Canital Ins	vestments: Importance and Difficulties, phases of capital hudgeting, levels of decision	' n r	<u>naking</u>
facets of proje	ot	analysis feasi	hility study – a schematic diagram, objectives of capital budgeting, levels of decision	.1 1	laking,
lacets of proje	ι	analysis, icasi	Inity study – a schematic diagram, objectives of capital budgeting		0 11=0
Drainat Casti		. Coat of Drain	UNIT - III of Maana of Einanga, Coat of Draduction, Warling Conital Decivirgment and its Einan		9 Π ΓS
Project Costi	ng	, Cost of Project	ted Cook Flow Statement, Projected Palance Sheet, Multi year Projections, Financial	ilCi	ng,
Modeling See	oj ioj	Cost Popofit A	teu Casil Flow Statement, Flojecteu Balance Sheet, Multi-year Flojections, Financial	•	
modeling, Soc	la	Cost Bellellt P		T	0.11
m 1 0 m 1		(D)			5 Hrs
Tools & Tech	n 1	ques of Projec	t Management: Bar (GAN11) chart, bar chart for combined activities, logic diagrams	s a	.na
networks, Pro	jec	et evaluation ai	nd review Techniques (PERT) Critical Path Method (CPM), Computerized project man	<u>ag</u>	ement
			UNIT - V		9 Hrs
Course Outco After going tl CO1 CO2		case Studies es, performance es: ough this cour Explain projec Evaluate the b	on Project Management: Case studies covering project planning, scheduling, use of the semicondex measurement.		ls
CO3	:	Analyze the co	nce <mark>pts, tool</mark> s and techniques for managing pr <mark>ojects.</mark>		
CO4	:	Illustrate proje	ect management practices to meet the needs of Domain specific stakeholders from m	ul	tiple
		sectors of the	economy (i.e. consulting, government, arts, media, and charity organizations).		
Reference Bo	oł	s:			
1. Prasanna C	ha	andra, Project I	Planning Analysis Selection Financing Implementation & amp; Review, Tata		
McGraw Hill F	ul	olication, 8th E	Edition, 2010, ISBN 0-07-007793-2.		
2. Project Mar	a	gement Institut	te, A Guide to the Project Management Body of Knowledge (PMBOK		
Guide), 5th Ed	lit	ion, 2013, ISB	N: 978- <mark>1-935589</mark> -67-9		
3. Harold Kerz	zne	er. Project Man	agement A System approach to Planning Scheduling & amp; Controlling,		
John Wiley &	ım	p: Sons Inc., 1	1th Edition, 2013, ISBN 978-1-118-02227-6.		
4. Rorv Burke	. F	roject Manage	ment – Planning and Controlling Techniques, John Wiley & amp: Sons, 4th		
Edition. 2004.	Í	SBN: 9812-53-	121-1		
, =001			VITITV/		
Schome of Ca		tinuous Intore	$r_{r_{r_{r_{r_{r_{r_{r_{r_{r_{r_{r_{r_{r$	—	
QUIZZES: Qui 10 Marks. The TESTS: Stude Levels: Remen	izz s nt	es will be cond um of two quiz s will be evalu- ering. Underst	lucted in online/offline mode. Two quizzes will be conducted & Each Quiz will be evant zes will be the Final Quiz marks. ated in test, descriptive questions with different complexity levels (Revised Bloom's T anding, Applying, Analyzing, Evaluating, and Creating). Two tests will be conducted	lu ax	ated for onomy

will be evaluated for 50 Marks, adding upto 100 marks. Final test marks will be reduced to 40 Marks.

EXPERIENTIAL LEARNING: Students will be evaluated for their creativity and practical implementation of the problem. Case study-based teaching learning and Program specific requirements (15), Video based

seminar/presentation/demonstration (25) adding upto 40 marks.

	RUBRIC for CIE	1	RUBRIC for SEE				
SLNo	Content	Marks	Q. No	Contents	Marks		
1	Quizzes - Q1 & Q2	20	Each u	nit consists of TWO questions of 20 Marks each. Answ	ver FIVE		
2	Tests - T1 & T2	40	1	full questions selecting ONE from each unit (1 to 5).			
3	Experiential Learning - EL1 & EL2	40	1&2	Unit-1: Question 1 or 2	20		
	Total Marks	100	3&4	Unit-2: Question 3 or 4	20		
			5&6	Unit-3: Question 5 or 6	20		
			7868	Unit-4: Question 7 or 8	20		
			9 & 10	Unit-5: Question 9 or 10	20		
				Total Marks	100		



RV	RV Educational II RV College o	nstitutions [®] of Engineering
STITUTOL ST	Autonomous Institution Affiliated to Visvesvaraya Technological University Belanavi	Approved by AICTE. New Delhi

University,	Belag	javi						
<u> </u>		201005105	SEMESTER: II					
Course Code	:	22IS2D10T	DATABASE AND INFORMATION SYSTEMS	CIE Marks	: 100			
Credits L-T-P	:	3-0-0		SEE Marks	: 100			
Hours	:	42L	Elective D (Global Elective)	SEE Durations	: 3 Hrs			
Facı	llt	y Coordinator:	Prof.Smitha G R					
			UNIT - I		8 Hrs			
Advanced Dat	ab	ase Models, Sy	rstems, and Applications : Enhanced Data Models: Introduction to A	Active, Temporal,	Spatial,			
Multimedia, a	nd	Deductive Da	tabases . Distributed Database Concepts : Distributed Database Co	ncepts, Data	α (1)			
Fragmentation	1,	Replication, an	d Allocation Techniques for Distributed Database Design, Overview	of Concurrency	Control			
and Recovery	ın	Distributed Da	atabases		0.17			
T , 1 , 1 ,				1.1.1.1.00	8 Hrs			
Introduction t	o I	Information Re	trieval and Web Search : Information Retrieval (IR) Concepts Retriev	al Models, Types	sof			
Queries in IR	Sy	stems , Text Pi	reprocessing, Inverted Indexing, Evaluation Measures of Search Re	levance ,Web Sea	arch and			
Analysis, Tren	as	s in Information	n Retrieval .					
			UNIT - III	<u> </u>	8 Hrs			
Information S	ys	tems, Organiza	tions and Strategy: Organizations and information systems, How in	formation system	ns impact			
organization a	no	business firm	is, Using information systems to gain competitive advantage, manage	gement issues, El	thical and			
Social issues i	n :	Information Sy	stems: Understanding ethical and Social issues related to information	ion Systems, Eth	ics in an			
intormation se	DCI	ety, The moral		iiiig.	0.11			
A -1- : : O		4 1 ID 11	UNII - IV		9 Hrs			
Achieving Ope	ra	tional Excellen	ment(CDM) systems. Enterprise systems, Supply chain mana	agement(SCM) sy	stems,			
Customer relationship management (CRM) systems, Enterprise application. E-commerce: Digital Markets Digital Goods:								
Building and I	7_4	commerce web	site A Case study on EPP		limerce,			
Dunung and I	2-1				0 11=0			
Monoging Kng		ledge	ONII - V		9 1115			
The knowledge	- w	nonogement lo	ndscape Enterprise wide knowledge management system. Knowled	lae work systems				
Intelligent tecl	י חח	iques Enhanc	ing Decision Making: Decision making and information systems. Bi	isiness intelligen	, ce in the			
enterprise. Bu	si	ness intelligend	constituencies. Building Information Systems: Systems as planne	ed organizational	change.			
Overview of sv	st	ems developme	ent.	sa organizationa	onango,			
Course Outco	m	es:						
After going th	ıre	ough this cour	rse the student will be able to:					
CO1	:	Understand th	e different models for Infromation Retrieval.					
CO2	:	Appricieate the	e technology of Information Retrieval and Web Search					
CO3	:	To understand	the basic principles and working of information technology.					
CO4	•	Describe the r	ole of information technology and information systems in business.					
Reference Bo	പ്പ	s.						
1 Kenneth C		udon and Ian	e P. Laudon: Management Information System Managing the Digit	al Firm Pearson				
Education 14	ь th	Global edition	2016 ISBN:0781202004007	ai Film, i caison				
2 Fundament	a1	s of Database S	Systems Ramez Elmasri Shamkant B Navathe 7th Edition 2016	Published by Pe	arson			
Copyright ©	IS	BN-10: 013397	70779	i ubilbileu by i et				
3. James A. O	' F	Brien, George N	I. Marakas: Management Information Systems, Global McGraw Hill	10th Edition, 20	011. ISBN:			
978-0072823	1	0.		, 10th Bardon, 1				
4. Database M	[a1	nagement Syste	ems, Raghu Ramakrishnan and Johannes Gehrke, 3rd Edition, 200	3. McGraw-Hill.	ISBN:			
97800712315	10)	,,,,,	-,,				
Scheme of Co	n	tinuous Interr	nal Evaluation (CIE): 20 + 40 + 40 = 100					
OUIZZES: Out	zz	es will be cond	ucted in online/offline mode. Two guizzes will be conducted & Each	n Ouiz will be eva	luated for			
10 Marks. The	e s	um of two quiz	zes will be the Final Ouiz marks.	C ¹¹				
TESTS: Stude	nt	s will be evaluated	ated in test, descriptive questions with different complexity levels (R	evised Bloom's T	axonomy			
Levels: Remen	ıb	ering, Understa	anding, Applying, Analyzing, Evaluating, and Creating). Two tests w	vill be conducted.	Each test			
will be evaluat	ec	l for 50 Marks,	adding upto 100 marks. Final test marks will be reduced to 40 Ma	rks.				
EXPERIENTI	۱L	LEARNING: S	tudents will be evaluated for their creativity and practical implement	ntation of the pro	blem.			
Case study-ba	se	d teaching lear	rning and Program specific requirements (15), Video based	-				
seminar/prese	en	tation/demons	tration (25) adding upto 40 marks.					

RUBRIC for CIE				RUBRIC for SEE			
SLNo	Content	Marks	Q. No	Contents	Marks		
1	Quizzes - Q1 & Q2	20	Each u	nit consists of TWO questions of 20 Marks each. Answ	ver FIVE		
2	Tests - T1 & T2	40]	full questions selecting ONE from each unit (1 to 5).			
3	Experiential Learning - EL1 & EL2	40	1&2	Unit-1: Question 1 or 2	20		
	Total Marks	100	38:4	Unit-2: Question 3 or 4	20		
			5&6	Unit-3: Question 5 or 6	20		
			7868	Unit-4: Question 7 or 8	20		
			9 & 10	Unit-5: Question 9 or 10	20		
				Total Marks	100		



PV Educational Institutions		Go, change	e the world
RV College of Engineering *			
Autonomous Institution Affiliated New Delhi			
to Visvesvaraya Technological University, Belagavi			
	SEMESTER: II		
Course Code : 22IS2D11T		CIE Marks	: 100
Credits L-T-P : 3-0-0	MANAGEMENT INFORMATION SYSTEMS	SEE Marks	: 100
Hours : 42L	Elective D (Global Elective)	SEE Durations	s : 3 Hrs
Faculty Coordinator:	Prof. Vanishree K		
	UNIT - I		8 Hrs
Overview: Introduction: Professional Software Developm activities, Coping with Change, Agile Software Development: In scaling agile methods. Informa Perspectives on information sys	nent, Software Engineering Ethics, Case studies. Software Proc Process improvement. The Rational Unified Process. Compute troduction to agile methods, Agile development techniques, Ag ion Systems in Global Business Today: The role of information stems, Contemporary approaches to information systems	cesses: Models, Proce r Aided Software En tile project managem n systems in busines	ess Igineering. Ient and Iss today,
	UNIT - II		9 Hrs
Requirements Engineering and Software Requirements: Functi and Change. System Modeling: architecture. Information Syste systems impact organization an issues	System Modeling: onal and Non-functional requirements. Requirements Elicitation Context models, Interaction models, Structural models, Behav ms, Organizations and Strategy: Organizations and information and business firms, Using information systems to gain competit	on, Specification, Va vioural models, Modon systems, How info ive advantage, mana	lidation el driven ormation agement
	UNIT - III		9 Hrs
Development and Testing: Design and implementation: Of development. Software Testing: Securing Information Systems: framework for security and cor	bject oriented design using UML, Design patterns, Implementa Development testing, Test-driven development, Release testing System vulnerability and abuse, Business value of security ar trol. Technology and tools for protecting information resources	tion issues, Open-so g, User testing. 1d control, Establish s. A case study on cy	purce vbercrime.
	UNIT - IV		8 Hrs
dependable systems: Dependa dependability, A15 Availability Markets Digital Goods: E-comr Software Management: Project Management: Risk Man	and reliability, reliability requirements, Reliability measurement nerce and the internet, E-commerce-business and technology, UNIT - V agement, Managing People, Teamwork, Project Planning: Softw	s, formal methods ar nts E-commerce: Dig <u>A Case study on ER</u> ware Pricing, Plan dr	nd gital PP. 8 Hrs iven
development, Project Schedulir Systems: Systems as planned o	ng, Agile planning, Estimation Techniques, COCOMO cost mod organizational change, Overview of systems development.	eling. Building Infor	mation
Course Outcomes:	se the student will be able to:		
CO1 · Understand ar	d apply the fundamental concents of software engineering for	information systems	3
CO2: Develop the kr	owledge about software engineering for management of inform	ation systems	
CO3 : Interpret and t	recommend the use information technology to solve business p	problems.	
CO4 : Apply a frame	vork and process for aligning organization's IT objectives with	business strategy.	
Reference Books:		0	
1. Kenneth C. Laudon and Jan Education, 14th Global edition	e P. Laudon: Management Information System, Managing the 1, 2016, ISBN:9781292094007.	Digital Firm, Pearson	n
2. Ian Sommerville,— Software 9788131762165	Engineering, 9th Edition, Pearson Education, 2013, ISBN:		
3. W.S. Jawadekar: Manageme	nt Information Systems, Tata McGraw Hill, 2006, ISBN: 97800	70616349.	
4. James A. O' Brien, George M 10th Edition, 2011, ISBN: 978-	. Marakas: Management Information Systems, Global McGraw 0072823110	r Hill,	
Scheme of Continuous Intern	al Evaluation (CIE): 20 + 40 + 40 = 100		
QUIZZES: Quizzes will be cond 10 Marks. The sum of two quiz TESTS: Students will be evaluated	ucted in online/offline mode. Two quizzes will be conducted & zes will be the Final Quiz marks. Ated in test, descriptive questions with different complexity level	Each Quiz will be ev	valuated for Taxonomy
Levels: Remembering, Understa will be evaluated for 50 Marks, EXPERIENTIAL LEARNING : S	anding, Applying, Analyzing, Evaluating, and Creating). Two te adding upto 100 marks. Final test marks will be reduced to 40 tudents will be evaluated for their creativity and practical impl	sts will be conducted 0 Marks. lementation of the p	d. Each test
Case study-based teaching lear seminar/presentation/demons	rning and Program specific requirements (15), Video based tration (25) adding upto 40 marks.		
Scheme of Semester End Exa choice from each unit. Each qu	mination (SEE) for 100 marks: The question paper will have estion will carry 20 marks. Student will have to answer one fu	FIVE questions with Il question from eac	n internal h unit.
	RUBIIC IOI CIE & SEE THEORY COURSES		

RUBRIC for CIE			RUBRIC for SEE			
SLNo	Content	Marks	Q. No	Contents	Marks	
1	Quizzes - Q1 & Q2	20	Each u	Each unit consists of TWO questions of 20 Marks each. Answer FIVE full questions selecting ONE from each unit (1 to 5).		
2	Tests - T1 & T2	40]			
3	Experiential Learning - EL1 & EL2	40	18:2	Unit-1: Question 1 or 2	20	
	Total Marks	100	3&4	Unit-2: Question 3 or 4	20	
		•	5&6	Unit-3: Question 5 or 6	20	
			78.8	Unit-4: Question 7 or 8	20	
			9 & 10	Unit-5: Question 9 or 10	20	
				Total Marks	100	



RV Educ	ational Institutions		Go, change	the world
RV RV Co	llege of Engineering *			
Autonomou Institution to Visvesva	JS Approved by AICTE, Affiliated New Delhi araya			
Technologi University,	cal Belagavi			
		SEMESTER: II		
Course Code Credits L-T-P	: 22MAT2D12T : 3-0-0	STATISTICAL AND OPTIMIZATION METHODS	CIE Marks SEE Marks	: 100
Hours	: 42L	Elective D (Global Elective)	SEE Durations	3 : 3 Hrs
Faculty Coord	inator:	Dr. PRAKASH R		
		UNIT - I		9 Hrs
Probability mo and random v Expected valu (MGF), MGF o	odels of N random ectors, Functions es of sums, Prob f the sum of inde	n variables, Vector notation, Marginal probability functions, Inde s of random vectors, Expected value vector and Correlation matri ability density function of the sum of two random variables, Mon spendent random variables, Characteristic function and Probabili	pendence of rando x, Gaussian rando tent Generating Fu ity generating func	m variables m vectors, inctions tion.
<u> </u>		UNIT - II		8 Hrs
Estimation: If and sufficience likelihood, Bay	Point estimation, y, Variance of a j yesian estimation	Estimator and estimate, Criteria for good estimates - unbiasedne point estimator, Methods of point estimation - Method of moment n of parameters.	ess, consistency, ef ts and Method of m	ficiency naximum
		UNIT - III		9 Hrs
Null and alter regions and p and two-sided samples (F, Cl	native hypothesis ower, Standard M confidence inter hi – square, Z, t -	s, Procedure for statistical testing, Type I and Type II errors: level lormal null distribution (Z-test), Z-tests for means and proportion vals, P-value, Inference about variances, Special tests of significa - test).	of significance, Re 1s, Duality: two-sid ance for large and s	ed tests small
_ , .	• · · ·	UNIT - IV		8 Hrs
Artificial Neur variants, Loss	al Networks: Intr functions in arti	oduction - Neuron model, Multilayer perceptions - Back propaga ficial neural networks, Stochastic gradient descent method.	tion algorithm and	its
		UNIT - V		8 Hrs
Data mining, data, Statistic Kernel functio	Hierarchy Cluste al nature of Big o ons and Nonlinea	ring, k-Means Clustering, Distance Metric, Data mining for Big d lata, Support Vector Machines, Statistical Learning Theory, Lines r Support Vector Machines.	ata, Characteristic ar Support Vector I	s of Big Machine,
Course Outor	mes			
After going th	hrough this cou	rse the student will be able to:		
C01	: Illustrate the f	fundamental concepts of statistics, random variables, estimation, nd machine learning algorithms.	, inferential statisti	ics, fuzzy
CO2	: Derive the solution statistics, fuzz	ation by applying the acquired knowledge of random variables, es y optimization and machine learning algorithms to the problems	stimation, inferenti of engineering app	ial olications.
CO3	: Evaluate the s world problem	olution of the problems using appropriate statistical and probabi s arising in many practical situations.	ility techniques to t	the real
CO4	: Compile the or optimization g	verall knowledge of statistics, probability distributions and estima ained to engage in life – long learning.	ation, tests of hypo	othesis and
Reference Bo	oks:			
1. Roy D. Yate ISBN: 978935	es, David J. Good 4243455.	man, "Probability and Stochastic Processes", 3rd Edition, An Ind	ian Adaptation, Wi	iley, 2021,
2. Douglas C. & Sons, 2019	Montgomery and ISBN: 9781119	l George C. Runger, "Applied Statistics and Probability for Engine 570615.	ers", 7th Edition, .	John Wiley
3. Trevor Hast Prediction", 21	tie Robert Tibshin nd Edition, Sprin	ani Jerome Friedman, "The Elements of Statistical Learning - Da ger, 2009 (Reprint 2017), ISBN-10: 0387848576, ISBN-13: 9780	ita Mining, Inference 387848570.	ce, and
4. Michael Ba 2014, ISBN- 1	ron, "Probability <u>3: 978-1-4822</u> -1	and Statistics for Computer Scientists", 2nd Edition, CRC Press, 410-9.		
5. Shai Shaley Cambridge Ur	v-Shwartz and Sh niversity Press, 20	nai Ben-David "Understanding Machine Learning: From Theory to 014, ISBN: 978-1-107-05713-5.) Algorithms", 1st H	Edition,



Scheme of Continuous Internal Evaluation (CIE): 20 + 40 + 40 = 100

QUIZZES: Quizzes will be conducted in online/offline mode. Two quizzes will be conducted & Each Quiz will be evaluated for 10 Marks. The sum of two quizzes will be the Final Quiz marks.

TESTS: Students will be evaluated in test, descriptive questions with different complexity levels (Revised Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating). Two tests will be conducted. Each test will be evaluated for 50 Marks, adding upto 100 marks. Final test marks will be reduced to 40 Marks.

EXPERIENTIAL LEARNING: Students will be evaluated for their creativity and practical implementation of the problem. Case study-based teaching learning and Program specific requirements (15), Video based

seminar/presentation/demonstration (25) adding upto 40 marks.

RUBRIC for CIE			RUBRIC for SEE			
SLNo	Content	Marks	Q. No	Contents	Marks	
1	Quizzes - Q1 & Q2	20	Each unit consists of TWO questions of 20 Marks each. Answer FT			
2	Tests - T1 & T2	40	full questions selecting ONE from each unit (1 to 5).			
3	Experiential Learning - EL1 & EL2	40	1&2	Unit-1: Question 1 or 2	20	
	Total Marks	100	3&4	Unit-2: Question 3 or 4	20	
10		148	5&6	Unit-3: Question 5 or 6	20	
			7&8	Unit-4: Question 7 or 8	20	
			9 & 10	Unit-5: Question 9 or 10	20	
				Total Marks	100	





SEMESTER: II									
Course Code	:	22ME2D13T	INDUSTRY 4 0	CIE Marks	: 100				
Credits L-T-P	:	3-0-0	INDUSIRI 4.0	SEE Marks	: 100				
Hours	:	42L	Elective D (Global Elective)	SEE Durations	: 3 Hrs				
Faci	11tr	v Coordinator	Dr. Gonalakrishna H D						
UNIT - I									
Fundamentals	3.0	f Industry 4.0			0				
Introduction.	Ind	lustry 4.0. RA	MI 4.0 (Reference Architecture Model Industry 4.0), Servitization, Pro	oduct Service-Sv	stem				
(PSS) Industry	74	.0 across the S	Sectors Introduction, Transportation 4.0: Multimodal Transportation	Systems, Rail 4.	0, Digital				
Transformatic	Transformation of Railways, Logistics 4.0 (Implications), Fundamentals of Industry 4.0 Introduction Industry 4.0 RAMI 4.0								
(Reference Arc	hi	tecture Model	Industry 4.0), Servitization, Product Service-System (PSS)	, , ,					
Industry 4.0 a	cr	oss the Sector	S S						
Introduction,	Tra	ansportation 4	.0: Multimodal Transportation Systems, Rail 4.0, Digital Transforma	tion of Railways,	Logistics				
4.0 (Implicatio	ns	- -			_				
		·	UNIT - II		8 Hrs				
The Concept of	of t	he IIoT: Moder	n Communication Protocols, Wireless Communication Technologies	, Proximity Netwo	ork				
Communication	on	Protocols, TCI	P/IP, API: A Technical Perspective, Middleware Architecture.						
			UNIT - III		8 Hrs				
Data Analytic	s iı	n Manufacturi	ng: Introduction, Power Consumption in manufacturing, Anomaly D	etection in Air					
Conditioning,	Sr	nart Remote M	lachinery Maintenance Systems with Komatsu, Quality Prediction in	Steel Manufactu	aring.				
Internet of Th	ing	s and New Va	lue Proposition, Introduction, Internet of Things Examples, IoTs Value	ue Creation Barri	iers:				
Standards, Se	cu	rity and Priva	cy Concerns.						
Advances in R	lob	otics in the Er	a of Industry 4.0, Introduction, Recent Technological Components o	f Robots, Advanc	ed				
Sensor Techn	olo	gies, Artificial	Intelligence, Internet of Robotic Things, Cloud Robotics.						
			UNIT - IV		9 Hrs				
Additive Manu	ıfa	cturing Techn	ologies and Applications: Introduction, Additive Manufacturing (AM)	Technologies, St	ereo				
lithography, 3	DF	P, Fused Depos	sition Modeling, Selective Laser Sintering, Laminated Object Manufa	cturing, Laser Er	ngineered				
Net Shaping,	Ad	vantages of Ad	ditive Manufacturing, Disadvantages of Additive Manufacturing.	.	6.1				
Advances in V	1rt	ual Factory Re	search and Applications, The State of Art, The Virtual Factory Softw	are, Limitations	of the				
Commercial S	011	ware.			0.11				
	1	·							
Augmented R	ai	ity: Definitions	and application of AR, VR, MR, Limitations of AR, VR, Hardware de		9 115				
	T 1 1	and increase and	aballangua in AD Industrial applications, IsT and the Need for Date	vices and Softwa	ure 9 ms				
Internet of Th	inn ima	cal issues and	challenges in AR, Industrial applications, IoT and the Need for Data	evices and Softwa Rationalization	y nis ure				
Internet of Th	ing	cal issues and s (IoT), Internet the Internet of	challenges in AR, Industrial applications, IoT and the Need for Data et of Things Vision, Internet of Things (IoT) Frameworks, Architectur f Things (IoT) Frameworks, Internet of Things (IoT)	evices and Softwa Rationalization e of Internet of T	hings				
Internet of Th (IoT), Visualiz	ing	cal issues and s (IoT), Internet the Internet c	challenges in AR, Industrial applications, IoT and the Need for Data et of Things Vision, Internet of Things (IoT) Frameworks, Architectur if Things (IoT), Essential Technologies of the Internet of Things (IoT), of IoT, Collaborative Operations, Training	evices and Softwa Rationalization e of Internet of T Key Technologies	y nis ure hings s Involved				
Internet of Th (IoT), Visualiza in Internet of	ing ng Th	cal issues and (s (IoT), Internet (the Internet c ings, Enablers	challenges in AR, Industrial applications, IoT and the Need for Data et of Things Vision, Internet of Things (IoT) Frameworks, Architectur of Things (IoT), Essential Technologies of the Internet of Things (IoT), of IoT, Collaborative Operations, Training.	evices and Softwa Rationalization e of Internet of T Key Technologies be way forward	re hings s Involved				
Internet of Th (IoT), Visualizi in Internet of Smart Factori A Roadmap: I	ing ng Th es:)ig	cal issues and s (IoT), Internet the Internet c ings, Enablers Introduction, ital Transform	challenges in AR, Industrial applications, IoT and the Need for Data et of Things Vision, Internet of Things (IoT) Frameworks, Architectur of Things (IoT), Essential Technologies of the Internet of Things (IoT), of IoT, Collaborative Operations, Training. Smart factories in action, Importance, Real world smart factories, T. ation, Transforming Operational Processes, Business Models, Increa	evices and Softwa Rationalization e of Internet of T Key Technologies he way forward. se Operational E	hings s Involved				
Internet of Th (IoT), Visualizi in Internet of Smart Factori A Roadmap: I Develop New I	ing ng Th es: Dig Bu	cal issues and s (IoT), Internet the Internet c ings, Enablers Introduction, ital Transform siness Models.	challenges in AR, Industrial applications, IoT and the Need for Data et of Things Vision, Internet of Things (IoT) Frameworks, Architectur of Things (IoT), Essential Technologies of the Internet of Things (IoT), of IoT, Collaborative Operations, Training. Smart factories in action, Importance, Real world smart factories, Tation, Transforming Operational Processes, Business Models, Increa	evices and Softwa Rationalization e of Internet of T Key Technologies he way forward. se Operational E	hings s Involved				
Internet of Th (IoT), Visualiz in Internet of Smart Factori A Roadmap: I Develop New I	ing ng Th es: Dig Bu	cal issues and s (IoT), Internet the Internet of ings, Enablers Introduction, ital Transform siness Models.	challenges in AR, Industrial applications, IoT and the Need for Data et of Things Vision, Internet of Things (IoT) Frameworks, Architectur of Things (IoT), Essential Technologies of the Internet of Things (IoT), of IoT, Collaborative Operations, Training. Smart factories in action, Importance, Real world smart factories, Tation, Transforming Operational Processes, Business Models, Increa	evices and Softwa Rationalization e of Internet of T Key Technologies he way forward. se Operational E	ire hings s Involved fficiency,				
Internet of Th (IoT), Visualizi in Internet of Smart Factori A Roadmap: I Develop New I	ing ng Th es: Dig Bu	cal issues and s (IoT), Internet the Internet c ings, Enablers Introduction, ital Transform siness Models. es:	challenges in AR, Industrial applications, IoT and the Need for Data et of Things Vision, Internet of Things (IoT) Frameworks, Architectur of Things (IoT), Essential Technologies of the Internet of Things (IoT), of IoT, Collaborative Operations, Training. Smart factories in action, Importance, Real world smart factories, T. ation, Transforming Operational Processes, Business Models, Increa	evices and Softwa Rationalization e of Internet of T Key Technologies he way forward. se Operational E	In the second se				
Internet of Th (IoT), Visualizi in Internet of Smart Factori A Roadmap: I Develop New I Course Outco After going th	ing ing Th es: Dig Bu	cal issues and s (IoT), Internet the Internet c ings, Enablers Introduction, ital Transform siness Models. es: pugh this cour	challenges in AR, Industrial applications, IoT and the Need for Data et of Things Vision, Internet of Things (IoT) Frameworks, Architectur of Things (IoT), Essential Technologies of the Internet of Things (IoT), of IoT, Collaborative Operations, Training. Smart factories in action, Importance, Real world smart factories, T ation, Transforming Operational Processes, Business Models, Increa	evices and Softwa Rationalization e of Internet of T Key Technologies he way forward. se Operational E	Interestings s Involved fficiency,				
Internet of Th (IoT), Visualizi in Internet of Smart Factori A Roadmap: I Develop New I Course Outco After going th CO1	ing ing Th es:)ig Bu	cal issues and gs (IoT), Internet the Internet c ings, Enablers Introduction, ital Transform siness Models. es: ough this cour Understand th	challenges in AR, Industrial applications, IoT and the Need for Data et of Things Vision, Internet of Things (IoT) Frameworks, Architectur of Things (IoT), Essential Technologies of the Internet of Things (IoT), of IoT, Collaborative Operations , Training. Smart factories in action, Importance, Real world smart factories, T ation, Transforming Operational Processes, Business Models, Increa	evices and Softwa Rationalization e of Internet of T Key Technologies he way forward. se Operational E	hings s Involved fficiency,				
Internet of Th (IoT), Visualizi in Internet of Smart Factori A Roadmap: I Develop New I Course Outco After going th CO1	ing ing Th es: Dig Bu	cal issues and s (IoT), Internet the Internet c ings, Enablers Introduction, ital Transform siness Models. es: ough this cour Understand th individuals	challenges in AR, Industrial applications, IoT and the Need for Data et of Things Vision, Internet of Things (IoT) Frameworks, Architectur of Things (IoT), Essential Technologies of the Internet of Things (IoT), of IoT, Collaborative Operations , Training. Smart factories in action, Importance, Real world smart factories, T ation, Transforming Operational Processes, Business Models, Increa rse the student will be able to: he opportunities, challenges brought about by Industry 4.0 for benef	evices and Softwa Rationalization e of Internet of T Key Technologies he way forward. se Operational E	hings s Involved fficiency, ns and				
Internet of Th (IoT), Visualizi in Internet of Smart Factori A Roadmap: I Develop New I Course Outco After going th CO1	ing ing Th es: Dig Bu	cal issues and s (IoT), Internet the Internet c ings, Enablers Introduction, ital Transform siness Models. es: ough this cour Understand th individuals Analyze the ef	challenges in AR, Industrial applications, IoT and the Need for Data et of Things Vision, Internet of Things (IoT) Frameworks, Architectur of Things (IoT), Essential Technologies of the Internet of Things (IoT), of IoT, Collaborative Operations , Training. Smart factories in action, Importance, Real world smart factories, T ation, Transforming Operational Processes, Business Models, Increa rse the student will be able to: he opportunities, challenges brought about by Industry 4.0 for beneficient fectiveness of Smart Factories, Smart cities, Smart products and Sm	evices and Softwa Rationalization e of Internet of T Key Technologies he way forward. se Operational E its of organization	Interesting the second				
Internet of Th (IoT), Visualizi in Internet of Smart Factori A Roadmap: I Develop New I Course Outco After going th CO1 CO2 CO3	ing ng Th es:)ig: 3u m	cal issues and s (IoT), Internet the Internet c ings, Enablers Introduction, ital Transform siness Models. es: bugh this cou Understand th individuals Analyze the ef Apply the Indu	challenges in AR, Industrial applications, IoT and the Need for Data et of Things Vision, Internet of Things (IoT) Frameworks, Architectur of Things (IoT), Essential Technologies of the Internet of Things (IoT), of IoT, Collaborative Operations , Training. Smart factories in action, Importance, Real world smart factories, T ation, Transforming Operational Processes, Business Models, Increa rese the student will be able to: ne opportunities, challenges brought about by Industry 4.0 for benef fectiveness of Smart Factories, Smart cities, Smart products and Sm astrial 4.0 concepts in a manufacturing plant to improve productivity	evices and Softwa Rationalization e of Internet of T Key Technologies he way forward. se Operational E its of organization art services y and profits	Interesting the second				
Internet of Th (IoT), Visualizi in Internet of Smart Factori A Roadmap: I Develop New I Course Outco After going th CO1 CO2 CO3 CO4	ing ing Th es: Dig Bu b r c	cal issues and s (IoT), Internet the Internet c ings, Enablers Introduction, ital Transform siness Models. es: Dugh this cour Understand the individuals Analyze the eff Apply the Indu Evaluate the eff	challenges in AR, Industrial applications, IoT and the Need for Data et of Things Vision, Internet of Things (IoT) Frameworks, Architectur of Things (IoT), Essential Technologies of the Internet of Things (IoT), of IoT, Collaborative Operations , Training. Smart factories in action, Importance, Real world smart factories, T ation, Transforming Operational Processes, Business Models, Increa rese the student will be able to: ne opportunities, challenges brought about by Industry 4.0 for benef fectiveness of Smart Factories, Smart cities, Smart products and Sm 1strial 4.0 concepts in a manufacturing plant to improve productivity ffectiveness of Cloud Computing in a networked economy	evices and Softwa Rationalization e of Internet of T Key Technologies he way forward. se Operational E its of organization art services y and profits	In s and				
Internet of Th (IoT), Visualizi in Internet of Smart Factori A Roadmap: I Develop New I Course Outco After going th CO1 CO2 CO3 CO4 Reference Bo	ing ing Th es:)ig Bu nro	cal issues and cal issues and s (IoT), Internet ings, Enablers Introduction, ital Transform siness Models. es: bugh this cour Understand the individuals Analyze the ef Apply the Indu Evaluate the est s:	challenges in AR, Industrial applications, IoT and the Need for Data et of Things Vision, Internet of Things (IoT) Frameworks, Architectur of Things (IoT), Essential Technologies of the Internet of Things (IoT), of IoT, Collaborative Operations , Training. Smart factories in action, Importance, Real world smart factories, T ation, Transforming Operational Processes, Business Models, Increa rese the student will be able to: ne opportunities, challenges brought about by Industry 4.0 for benef fectiveness of Smart Factories, Smart cities, Smart products and Sm Istrial 4.0 concepts in a manufacturing plant to improve productivity ffectiveness of Cloud Computing in a networked economy	evices and Softwa Rationalization e of Internet of T Key Technologies he way forward. se Operational E its of organization hart services y and profits	In s and				
Internet of Th (IoT), Visualizi in Internet of Smart Factori A Roadmap: I Develop New I Course Outco After going th CO1 CO2 CO3 CO4 Reference Bo	ing ing Th es: Dig Bu m i : : : : :	cal issues and cal issues and gs (IoT), Internet ings, Enablers Introduction, ital Transform siness Models. es: ough this cour- Understand the individuals Analyze the eff Apply the Indu Evaluate the eff s: rist_Industry.	challenges in AR, Industrial applications, IoT and the Need for Data et of Things Vision, Internet of Things (IoT) Frameworks, Architectur of Things (IoT), Essential Technologies of the Internet of Things (IoT), of IoT, Collaborative Operations , Training. Smart factories in action, Importance, Real world smart factories, T ation, Transforming Operational Processes, Business Models, Increa rese the student will be able to: ne opportunities, challenges brought about by Industry 4.0 for beneficient fectiveness of Smart Factories, Smart cities, Smart products and Sm 1strial 4.0 concepts in a manufacturing plant to improve productivity ffectiveness of Cloud Computing in a networked economy	evices and Softwa Rationalization e of Internet of T Key Technologies he way forward. se Operational E its of organization hart services y and profits	Interior of the second				
Internet of Th (IoT), Visualizi in Internet of Smart Factori A Roadmap: I Develop New I Course Outco After going ti CO1 CO2 CO3 CO4 Reference Bo 1. Alasdair Gi 2. Alp Ustund	ing ing Th es: Dig Bu m i : : : : : : : : :	cal issues and cal issues and s (IoT), Internet ings, Enablers Introduction, ital Transform siness Models. es: ough this cour- Understand the individuals Analyze the eff Apply the Indu Evaluate the eff s: rist, Industry Emre Cevilco	challenges in AR, Industrial applications, IoT and the Need for Data et of Things Vision, Internet of Things (IoT) Frameworks, Architectur of Things (IoT), Essential Technologies of the Internet of Things (IoT), of IoT, Collaborative Operations , Training. Smart factories in action, Importance, Real world smart factories, T ation, Transforming Operational Processes, Business Models, Increa rese the student will be able to: ne opportunities, challenges brought about by Industry 4.0 for benef fectiveness of Smart Factories, Smart cities, Smart products and Sm 1strial 4.0 concepts in a manufacturing plant to improve productivity ffectiveness of Cloud Computing in a networked economy 4.0 The Industrial Internet Of Things, Apress Publisher, ISBN-13 (pl an Industry 4.0: Managing The Digital Transformation, Springer 200	evices and Softwa Rationalization e of Internet of T Key Technologies he way forward. se Operational E its of organization hart services y and profits bk): 978-1-4842-	Interview of the second				
Internet of Th (IoT), Visualizi in Internet of Smart Factori A Roadmap: I Develop New I Course Outco After going th CO1 CO2 CO3 CO4 Reference Bo 1. Alasdair Gi 2. Alp Ustund 978-3-319-57	ing ing Th es: Jig Bu m i i i i i i i i i i i i i i i i g M m i g Bu i Bu i	cal issues and cal issues and gs (IoT), Internet ings, Enablers Introduction, ital Transform siness Models. es: ough this cour- Understand the individuals Analyze the eff Apply the Indu Evaluate the eff s: rist, Industry , Emre Cevikca 9-9.	challenges in AR, Industrial applications, IoT and the Need for Data et of Things Vision, Internet of Things (IoT) Frameworks, Architectur of Things (IoT), Essential Technologies of the Internet of Things (IoT), of IoT, Collaborative Operations , Training. Smart factories in action, Importance, Real world smart factories, T ation, Transforming Operational Processes, Business Models, Increa rse the student will be able to: ne opportunities, challenges brought about by Industry 4.0 for benef fectiveness of Smart Factories, Smart cities, Smart products and Sm astrial 4.0 concepts in a manufacturing plant to improve productivity ffectiveness of Cloud Computing in a networked economy 4.0 The Industrial Internet Of Things, Apress Publisher, ISBN-13 (pl an, Industry 4.0: Managing The Digital Transformation, Springer, 20	evices and Softwa Rationalization e of Internet of T Key Technologies he way forward. se Operational E its of organization hart services y and profits bk): 978-1-4842- 18 ISBN	Interview of the second				
Internet of Th (IoT), Visualizi in Internet of Th Smart Factori A Roadmap: I Develop New I Course Outco After going th CO1 CO2 CO3 CO4 Reference Bo 1. Alasdair Gi 2. Alp Ustund 978-3-319-57 3. Ovidiu Verm	ing ing Th es: Jig Bu m i i i i i i i i i i i i i i i i g m h r c i g Bu m h r c i g Bu i g Bu i g Bu i g Bu i g b i g Bu i g b i g i i g i i g b i i i i	cal issues and cal issues and cs (IoT), Internet the Internet c ings, Enablers Introduction, ital Transform siness Models. es: ough this cour Understand the individuals Analyze the eff Apply the Indu Evaluate the eff s: rist, Industry , Emre Cevikca 9-9. an and Peer F	challenges in AR, Industrial applications, IoT and the Need for Data et of Things Vision, Internet of Things (IoT) Frameworks, Architectur of Things (IoT), Essential Technologies of the Internet of Things (IoT), of IoT, Collaborative Operations , Training. Smart factories in action, Importance, Real world smart factories, T ation, Transforming Operational Processes, Business Models, Increa rese the student will be able to: ne opportunities, challenges brought about by Industry 4.0 for benef fectiveness of Smart Factories, Smart cities, Smart products and Sm astrial 4.0 concepts in a manufacturing plant to improve productivity ffectiveness of Cloud Computing in a networked economy 4.0 The Industrial Internet Of Things, Apress Publisher, ISBN-13 (pl an, Industry 4.0: Managing The Digital Transformation, Springer, 20 riess, Designing the industry - Internet of things connecting the phy	evices and Softwa Rationalization e of Internet of T Key Technologies he way forward. se Operational E its of organization art services y and profits bk): 978-1-4842- 018 ISBN	prins rre hings s Involved fficiency, ns and 2046-7 virtual				
Internet of Th (IoT), Visualizi in Internet of Th Smart Factori A Roadmap: I Develop New I Course Outco After going th CO1 CO2 CO3 CO4 Reference Bo 1. Alasdair Gi 2. Alp Ustund 978-3-319-57 3.Ovidiu Vern worlds. Rivers	ing ing Th es: Jig Bu ic i i i i i i i i i i i i i o k i c h ag 86 nes	cal issues and cal issues and s (IoT), Internet ings, Enablers Introduction, ital Transform siness Models. es: bugh this cour Understand the individuals Analyze the eff Apply the Indu Evaluate the eff s: rist, Industry , Emre Cevikca 9-9. an and Peer F ablishers. 201	challenges in AR, Industrial applications, IoT and the Need for Data et of Things Vision, Internet of Things (IoT) Frameworks, Architectur of Things (IoT), Essential Technologies of the Internet of Things (IoT), of IoT, Collaborative Operations , Training. Smart factories in action, Importance, Real world smart factories, T ation, Transforming Operational Processes, Business Models, Increa rese the student will be able to: ne opportunities, challenges brought about by Industry 4.0 for benef fectiveness of Smart Factories, Smart cities, Smart products and Sm 1strial 4.0 concepts in a manufacturing plant to improve productivity ffectiveness of Cloud Computing in a networked economy 4.0 The Industrial Internet Of Things, Apress Publisher, ISBN-13 (pl an, Industry 4.0: Managing The Digital Transformation, Springer, 20 riess, Designing the industry - Internet of things connecting the phy 6 ISBN 978-87-93379-81-7	evices and Softwa Rationalization e of Internet of T Key Technologies he way forward. se Operational E its of organization art services y and profits bk): 978-1-4842- 018 ISBN esical, digital and	In s and 2046-7 virtual				
Internet of Th (IoT), Visualizi in Internet of Th Smart Factori A Roadmap: I Develop New I Course Outco After going th CO1 CO2 CO3 CO4 Reference Bo 1. Alasdair Gi 2. Alp Ustund 978-3-319-57 3.Ovidiu Vern worlds, Rivers 4.Christoph J	ing ing Th es:)ig 3u m i : : : : : : ok ag 86 nes	cal issues and s (IoT), Internet ings, Enablers Introduction, ital Transform siness Models. es: bugh this cour Understand the individuals Analyze the eff Apply the Indu Evaluate the eff analyze for a fill and the fill and the fill and the fill and the fill and the fill and the fill and the fill and the fill and the fill and th	challenges in AR, Industrial applications, IoT and the Need for Data et of Things Vision, Internet of Things (IoT) Frameworks, Architectur of Things (IoT), Essential Technologies of the Internet of Things (IoT), of IoT, Collaborative Operations , Training. Smart factories in action, Importance, Real world smart factories, T ation, Transforming Operational Processes, Business Models, Increa rese the student will be able to: ne opportunities, challenges brought about by Industry 4.0 for benef fectiveness of Smart Factories, Smart cities, Smart products and Sm 1strial 4.0 concepts in a manufacturing plant to improve productivity ffectiveness of Cloud Computing in a networked economy 4.0 The Industrial Internet Of Things, Apress Publisher, ISBN-13 (pl an, Industry 4.0: Managing The Digital Transformation, Springer, 20 riess, Designing the industry - Internet of things connecting the phy 6 ISBN 978-87-93379-81-7 ie concept Industry 4.0- An Empirical Analysis of Technologies and	evices and Softwa Rationalization e of Internet of T Key Technologies he way forward. se Operational E its of organization art services y and profits bk): 978-1-4842- 18 ISBN sical, digital and Applications in P	In s and 2046-7 virtual				
Internet of Th IoT), Visualizin Internet of Smart Factori A Roadmap: I Develop New I Course Outco After going th	ing ing Th es: Dig Bu	cal issues and s (IoT), Internet the Internet c ings, Enablers Introduction, ital Transform siness Models. es: pugh this cour	challenges in AR, Industrial applications, IoT and the Need for Data et of Things Vision, Internet of Things (IoT) Frameworks, Architectur of Things (IoT), Essential Technologies of the Internet of Things (IoT), of IoT, Collaborative Operations, Training. Smart factories in action, Importance, Real world smart factories, T ation, Transforming Operational Processes, Business Models, Increa	evices and Softwa Rationalization e of Internet of T Key Technologies he way forward. se Operational E	In the second se				
Internet of Th (IoT), Visualizi in Internet of Smart Factori A Roadmap: I Develop New I Course Outco After going th CO1	ing ing Th es: Dig Bu	cal issues and s (IoT), Internet the Internet c ings, Enablers Introduction, ital Transform siness Models. es: ough this cour Understand th individuals	challenges in AR, Industrial applications, IoT and the Need for Data et of Things Vision, Internet of Things (IoT) Frameworks, Architectur of Things (IoT), Essential Technologies of the Internet of Things (IoT), of IoT, Collaborative Operations , Training. Smart factories in action, Importance, Real world smart factories, T ation, Transforming Operational Processes, Business Models, Increa rse the student will be able to: In opportunities, challenges brought about by Industry 4.0 for benef	evices and Softwa Rationalization e of Internet of T Key Technologies he way forward. se Operational E	hings s Involved fficiency, ns and				
Internet of Th (IoT), Visualizi in Internet of Smart Factori A Roadmap: I Develop New I Course Outco After going th CO1	ing ing Th ess: Dig Bu	cal issues and gs (IoT), Internet the Internet c ings, Enablers Introduction, ital Transform siness Models. es: ough this cour Understand th individuals	challenges in AR, Industrial applications, IoT and the Need for Data et of Things Vision, Internet of Things (IoT) Frameworks, Architectur of Things (IoT), Essential Technologies of the Internet of Things (IoT), of IoT, Collaborative Operations , Training. Smart factories in action, Importance, Real world smart factories, T ation, Transforming Operational Processes, Business Models, Increa rse the student will be able to: the opportunities, challenges brought about by Industry 4.0 for beneficient featurements of Smart Factories, Smart articles, Smart and Smart Factories, Smart Factories, Smart and Smart Factories, Smart and Smart Factories, Smart Factories, Smart and Smart Factories, Smart and Smart Factories, Smart Factories, Smart Factories, Smart and Smart Factories, Smart	evices and Softwa Rationalization e of Internet of T Key Technologies he way forward. se Operational E its of organization	In s and				
Internet of Th (IoT), Visualizi in Internet of Smart Factori A Roadmap: I Develop New I Course Outco After going th CO1	ing ing Th es: Dig Bu	cal issues and gs (IoT), Internet the Internet c ings, Enablers Introduction, ital Transform siness Models. es: bugh this cour Understand th individuals Analyze the ef	challenges in AR, Industrial applications, IoT and the Need for Data et of Things Vision, Internet of Things (IoT) Frameworks, Architectur of Things (IoT), Essential Technologies of the Internet of Things (IoT), of IoT, Collaborative Operations , Training. Smart factories in action, Importance, Real world smart factories, T ation, Transforming Operational Processes, Business Models, Increa rese the student will be able to: ne opportunities, challenges brought about by Industry 4.0 for benef fectiveness of Smart Factories, Smart cities, Smart products and Sm	evices and Softwa Rationalization e of Internet of T Key Technologies he way forward. se Operational E its of organization	Ins and				
Internet of Th (IoT), Visualizi in Internet of Smart Factori A Roadmap: I Develop New I Course Outco After going th CO1 CO2 CO3	ing ing Th es: Dig Bu m i : :	cal issues and gs (IoT), Internet the Internet c ings, Enablers Introduction, ital Transform siness Models. es: ough this cour Understand th individuals Analyze the ef Apply the Indu	challenges in AR, Industrial applications, IoT and the Need for Data et of Things Vision, Internet of Things (IoT) Frameworks, Architectur of Things (IoT), Essential Technologies of the Internet of Things (IoT), of IoT, Collaborative Operations , Training. Smart factories in action, Importance, Real world smart factories, T ation, Transforming Operational Processes, Business Models, Increa rese the student will be able to: ne opportunities, challenges brought about by Industry 4.0 for beneficient fectiveness of Smart Factories, Smart cities, Smart products and Sm 1strial 4.0 concepts in a manufacturing plant to improve productivity	evices and Softwa Rationalization e of Internet of T Key Technologies he way forward. se Operational E its of organization hart services y and profits	In s and				
Internet of Th (IoT), Visualizi in Internet of Smart Factori A Roadmap: I Develop New I Course Outco After going t CO1 CO2 CO3 CO3	ing ing Th es: Dig Bu Dig Bu	cal issues and gs (IoT), Internet the Internet c ings, Enablers Introduction, ital Transform siness Models. es: ough this cour- Understand th individuals Analyze the ef Apply the Indu Evaluate the e	challenges in AR, Industrial applications, IoT and the Need for Data et of Things Vision, Internet of Things (IoT) Frameworks, Architectur of Things (IoT), Essential Technologies of the Internet of Things (IoT), of IoT, Collaborative Operations , Training. Smart factories in action, Importance, Real world smart factories, T ation, Transforming Operational Processes, Business Models, Increa rese the student will be able to: ne opportunities, challenges brought about by Industry 4.0 for beneficient fectiveness of Smart Factories, Smart cities, Smart products and Sm astrial 4.0 concepts in a manufacturing plant to improve productivity ffectiveness of Cloud Computing in a networked economy	evices and Softwa Rationalization e of Internet of T Key Technologies he way forward. se Operational E its of organization hart services y and profits	Interview of the second				
Internet of Th (IoT), Visualizi in Internet of Smart Factori A Roadmap: I Develop New I Course Outco After going th CO1 CO2 CO3 CO4 Reference Bo	ing ing Th es: Jig Bu m i : : : :	cal issues and cal issues and g (IoT), Internet ings, Enablers Introduction, ital Transform siness Models. es: bugh this cour- Understand the individuals Analyze the eff Apply the Indu Evaluate the efficiency site Industry	challenges in AR, Industrial applications, IoT and the Need for Data et of Things Vision, Internet of Things (IoT) Frameworks, Architectur of Things (IoT), Essential Technologies of the Internet of Things (IoT), of IoT, Collaborative Operations , Training. Smart factories in action, Importance, Real world smart factories, T ation, Transforming Operational Processes, Business Models, Increa rese the student will be able to: ne opportunities, challenges brought about by Industry 4.0 for beneficient fectiveness of Smart Factories, Smart cities, Smart products and Sm Istrial 4.0 concepts in a manufacturing plant to improve productivity ffectiveness of Cloud Computing in a networked economy	evices and Softwa Rationalization e of Internet of T Key Technologies he way forward. se Operational E its of organization art services y and profits	In s and				
Internet of Th (IoT), Visualizi in Internet of Smart Factori A Roadmap: I Develop New I Course Outco After going th CO1 CO2 CO3 CO4 Reference Bo 1. Alasdair Gi	ing ing Th es: Dig Bu m i : : : : : : : :	cal issues and cal issues and s (IoT), Internet ings, Enablers Introduction, ital Transform siness Models. es: ough this cour- Understand the individuals Analyze the eff Apply the Indu Evaluate the eff s: rrist, Industry Emre Cevilco	challenges in AR, Industrial applications, IoT and the Need for Data et of Things Vision, Internet of Things (IoT) Frameworks, Architectur of Things (IoT), Essential Technologies of the Internet of Things (IoT), of IoT, Collaborative Operations , Training. Smart factories in action, Importance, Real world smart factories, T ation, Transforming Operational Processes, Business Models, Increa rese the student will be able to: ne opportunities, challenges brought about by Industry 4.0 for beneficient fectiveness of Smart Factories, Smart cities, Smart products and Sm 1strial 4.0 concepts in a manufacturing plant to improve productivity effectiveness of Cloud Computing in a networked economy 4.0 The Industrial Internet Of Things, Apress Publisher, ISBN-13 (plan Industry 4.0: Managing The Digital Transformation, Springer, 200	evices and Softwa Rationalization e of Internet of T Key Technologies he way forward. se Operational E its of organization hart services y and profits bk): 978-1-4842-	hings s Involved fficiency, ns and 2046-7				
Internet of Th (IoT), Visualizi in Internet of Smart Factori A Roadmap: I Develop New I Course Outco After going th CO1 CO2 CO3 CO4 Reference Bo 1. Alasdair Gi 2. Alp Ustund 978-3-319-57	ing ing Th es: Jig Bu Dig Bu i : : : : : : : : : : : : : : : : : :	cal issues and s (IoT), Internet the Internet c ings, Enablers Introduction, ital Transform siness Models. es: Dugh this cour Understand the individuals Analyze the eff Apply the Indu Evaluate the eff s: rist, Industry , Emre Cevikca 9-9.	challenges in AR, Industrial applications, IoT and the Need for Data et of Things Vision, Internet of Things (IoT) Frameworks, Architectur of Things (IoT), Essential Technologies of the Internet of Things (IoT), of IoT, Collaborative Operations , Training. Smart factories in action, Importance, Real world smart factories, T ation, Transforming Operational Processes, Business Models, Increa rese the student will be able to: ne opportunities, challenges brought about by Industry 4.0 for benef fectiveness of Smart Factories, Smart cities, Smart products and Sm istrial 4.0 concepts in a manufacturing plant to improve productivity ffectiveness of Cloud Computing in a networked economy 4.0 The Industrial Internet Of Things, Apress Publisher, ISBN-13 (pl an, Industry 4.0: Managing The Digital Transformation, Springer, 20	evices and Softwa Rationalization e of Internet of T Key Technologies he way forward. se Operational E its of organization art services y and profits bk): 978-1-4842- 018 ISBN	In s and 2046-7				
Internet of Th (IoT), Visualizi in Internet of Th Smart Factori A Roadmap: I Develop New I Course Outco After going th CO1 CO2 CO3 CO4 Reference Bo 1. Alasdair Gi 2. Alp Ustund 978-3-319-57 3.Ovidiu Verm	ing ing Th es: Jig Bu i i i i i i i i i i i i i i i g b i g Bu Bu i g Bu i g Bu i g Bu i g Bu i g Bu i g Bu i g Bu i g Bu i g Bu i g Bu i g Bu i g Bu i Bu i	cal issues and cal issues and s (IoT), Internet ings, Enablers Introduction, ital Transform siness Models. es: bugh this cour Understand the individuals Analyze the eff Apply the Indu Evaluate the eff s: rist, Industry , Emre Cevikca 9-9. an and Peer F	challenges in AR, Industrial applications, IoT and the Need for Data et of Things Vision, Internet of Things (IoT) Frameworks, Architectur of Things (IoT), Essential Technologies of the Internet of Things (IoT), of IoT, Collaborative Operations , Training. Smart factories in action, Importance, Real world smart factories, T ation, Transforming Operational Processes, Business Models, Increa rese the student will be able to: ne opportunities, challenges brought about by Industry 4.0 for benef fectiveness of Smart Factories, Smart cities, Smart products and Sm astrial 4.0 concepts in a manufacturing plant to improve productivity ffectiveness of Cloud Computing in a networked economy 4.0 The Industrial Internet Of Things, Apress Publisher, ISBN-13 (pl an, Industry 4.0: Managing The Digital Transformation, Springer, 20 riess, Designing the industry - Internet of things connecting the phy	evices and Softwa Rationalization e of Internet of T Key Technologies he way forward. se Operational E its of organization art services y and profits bk): 978-1-4842- 018 ISBN sical, digital and	In s and 2046-7 virtual				
Internet of Th (IoT), Visualizi in Internet of Th Smart Factori A Roadmap: I Develop New I Course Outco After going th CO1 CO2 CO3 CO4 Reference Bo 1. Alasdair Gi 2. Alp Ustund 978-3-319-57 3.Ovidiu Vern worlds, Riverse	ing ing Th es: Jig Ju on i i i i i i i i i i i i i i i g Bu on i g Ju i g Ju i g Ju i g Ju i g Ju i g Ju i g Ju i g Ju ju g Ju ju g Ju ju g Ju ju g Ju ju g Ju ju g Ju ju g Ju ju g Ju ju g Ju ju g Ju ju g Ju ju g Ju Ju Ju Ju Ju Ju Ju Ju Ju Ju Ju Ju Ju	cal issues and cal issues and gs (IoT), Internet ings, Enablers Introduction, ital Transform siness Models. es: ough this cour- Understand the individuals Analyze the eff Apply the Indu Evaluate the eff s: rist, Industry , Emre Cevikca 9-9. an and Peer F ublishers, 201	challenges in AR, Industrial applications, IoT and the Need for Data et of Things Vision, Internet of Things (IoT) Frameworks, Architectur of Things (IoT), Essential Technologies of the Internet of Things (IoT), of IoT, Collaborative Operations , Training. Smart factories in action, Importance, Real world smart factories, T ation, Transforming Operational Processes, Business Models, Increa rese the student will be able to: ne opportunities, challenges brought about by Industry 4.0 for benef fectiveness of Smart Factories, Smart cities, Smart products and Sm 1strial 4.0 concepts in a manufacturing plant to improve productivity ffectiveness of Cloud Computing in a networked economy 4.0 The Industrial Internet Of Things, Apress Publisher, ISBN-13 (pl an, Industry 4.0: Managing The Digital Transformation, Springer, 20 riess, Designing the industry - Internet of things connecting the phy 6 ISBN 978-87-93379-81-7	evices and Softwa Rationalization e of Internet of T Key Technologies he way forward. se Operational E its of organization art services y and profits bk): 978-1-4842- 018 ISBN sical, digital and	In s and 2046-7 virtual				
Internet of Th (IoT), Visualizi in Internet of Smart Factori A Roadmap: I Develop New I Course Outco After going th CO1 CO2 CO3 CO4 Reference Bo 1. Alasdair Gi 2. Alp Ustund 978-3-319-57 3.Ovidiu Vern worlds, Rivers 4.Christoph J	ing ing Th es:)ig 3u m i : : : : : : : o k ag 86 nes	cal issues and cal issues and s (IoT), Internet ings, Enablers Introduction, ital Transform siness Models. es: ough this cour- Understand the individuals Analyze the eff Apply the Indu Evaluate the eff s: rist, Industry , Emre Cevikca 9-9. an and Peer F ablishers, 201 Bartodziej, The	challenges in AR, Industrial applications, IoT and the Need for Data et of Things Vision, Internet of Things (IoT) Frameworks, Architectur of Things (IoT), Essential Technologies of the Internet of Things (IoT), of IoT, Collaborative Operations , Training. Smart factories in action, Importance, Real world smart factories, T ation, Transforming Operational Processes, Business Models, Increa rese the student will be able to: ne opportunities, challenges brought about by Industry 4.0 for benef fectiveness of Smart Factories, Smart cities, Smart products and Sm astrial 4.0 concepts in a manufacturing plant to improve productivity ffectiveness of Cloud Computing in a networked economy 4.0 The Industrial Internet Of Things, Apress Publisher, ISBN-13 (pl an, Industry 4.0: Managing The Digital Transformation, Springer, 20 riess, Designing the industry - Internet of things connecting the phy 6 ISBN 978-87-93379-81-7 ie concept Industry 4.0- An Empirical Analysis of Technologies and A	evices and Softwa Rationalization e of Internet of T Key Technologies he way forward. se Operational E its of organization hart services y and profits bk): 978-1-4842- 018 ISBN sical, digital and Applications in Pa	In s and 2046-7 virtual				



Scheme of Continuous Internal Evaluation (CIE): 20 + 40 + 40 = 100

QUIZZES: Quizzes will be conducted in online/offline mode. Two quizzes will be conducted & Each Quiz will be evaluated for 10 Marks. The sum of two quizzes will be the Final Quiz marks.

TESTS: Students will be evaluated in test, descriptive questions with different complexity levels (Revised Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating). Two tests will be conducted. Each test will be evaluated for 50 Marks, adding upto 100 marks. Final test marks will be reduced to 40 Marks.

EXPERIENTIAL LEARNING: Students will be evaluated for their creativity and practical implementation of the problem. Case study-based teaching learning and Program specific requirements (15), Video based

seminar/presentation/demonstration (25) adding upto 40 marks.

RUBRIC for CIE			RUBRIC for SEE			
SLNo	Content	Marks	Q. No	Contents	Marks	
1	Quizzes - Q1 & Q2	20	Each unit consists of TWO questions of 20 Marks each. Answer FIV			
2	Tests - T1 & T2	40	full questions selecting ONE from each unit (1 to 5).			
3	Experiential Learning - EL1 & EL2	40	1&2	Unit-1: Question 1 or 2	20	
	Total Marks	100	3&4	Unit-2: Question 3 or 4	20	
10		t KS	5&6	Unit-3: Question 5 or 6	20	
			7&8	Unit-4: Question 7 or 8	20	
			9 & 10	Unit-5: Question 9 or 10	20	
				Total Marks	100	




201.0000 80100 <u>0</u>	37.6	- 2	SEMESTER: II		-	
Course Code	:	22MDC24L	ANTENNAS and DE LADOBATODY	CIE Marks	:	50
Credits L-T-P	:	1 - 0 - 1	ANTENNAS and RF LABORATORY	SEE Marks	:	50
Hours	:	14L + 28P	(Coding / Skill Laboratory)	SEE Durations	:	3 Hrs
Facul	t	y Coordinator:	Dr. Shanthi. P		-	
			Content			28 Hrs
GHz. 2. Measurement microwave bence Passive comport Spectrum Analy 5. Design and c circuits design 7. Design and S	e ch vz h u Si	ment of S-para nes. 3. Measure ents using micro er aracterization sing smith cha mulation of Pa	meters, VSWR, power measurements of waveguide co ement of S-parameters, VSWR, power measurements owave characterization Equipment's such as Vector N of Microstrip lines using line-calc tool, Lumped and d rt tools in ADS/AWR ssive circuits using ADS/AWR	omponents using of Microwave act Network Analyzer	g tiv tiv	ve and and ng
8.Design and Si	ir	nulation of Act	ve circuits using ADS/AWR			
9.Design and si	n	nulation of RF	ransceiver system using ADS/AWR			
After going thr CO1 CO2 CO3 CO4 Reference Boo 1. Reinhold Luc Edition, 2012, I 2. Mathew M. R 0130279587		Review the con Design and ev Characterize t Evaluate the p s vig, Pavel Brete BN: 978-81-3 dmanesh, Rad	se the student will be able to: accepts of RF components , circuits and RF subsystem aluate the Industry specific Practical antennas the Antenna and RF system using measurement setup erformance of RF passive/active circuits using EDA to the Antenna end RF passive/active and applications, Pear 7-6218-9. to Frequency and Microwave Electronics, Pearson Ed	os tools rson Asia Educat ucation Asia, 200	 io	n, 2nd 1, ISBN :
3. David M. Poz 978-0-470-631	а 5	r, Microwave E 5-3,	ngineering, 2011, John Wiley & Sons, 4th Edition, 20	011 ISBN:		
4. Frontiers in A	41	ntennas: Next	Generation Design & Engineerin <mark>g, Frank</mark> B gross, 201	11, Mcgraw Hill		
Scheme of Con Laboratory sess every session. T Marks i.e (Lab I innovative expe Test). This adds	nt sio Th Ro ri	inuous Intern on is held ever he average of m eport, Observa iments in the la to 50 Marks.	al Evaluation (CIE- Laboratory) : Only LAB Course week as per the timetable and the performance of the arks over number of experiments conducted over the tion & Analysis). The students are encouraged to imp ab (10 marks). At the end of the semester a test is cor	30 + 10 + 10 = 5 ne student is eval weeks is conside lement additiona nducted for 10 M	50 lu er l a). The lated in red for 30 rks (Lab
Scheme of Sen evaluated for W 40 Marks and V	r 71	e ster End Exa ite-up, Experin va will be cond	mination (SEE- Laboratory) : Only LAB Course 40 - mental Setup, Experiment Conduction with Results, A ucted for 10 Marks adding to 50 Marks.	+ 10 =50. Studer malysis & Discus	nt: ss	s will be ions for
			Only LAB Courses with 50 Marks			

RUBRIC FOR CIE			RUBRIC FOR SEE		
S1.No	Content	Marks	Content	Marks	
1	Write Up, Setup, Conduction Results, Analysis & Discussions	30	1. Write Up, Setup, Conduction	40	
2	Innovative Experiment/Concept Design & Implementation	10	2. Results, Analysis & Discussions	40	
3	Laboratory Internal	10	Viva Voce	10	
	Total Marks	50	Total Marks	50	

RV Educational Institutions * RV College of Engineering * Autonomous Institution Afflieted to Visvesvaraya Technological University, Belagavi

		SEMESTER: II		-			
Course Code	: 22HSS25T	PROFESSIONAL SKILL	CIE Marks :	50			
Credits L-T-P	: 2-0-0	DEVELOPMENT- I	SEE Marks :	50			
Hours	: 28L	Common Course to all M.Tech Programs	SEE Durations :	2 Hrs			
Facul	ty Coordinator:	Dr. C.Bindu Ashwini		-			
		UNIT - I		4 Hrs			
Communicatio	on Skills: Basics	s of Communication, Personal Skills & amp	; Presentation Sk	ills –			
Introduction,	Application, Sin	nulation, Attitudinal Development, Self Co	nfidence, SWOC a	analysis.			
Resume Writin	ng: Understand	ing the basic essentials for a resume, Resu	ame writing tips G	ruidelines			
for better pres	sentation of fact	s. Theory and Applications.		-			
		UNIT - II		8 Hrs			
Quantitative A	Aptitude and Da	ta Analysis: Number Systems, Math Vocal	bulary, fraction de	ecimals, digit			
places etc. Sin	nple equations ·	– Linear equations, Elimination Method, S	ubstitution metho	od,			
Inequalities. F	Reasoning – a. V	erbal - Blood Relation, Sense of Direction,	Arithmetic & amp	; Alphabet.			
b. Non- Verba	l reasoning - Vi	sual Sequence, Visual analogy and classifi	cation. Analytical	Reasoning -			
Single & amp;	Multiple compa	risons, Linear Sequencing.	11 · D 1 /	1			
Logical Aptitu	de, - Syllogism,	Venn-diagram method, Three statement s	yllogism, Deducti	ve and			
inductive reas	soning. Introduc	ction to puzzle and games organizing inform	nation, parts of a	n argument,			
Verbal Apolog	s, arguments an	nt assumptions.	nalogies Gromm	or review			
sentence com	nletions senten	ce corrections antonyms/synonyms yoca	hulary huilding e	to Reading			
Comprehensio	on. Problem Sol	ving	ibulary building c	te. Reading			
	, 110010111 001	IINIT - III	(0)	6 Hrs			
Interview Skill	ls: Questions as	ked &: how to handle them. Body lan	guage in interview	v and			
Etiquette – Co	nversational an	d Professional. Dress code in interview. Pr	ofessional attire a	and Grooming.			
Behavioral an	d technical inte	rviews, Mock interviews - Mock interviews	with different Par	nels. Practice			
on Stress Inte	rviews, Technic	al Interviews, and General HR interviews					
		UNIT - IV		5 Hrs			
Interpersonal	and Managerial	l Skills: Optimal co-existence, cultural sen	sitivity, gender se	nsitivity;			
capability and	l maturity mode	el, dec <mark>ision making</mark> ability a <mark>nd analy</mark> sis for	brain storming; (droup			
discussion(As	sertiveness) and	l presentation skills;	/				
		UNIT - V		5 Hrs			
Motivation: Se	elf-motivation, g	roup motivation, Behavioral Management,	Inspirational and	l motivational			
speech with c	onclusion. (Exa	mples to be cited). Leadership Skills: Ethic	s and Integrity, G	oal Setting,			
leadership abi	ility.						
Course Outco	omes:						
After going t	hrough this co	urse the student will be able to:					
CO1	: Develop profe	ssional skill to suit the industry requirement	ent.				
CO2	: Analyze probl	ems using quantitative and reasoning skil	ls				
CO3	: Develop leade	ership and inter personal working skills.					
CO4	: Demonstrate	verbal communication skills with appropr	iate body languag	e.			
Reference Books:							
1. The 7 Habit	ts of Highly Effe	ctive People, Stephen R Covey Free Press,	2004 Edition,				
ISBN: 074327	2455						
2. How to win	friends and inf.	luence people, Dale Carnegie General Pres	s, 1st Edition, 20	16,			
ISBN: 978938	0914787						
3. Crucial Cor	nversation: Tool	s for Talking When Stakes are High, Kerry	Patterson, Josepl	h			
Grenny, Ron I	Mcmillan 2012	Edition, McGraw-Hill Publication ISBN: 97	80071772204				
14. Ethnus, An	timithra: Best A	optitude Book .2014 Edition. Tata McGraw	7 H111 ISBN: 97812	259058738			



Phase *	Activity
	Test 1 is conducted after the completion of 9 hours of training programme (3
т	Classes). Question paper will have two parts. Part A will be Quiz for 10 Marks and
1	Part B for 50 Marks Descriptive answers.
	Test 2 is conducted after the completion of 18 hours of training programme (6 Classes).
TT	Question paper will have two parts. Part A will be Quiz for 10 Marks and Part B for 50
11	Marks Descriptive answers. Total test marks will be reduced to 30 Marks and Total Quiz
	marks will be 20 Marks. Final CIE would be 50 Marks.
	CIE marks 20 Quiz + 30 Test = 50 Marks
Semester E	nd Examination: SEE is conducted for 50 Marks for a duration of 2 hours.



SERIESTIC: III Course Code [22MDC31T Advanced Wireless Systems CIE Marks : 100 Gourse Code SEE Marks : 100 Hours: 1/2 + 28T Professional Core - 5 SEE Durations : 3 Hrs Faculty Coordinator: Dr. K. Nagamani UNT - I 9 Hrs Review of UMTS and GSM, History of IG 03G, need for the LTE, from UMTS to LTE and from LTE to LTE advanced, 3GPP specification for LTE, High level architecture, architecture of E-UTRAN, Evolved packet core.5G use case requirements, 5G systemconcept. Massive MIMO, Resource allocation and transceiver algorithms for massive MIMO, Fundamentals of baseband and RF implementations in massive MIMO, Channel models. UNT - II 9 Hrs Spectrum: Introduction, High-level requirements for the 5G architecture, Functional architecture and 5G deployment. UNT - II 9 Hrs Spectrum technologies, Spectrum toolbox, Main technology components, Value of spectrum for 5G: a techno-economic perspective Security Issues and Challenges in 5G communications. UNT - II
Course Code [:] ZMIDC31T Advanced Wireless Systems CH: Marks [:] 100 Hours [:] 42L + 28T Professional Core - 5 SEE Durations [:] 3 Hrs Faculty Coordinator: [Dr. K. Nagamani SEE Marks [:] 100 Review of UMTS and GSM, History of IG to 3G, need for the LTE, from UMTS to LTE and from LTE to LTE advanced, 3GPP specification for LTE, High level architecture, architecture of E-UTRAN, Evolved packet core.5G use cases and system concept: Use case requirements, 5G systemconcept. Massive MIMO, Resource allocation and transceiver algorithms for massive MIMO, Fundamentals of baseband and RF implementations in massive MIMO, Channel models. Network and transceiver algorithms for massive MIMO, Fundamentals of baseband and RF implementations, High-level requirements for the 5G architecture, Functional architecture and 5G deployment. 8 Hrs Spectrum: Introduction ,Spectrum for 4G, Spectrum access modes and sharing scenarios , 5G spectrum technologies, Spectrum toolbox, Main technology components, Value of spectrum for 5G a techno-economic perspective 9 Hrs Massive MTC, Summary of uMTC features. UNIT - II 9 Hrs Device to Device (D2D) communications: Proveriew of a potential 5G communications, Multi-ope 2D, Multi-hop D2D communications: for proximity and emergency services, Multi operator D2D, Multi-hop D2D communications: From 4G to 5G, Radio resource management for mobile broadband D2D, Multi-hop D2D communications for proximity and emergency services, Multi operator D2D commun
Credits L-T-P 1:3 - 1 - 0 SEE Marks 1:100 Hours 1:421 + 28T Professional Core - 5 SEE Durations 1:3 Hrs Faculty Coordinator: Dr. K. Nagamani 9 Hrs Review of UMTS and GSM, History of 16 0 3G, need for the LTE, from UMTS to LTE and from LTE to LTE advanced, 3GPP specification for LTE, High level architecture, architecture of E-UTRAN, Evolved packet core.5G use cases and system concept: Use case requirements, 5G systemconcept. Massive multiple-input multiple-output (MIMO) systems: Introduction, Theoretical background, Pilot design for massive MIMO, Rennel models. The 5G Architecture: Introduction, High-level requirements for the 5G architecture, Functional architecture and 5G deployment. 8 Hrs Spectrum: Introduction, Spectrum for 4G, Spectrum challenges in 5G,5G spectrum landscape and requirements, Spectrum toolbox, Main technology components, Value of spectrum for 5G communications: Overlew of a potential 5G communications system architecture, Security for 5G communications: Introduction, Fundamental techniques for MTC, Massive MTC, Massive MTC, Massive MTC, Summary of uMTC features. 9 Hrs Device (D2D) communications: For 4G to 5G, Radio resource management for mobile broadband D2D, Multi-hop D2D communications for proximity and emergency services, Multi operator D2D communications: For 4G to 5G, Radio resource management for mobile broadband D2D, Multi-hop D2D communications for proximity and entergency services, Radio access for V2X communication, Radio access for massive machine-type communications. 8 Hrs R
Hours [:] (3Lt + 28T Professional Core - 5 [SEE Durations] [:] 3 Hrs Faculty Coordinator: [Dr. K. Nagamani 9 Hrs Review of UMTS and GSM, History of 1G to 3G, need for the LTE, from UMTS to LTE and from LTE to LTE advanced, 3GPP specification for LTE, High level architecture; architecture of E-UTRAN, Evolved packet core.5G use cases and system concept: Use case requirements, 5G systemconcept. 9 Hrs Massive MIMO, Resource allocation and transceiver algorithms for massive MIMO, Fundamentals of baseband and RF implementations in massive MIMO, Channel models. 8 Hrs The 5G Architecture: Introduction, High-level requirements for the 5G architecture, Functional architecture and 5G deployment. 8 Hrs Spectrum: Introduction, Spectrum for 4G, Spectrum challenges in 5G, 5G spectrum landscape and requirements, Sectrum technologies, Spectrum toolbox, Main technology components, Value of spectrum for 5G: a techno-economic perspective 8 Hrs Security Issues and Challenges in 5G GG communications. 9 Hrs Massive MTC, Summary of uMTC features. 9 Hrs Device to Device (D2D) communications: From 4G to 5G, Radio resource management for mobile broadband D2D, Multi-hop D2D communications for proximity and emergency services, Multi operator D2D communication. 8 Hrs The 5G radio-access technologies: Access design principles for multi-user communications, Multi-carrier with filtering: a new waveform, Non-orthogonal schemes for efficient multiple access, Radio access for V2X communication, Radio access for V2X communication, Radio acc
Faculty Coordinator: [Dr. K. Nagamani UNIT - I 9 Hrs Review of UMTS and GSM, History of 1G to 3G, need for the LTE, from UMTS to LTE and from LTE to LTE advanced, 3GPP specification for LTE, High level architecture, architecture of E-UTRAN, Evolved packet core.5G use case requirements, 5G systemconcept. Massive multiple-input multiple-output (MIMO) systems: Introduction, Theoretical background, Pilot design for massive MIMO, Resource allocation and transceiver algorithms for massive MIMO, Fundamentals of baseband and RF implementations in massive MIMO, Channel models. The 5G Architecture: Introduction, High-level requirements for the 5G architecture, Functional architecture and 5G flexibility, Physical architecture and 5G deployment. 8 Hrs Spectrum: Introduction, Spectrum for 4G, Spectrum challenges in 5G, 5G spectrum landscape and requirements, Boetrum access modes and sharing scenarios , 5G spectrum for 5G communications: Devriew of a potential 5G communications system architecture, Security Issues and Challenges in 5G communications Sectors. 9 Hrs Machine-type communications: Introduction, Fundamental techniques for MTC, Massive MTC, Massive MTC, Summary of uMTC features. 9 Hrs Device to D2D communications: Form 4G to 5G, Radio resource management for mobile broadband D2D, Multi-hop D2D communications for proximity and emergency services, Multi-carrier with filtering: a new waveform, Non-orthogonal schemes for efficient multiple access, Radio access for dense deployments, Radio access for V2X communication: Network deployment, Kadio access for Hassi access for dense deployments, Radio access for V2X communication. 8 Hrs
UNIT - 1 9 Hrs Review of UMTS and GSM, History of 1G to 3G, need for the LTE, from UMTS to LTE and from LTE to LTE advanced, 3GPP specification for LTE, High level architecture, architecture of E-UTRAN, Evolved packet core.5G use cases and system concept: Use case requirements, 5G systemconcept. Massive MIMO, Resource allocation and transceiver algorithms for massive MIMO, Fundamentals of baseband and RF implementations in massive MIMO, Channel models. The SG Architecture: Introduction, High-level requirements for the 5G architecture, Punctional architecture and 5G flexibility, Physical architecture and 5G deployment. 8 Hrs Spectrum: Introduction, Aligh-level requirements for the SG architecture, Functional architecture and requirements, Bandwidth requirements, Spectrum challenges in 5G, 5G spectrum landscape and requirements, Bectrum for 4G, Spectrum challenges in 5G, 5G spectrum landscape security for 5G: a techno-economic perspective Security for 5G communications: Overview of a potential 5G communications system architecture, Security Issues and Challenges in 5G communications system architecture, Security Issues and Challenges in 5G off to 5G, Radio resource management for mobile broadband D2D, Multi-hop D2D communications for proximity and emergency services, Multi operator D2D communications. From 4G to 5G, Radio resource management for mobile broadband D2D, Multi-hop D2D communications for proximity and emergency services, Radio access for dense deployments, Radio access for V2X communication, Radio access for massive machine-type communication. 8 Hrs The 5G radio-access technologies: Access design principles for multi-lever communications, Multi- carrier with filtering: a new waveform, Non-orthogonal schemes for efficient multiple access, Radio access for dense deployment
Review of UMTS and GSM, History of 1G to 3G, need for the LTE, from UMTS to LTE and from LTE to LTE advanced, 3GPP specification for LTE, High level architecture, architecture of E-UTRAN, Evolved packet core.5G use cases and system concept: Use case requirements, 5G systemconcept. Massive MIMO, Resource allocation and transceiver algorithms for massive MIMO, Fundamentals of baseband and RF implementations in massive MIMO, Channel models. The 5G architecture: Introduction, High-level requirements for the 5G architecture, Functional architecture and 5G deployment. UNIT · II 8 Hrs Spectrum: Introduction, Spectrum for 4G, Spectrum challenges in 5G, 5G spectrum landscape and requirements, Bandwidth requirements, Spectrum cases modes and sharing scenarios , 5G spectrum technologies, Spectrum toolbox, Main technology components, Value of spectrup for 5G: a techno-economic perspective of SG communications: Overview of a potential 5G communications system architecture, Security Issues and Challenges in 5G ommunications for proximity and emergency services, Multi-Ope D2D communications: For MG to 5G, Radio resource management for mobile broadband D2D, Multi-hop D2D communications for proximity and emergency services, Multi-operator D2D communications. For V2X communication, Multi-carrier with filtering: a new waveform, Non-orthogonal schemes for efficient multiple access, Radio access for dense deployment, Sadio access for V2X communication. WINT · V 8 Hrs Relaying and wireless network coding: The role of relaying and network coding in 5G wireless networks, Multi-flow wireless backhauling, Highly flexible multi-flow relaying, Buffer-aided relaying Interference management in 5G. Mobility management in 5G. Jonamic network deployment, Sector 10 . Describe the history and concepts of 5G networks and its architecture. COII: Describe the student will be able to: COII: Describe the machine communication and device to device communication.
advanced, 3GPP specification for LTE, High level architecture, architecture, E-UTRAN, Evolved packet core.5G use cases and system concept. Use case requirements, 5G systemconcept. Massive MIMO, Resource allocation and transceiver algorithms for massive MIMO, Fundamentals of baseband and RF implementations in massive MIMO, Channel models. The 5G Architecture: Introduction, High-level requirements for the 5G architecture, Functional architecture and 5G flexibility, Physical architecture and 5G deployment. B Hrs Spectrum: Introduction ,Spectrum for 4G , Spectrum challenges in 5G ,5G spectrum landscape and requirements , Bandwidth requirements, Spectrum access modes and shring scenarios , 5G spectrum technologies, Spectrum toolbox, Main technology components, Value of spectrum for 5G: a techno-economic perspective Security for 5G communications: Overview of a potential 5G communications system architecture, Security Issues and Challenges in 5G communications UNT - II 9 Hrs Machine-type communications: Introduction, Fundamental techniques for MTC, Massive MTC, Massive MTC, Summary of uMTC features. Device to Device (D2D) communications: From 4G to 5G, Radio resource management for mobile broadband D2D, Multi-hop D2D communications for proximity and emergency services, Multi operator D2D communication. UNIT - IV 8 Hrs The 5G radio-access technologies: Access for V2X communication, Radio access for massive machine-type communication. UNIT - V 8 Hrs Relaying and wireless network coding: The role of relaying and network coding in 5G wireless networks, Multi-flow wireless backhauling, Highly flexible multi-flow relaying, Buffer-aided relaying Interference management, mobility management and dynamic reconfiguration: Network deployment types, Interference management in 5G. Mobility management in 5G, Dynamic network reconfiguration in 5G Course Outcomes: After going through this course the student will be able to: <u>COII: Describe the history and concepts of 5G networks and its architecture</u> .
use cases and system concept: Use case requirements, 5G systemconcept. Massive multiple-input multiple-output (IMIO) systems: Introduction, Theoretical background, Pilot design for massive MIMO, Resource allocation and transceiver algorithms for massive MIMO, Fundamentals of baseband and RF implementations in massive MIMO, Channel models. The 5G Architecture: Introduction, High-level requirements for the 5G architecture, Functional architecture and 5G flexibility, Physical architecture and 5G deployment. UNIT - II 8 Hrs Spectrum: Introduction, Spectrum for 4G, Spectrum access modes and sharing scenarios , 5G spectrum technologies, Spectrum toolbox, Main technology components, Value of spectrum for 5G: a techno-economic perspective Security for 5G communications: Overview of a potential 5G communications system architecture, Security for 5G communications: Overview of a potential 5G communications system architecture, Security for 5G communications: Introduction, Fundamental techniques for MTC, Massive MTC, Massive MTC, Summary of uMTC features. Device to D2D communications: From 4G to 5G, Radio resource management for mobile broadband D2D, Multi-hop D2D communications for proximity and emergency services, Multi operator D2D communication. UNIT - IV 8 Hrs The 5G radio-access technologies: Access design principles for multi-user communications, Multi- carrier with filtering: a new waveform, Non-orthogonal schemes for efficient multiple access, Radio access for dense deployments, Radio access for V2X communication, Radio access for massive machine-type communication. UNIT - V 8 Hrs Relaying and wireless network coding: The role of relaying and network coding in 5G wireless networks, Multi-flow wireless backhauling, Highly flexible multi-flow relaying, Buffer-aided relaying Interference management, mobility management and dynamic reconfiguration: Network reconfiguration in 5G Course Outcomes: After going through this course the student will be able to: <u>COII : Describe t</u>
Massive multiple-input multiple-output (MIMO) systems: introduction, Theoretical background, Pilot design for massive MIMO, Resource allocation and transceiver algorithms for massive MIMO, Fundamentals of baseband and RF implementations in massive MIMO, Channel models. The 5G Architecture: Introduction, High-level requirements for the 5G architecture, Functional architecture and 5G dexibility, Physical architecture and 5G deployment. UNIT - II 8 Hrs Spectrum: Introduction ,Spectrum for 4G , Spectrum challenges in 5G ,5G spectrum landscape and requirements, Bandwidth requirements, Spectrum access modes and sharing scenarios , 5G spectrum technologies, Spectrum toolbox, Main technology components, Value of spectrum for 5G : a techno-economic perspective Security for 5G communications: Overview of a potential 5G communications system architecture, Security for 5G communications: Overview of a potential 5G communications system architecture, Security Issues and Challenges in 5G communication. UNIT - III 9 Hrs Machine-type communications: From 4G to 5G, Radio resource management for mobile broadband D2D, Multi-hop D2D communications for proximity and emergency services, Multi operator D2D communications. UNIT - IV 8 Hrs The 5G radio-access technologies: Access design principles for multi-user communications, Multi- carrier with filtering: a new waveform, Non-orthogonal schemes for efficient multiple access, Radio access for dense deployments, Radio access for V2X communication, Radio access for massive machine-type communication. UNIT - V 8 Hrs Relaying and wireless network coding: The role of relaying and network coding in 5G wireless networks, Multi-flow wireless backhauling, Highly flexible multi-flow relaying, Buffer-aided relaying Interference management, mobility management and dynamic reconfiguration: Network deployment types, Interference management in 5G. Mobility management in 5G, Dynamic network reconfiguration in 5G Course Outcomes: After going through this course the student will be ab
massive MIMO, Resource allocation and transceiver algorithms for massive MIMO, Fundamentals of baseband and RF implementations in massive MIMO, Channel models. The 5G Architecture: Introduction, High-level requirements for the 5G architecture, Functional architecture and 5G flexibility, Physical architecture and 5G deployment. UNIT - II 8 Hrs Spectrum: Introduction ,Spectrum for 4G , Spectrum challenges in 5G ,5G spectrum landscape and requirements , Bandwidth requirements, Spectrum access modes and sharing scenarios , 5G spectrum technologies, Spectrum toolbox, Main technology components, Value of spectrum for 5G: a techno-economic perspective Security for 5G communications: Overview of a potential 5G communications system architecture, Security Issues and Challenges in 5G communication. UNIT - III 9 Hrs Machine-type communications: Introduction, Fundamental techniques for MTC, Massive MTC, Massive MTC, Summary of uMTC features. Device to Device (D2D) communications for proximity and emergency services, Multi operator D2D communications for proximity and emergency services, Multi operator D2D communication. UNIT - IV 8 Hrs The 5G radio-access technologies: Access design principles for multi-user communications, Multi- carrier with filtering: a new waveform, Non-orthogonal schemes for efficient multiple access, Radio access for dense deployments, Radio access for V2X communication, Radio access for massive machine-type communication. UNIT - V 8 Hrs Relaying and wireless network coding: The role of relaying and network coding in 5G wireless networks, Multi-flow wireless backhauling, Highly flexible multi-flow relaying, Buffer-aided relaying Interference management, mobility management and dynamic reconfiguration: Network deployment types, Interference management in 5G. Mobility management in 5G, Dynamic network reconfiguration in 5G Course Outcomes: After going through this course the student will be able to: CO11: Describe the history and concepts of 5G networks and its architecture. C
and refinite inducts. Introductions. High-level requirements for the 5G architecture, Functional architecture and 5G flexibility, Physical architecture and 5G deployment. Image: State S
Unit of Architecture influencement and 5G deployment. 8 Hrs SG flexibility, Physical architecture and 5G deployment. 8 Hrs Spectrum: Introduction, Spectrum for 4G, Spectrum challenges in 5G, 5G spectrum landscape and requirements, Bandwidth requirements, Spectrum access modes and sharing scenarios , 5G spectrum technologies, Spectrum toolbox, Main technology components, Value of spectrum technologies, Spectrum toolbox, Main technology components, Value of spectrum technologies, Spectrum toolbox, Main technology components, Value of spectrum technologies in 5G communication. 9 Hrs Security Issues and Challenges in 5G communication. 9 Hrs Machine-type communications: Introduction, Fundamental techniques for MTC, Massive MTC, Massive MTC, Summary of uMTC features. 9 Hrs Device to Device (D2D) communications for proximity and emergency services, Multi operator D2D communications. 8 Hrs The 5G radio-access technologies: Access design principles for multi-user communications, Multi-carrier with filtering: a new waveform, Non-orthogonal schemes for efficient multiple access, Radio access for V2X communication, Radio access for wassive machine-type communication. 8 Hrs Relaying and wireless network coding: The fole of relaying and network coding in 5G 8 Hrs Duff - aided relaying 10 HT - V 8 Hrs Course Outcomes: After going through this course the student will be able to: CO1 : [Describe the history and concepts of G networks and its architecture. CO1 : [Describe the history and concepts of G netwo
UNT - II 8 Hrs Spectrum: Introduction , Spectrum for 4G , Spectrum challenges in 5G ,5G spectrum landscape and requirements , Bandwidth requirements, Spectrum access modes and sharing scenarios , 5G spectrum technologies, Spectrum toolbox, Main technology components, Value of spectrum for 5G: a techno-economic perspective Security for 5G communications: Overview of a potential 5G communications system architecture, Security Issues and Challenges in 5G of communication. 9 Hrs Machine-type communications: Introduction, Fundamental techniques for MTC, Massive MTC, Massive MTC, Summary of uMTC features. Device (D2D) communications: From 4G to 5G, Radio resource management for mobile broadband D2D, Multi-hop D2D communications for proximity and emergency services, Multi operator D2D communication. UNIT - IV 8 Hrs The 5G radio-access technologies: Access design principles for multi-user communications, Multicarrier with filtering: a new waveform, Non-orthogonal schemes for efficient multiple access, Radio access for dense deployments, Radio access for V2X communication, Radio access for massive machine-type communication. UNIT - V 8 Hrs Relaying and wireless network coding: The role of relaying and network coding in 5G wireless networks, Multi-flow wireless backhauling, Highly flexible multi-flow relaying, Buffer-aided relaying IUNIT - V Relaying and wireless network coding: The role of relaying and network coding in 5G wireless networks, Multi-flow
Spectrum: Introduction ,Spectrum for 4G , Spectrum challenges in 5G ,5G spectrum landscape and requirements , Bandwidth requirements, Spectrum access modes and sharing scenarios , 5G spectrum technologies, Spectrum toolbox, Main technology components, Value of spectrum for 5G: a techno-economic perspective Security for 5G communications: Overview of a potential 5G communications system architecture, Security for 5G communications: Overview of a potential 5G communications system architecture, Security Issues and Challenges in 5G communication. UNIT - III 9 Hrs Machine-type communications: Introduction, Fundamental techniques for MTC, Massive MTC, Massive MTC, Summary of uMTC features. Device to Device (D2D) communications: From 4G to 5G, Radio resource management for mobile broadband D2D, Multi-hop D2D communications for proximity and emergency services, Multi operator D2D communication. UNIT - IV 8 Hrs The 5G radio-access technologies: Access design principles for multi-user communications, Multi- carrier with filtering: a new waveform, Non-orthogonal schemes for efficient multiple access, Radio access for dense deployments, Radio access for V2X communication, Radio access for massive machine-type communication. UNIT - V 8 Hrs Relaying and wireless network coding: The role of relaying and network coding in 5G wireless networks, Multi-flow wireless backhauling, Highly flexible multi-flow relaying, Buffer-aided relaying Interference management, mobility management and dynamic reconfiguration: Network deployment types, Interference management in 5G. Mobility management in 5G, Dynamic network reconfiguration in 5G Course Outcomes: After going through this course the student will be able to: CO1 : Describe the history and concepts of 5G networks and its architecture. CO2 : Analyze the machine-to-machine communication and device to device communication
Spectrum in thorder ton spectrum in the spectrum in the spectrum in thickedpe and requirements. Spectrum access modes and sharing scenarios , 5G spectrum technologies, Spectrum toolbox, Main technology components, Value of spectrum for 5G: a techno-economic perspective Security for 5G communications: Overview of a potential 5G communications system architecture, Security Issues and Challenges in 5G communication. UNIT - III 9 Hrs Machine-type communications: Introduction, Fundamental techniques for MTC, Massive MTC, Massive MTC, Summary of uMTC features. 9 Hrs Device to Device (D2D) communications: From 4G to 5G, Radio resource management for mobile broadband D2D, Multi-hop D2D communications for proximity and emergency services, Multi operator D2D communication. 8 Hrs The 5G radio-access technologies: Access design principles for multi-user communications, Multi-carrier with filtering: a new waveform, Non-orthogonal schemes for efficient multiple access, Radio access for dense deployments, Radio access for V2X communication, Radio access for massive machine-type communication. 8 Hrs Relaying and wireless network coding: The role of relaying and network coding in 5G wireless networks, Multi-flow wireless backhauling, Highly flexible multi-flow relaying, Buffer-aided relaying 8 Hrs Interference management, mobility management and dynamic reconfiguration: Network deployment types, Interference management in 5G. Mobility management in 5G, Dynamic network reconfiguration in 5G 9 Course Outcomes: COI : Describe the history and concepts of 5G networks and its architecture. COI : Describe the history and concepts of 5G networks and its architecture.<
and requirements , bandwith requirements , bectrum toolbox, Main technology components, Value of spectrum tochnologies, Spectrum toolbox, Main technology components, Value of spectrum for 5G: a techno-economic perspective Security for 5G communications: Overview of a potential 5G communications system architecture, Security Issues and Challenges in 5G communication. 9 Hrs Machine-type communications: Introduction, Fundamental techniques for MTC, Massive MTC, Massive MTC, Summary of uMTC features. 9 Hrs Device to Device (D2D) communications: From 4G to 5G, Radio resource management for mobile broadband D2D, Multi-hop D2D communications for proximity and emergency services, Multi operator D2D communication. 8 Hrs The 5G radio-access technologies: Access design principles for multi-user communications, Multicarrie with filtering: a new waveform, Non-orthogonal schemes for efficient multiple access, Radio access for V2X communication, Radio access for massive machine-type communication. 8 Hrs Relaying and wireless network coding: The role of relaying and network coding in 5G wireless networks, Multi-flow wireless backhauling, Highly flexible multi-flow relaying, Buffer-aided relaying 8 Hrs Course Outcomes: After going through this course the student will be able to: COUL Analyze the machine-type communication in 5G
Sot spectrum for 5G: a techno-economic perspective 9 Hrs Security for 5G communications: Overview of a potential 5G communications system architecture, 9 Hrs Security Issues and Challenges in 5G communication. 9 Hrs Machine-type communications: Introduction, Fundamental techniques for MTC, Massive MTC, 9 Hrs Massive MTC, Summary of uMTC features. 9 UNIT - III 9 Hrs Device to Device (D2D) communications: From 4G to 5G, Radio resource management for mobile broadband D2D, Multi-hop D2D communications for proximity and emergency services, Multi operator D2D communication. UNIT - IV 8 Hrs The 5G radio-access technologies: Access design principles for multi-user communications, Multi-carrier with filtering: a new waveform, Non-orthogonal schemes for efficient multiple access, Radio access for V2X communication, Radio access for massive machine-type communication. 8 Hrs Relaying and wireless network coding: The role of relaying and network coding in 5G wireless networks, Multi-flow wireless backhauling, Highly flexible multi-flow relaying, Buffer-aided relaying 8 Hrs Interference management, mobility management and dynamic reconfiguration: Network deployment types, Interference management in 5G. Mobility management in 5G, Dynamic network reconfiguration in 5G Course Outcomes: After going through this course the student will be able to: COI : Describe the history and concepts of 5G networks and its architecture. COI : Describe
Security for 5G communications: Overview of a potential 5G communications system architecture, Security Issues and Challenges in 5G communication. UNIT - III 9 Hrs Machine-type communications: Introduction, Fundamental techniques for MTC, Massive MTC, Massive MTC, Summary of uMTC features. Device (D2D) communications: From 4G to 5G, Radio resource management for mobile broadband D2D, Multi-hop D2D communications for proximity and emergency services, Multi operator D2D communication. UNIT - IV 8 Hrs The 5G radio-access technologies: Access design principles for multi-user communications, Multi- carrier with filtering: a new waveform, Non-orthogonal schemes for efficient multiple access, Radio access for dense deployments, Radio access for V2X communication, Radio access for massive machine-type communication. UNIT - V 8 Hrs Relaying and wireless network coding: The role of relaying and network coding in 5G wireless networks, Multi-flow wireless backhauling, Highly flexible multi-flow relaying, Buffer-aided relaying Interference management, mobility management and dynamic reconfiguration: Network deployment types, Interference management in 5G. Mobility management in 5G, Dynamic network reconfiguration in 5G Course Outcomes: After going through this course the student will be able to: COI : Describe the history and concepts of 5G networks and its architecture. CO2 : Analyze the machine-to-machine communication and device to device communication
Security Issues and Challenges in 5G communication. WINT - III 9 Hrs Machine-type communications: Introduction, Fundamental techniques for MTC, Massive MTC, Massive MTC, Summary of uMTC features. Device to Device (D2D) communications: From 4G to 5G, Radio resource management for mobile broadband D2D, Multi-hop D2D communications for proximity and emergency services, Multi operator D2D communication. WINT - IV 8 Hrs The 5G radio-access technologies: Access design principles for multi-user communications, Multi- carrier with filtering: a new waveform, Non-orthogonal schemes for efficient multiple access, Radio access for dense deployments, Radio access for V2X communication, Radio access for massive machine-type communication. UNIT - V 8 Hrs Relaying and wireless network coding: The role of relaying and network coding in 5G wireless networks, Multi-flow wireless backhauling, Highly flexible multi-flow relaying, Buffer-aided relaying Interference management, mobility management and dynamic reconfiguration: Network deployment types, Interference management in 5G. Mobility management in 5G, Dynamic network reconfiguration in 5G Course Outcomes: After going through this course the student will be able to: COl COl Analyze the machine-to-machine communication and device to device communication
UNIT - III 9 Hrs Machine-type communications: Introduction, Fundamental techniques for MTC, Massive MTC, Massive MTC, Summary of uMTC features. Period Device to Device (D2D) communications: From 4G to 5G, Radio resource management for mobile broadband D2D, Multi-hop D2D communications for proximity and emergency services, Multi operator D2D communication. 8 Hrs The 5G radio-access technologies: Access design principles for multi-user communications, Multi- carrier with filtering: a new waveform, Non-orthogonal schemes for efficient multiple access, Radio access for dense deployments, Radio access for V2X communication, Radio access for massive machine-type communication. 8 Hrs Relaying and wireless network coding: The role of relaying and network coding in 5G wireless networks, Multi-flow wireless backhauling, Highly flexible multi-flow relaying, Buffer-aided relaying Interference management, mobility management and dynamic reconfiguration: Network deployment types, Interference management in 5G. Mobility management in 5G, Dynamic network reconfiguration in 5G Portere Course the student will be able to: CO1 : Describe the history and concepts of 5G networks and its architecture.
Machine-type communications: Introduction, Fundamental techniques for MTC, Massive MTC, Massive MTC, Summary of uMTC features. Device to Device (D2D) communications: From 4G to 5G, Radio resource management for mobile broadband D2D, Multi-hop D2D communications for proximity and emergency services, Multi operator D2D communication. WIT - IV 8 Hrs The 5G radio-access technologies: Access design principles for multi-user communications, Multi-carrier with filtering: a new waveform, Non-orthogonal schemes for efficient multiple access, Radio access for dense deployments, Radio access for V2X communication, Radio access for massive machine-type communication. UNIT - V 8 Hrs Relaying and wireless network coding: The role of relaying and network coding in 5G wireless networks, Multi-flow wireless backhauling, Highly flexible multi-flow relaying, Buffer-aided relaying Interference management and dynamic reconfiguration: Network deployment types, Interference management in 5G. Mobility management in 5G, Dynamic network reconfiguration in 5G Course Outcomes: After going through this course the student will be able to: COUL: Describe the history and concepts of 5G networks and its architecture. COUL: Describe the history and concepts of 5G networks and its architecture.
Massive MTC, Summary of uMTC features. Device to Device (D2D) communications: From 4G to 5G, Radio resource management for mobile broadband D2D, Multi-hop D2D communications for proximity and emergency services, Multi-operator D2D communication. Image: Communication communication. Image: Communication communicatico communication communication communication c
Device to Device (D2D) communications: From 4G to 5G, Radio resource management for mobile broadband D2D, Multi-hop D2D communications for proximity and emergency services, Multi operator D2D communication. UNIT - IV 8 Hrs The 5G radio-access technologies: Access design principles for multi-user communications, Multi- carrier with filtering: a new waveform, Non-orthogonal schemes for efficient multiple access, Radio access for dense deployments, Radio access for V2X communication, Radio access for massive machine-type communication. 8 Hrs UNIT - V 8 Hrs Relaying and wireless network coding: The role of relaying and network coding in 5G wireless networks, Multi-flow wireless backhauling, Highly flexible multi-flow relaying, Buffer-aided relaying Interference management, mobility management and dynamic reconfiguration: Network deployment types, Interference management in 5G. Mobility management in 5G, Dynamic network reconfiguration in 5G Course Outcomes: After going through this course the student will be able to: CO1 : Describe the history and concepts of 5G networks and its architecture. CO2 : Analyze the machine-to-machine communication and device to device communication
broadband D2D, Multi-hop D2D communications for proximity and emergency services, Multi operator D2D communication. UNIT - IV 8 Hrs The 5G radio-access technologies: Access design principles for multi-user communications, Multi- carrier with filtering: a new waveform, Non-orthogonal schemes for efficient multiple access, Radio access for dense deployments, Radio access for V2X communication, Radio access for massive machine-type communication. 8 Hrs Relaying and wireless network coding: The role of relaying and network coding in 5G wireless networks, Multi-flow wireless backhauling, Highly flexible multi-flow relaying, Buffer-aided relaying Interference management, mobility management and dynamic reconfiguration: Network deployment types, Interference management in 5G. Mobility management in 5G, Dynamic network reconfiguration in 5G Course Outcomes: After going through this course the student will be able to: CO1 i Describe the history and concepts of 5G networks and its architecture. CO2
UNIT - IV 8 Hrs The 5G radio-access technologies: Access design principles for multi-user communications, Multi-carrier with filtering: a new waveform, Non-orthogonal schemes for efficient multiple access, Radio access for dense deployments, Radio access for V2X communication, Radio access for massive machine-type communication. 8 Hrs UNIT - V 8 Hrs Relaying and wireless network coding: The role of relaying and network coding in 5G wireless networks, Multi-flow wireless backhauling, Highly flexible multi-flow relaying, Buffer-aided relaying 8 Hrs Interference management, mobility management and dynamic reconfiguration: Network deployment types, Interference management in 5G. Mobility management in 5G, Dynamic network reconfiguration in 5G Course Outcomes: After going through this course the student will be able to: CO1 : Describe the history and concepts of 5G networks and its architecture. CO2 : Analyze the machine-to-machine communication and device to device communication
UNIT - IV 8 Hrs The 5G radio-access technologies: Access design principles for multi-user communications, Multi- carrier with filtering: a new waveform, Non-orthogonal schemes for efficient multiple access, Radio access for dense deployments, Radio access for V2X communication, Radio access for massive machine-type communication. 8 Hrs Image: Communication of the test of the test of the test of
The 5G radio-access technologies: Access design principles for multi-user communications, Multi-carrier with filtering: a new waveform, Non-orthogonal schemes for efficient multiple access, Radio access for dense deployments, Radio access for V2X communication, Radio access for massive machine-type communication. UNIT - V 8 Hrs Relaying and wireless network coding: The role of relaying and network coding in 5G wireless networks, Multi-flow wireless backhauling, Highly flexible multi-flow relaying, Buffer-aided relaying Interference management, mobility management and dynamic reconfiguration: Network deployment types, Interference management in 5G. Mobility management in 5G, Dynamic network reconfiguration in 5G Course Outcomes: After going through this course the student will be able to: CO1 : Describe the history and concepts of 5G networks and its architecture. CO2 : Analyze the machine-to-machine communication and device to device communication
carrier with filtering: a new waveform, Non-orthogonal schemes for efficient multiple access, Radio access for dense deployments, Radio access for V2X communication, Radio access for massive machine-type communication. UNIT - V 8 Hrs Relaying and wireless network coding: The role of relaying and network coding in 5G wireless networks, Multi-flow wireless backhauling, Highly flexible multi-flow relaying, Buffer-aided relaying Interference management, mobility management and dynamic reconfiguration: Network deployment types, Interference management in 5G. Mobility management in 5G, Dynamic network reconfiguration in 5G Course Outcomes: After going through this course the student will be able to: CO1 : Describe the history and concepts of 5G networks and its architecture. CO2 : Analyze the machine-to-machine communication and device to device communication
access for dense deployments, Radio access for V2X communication, Radio access for massive machine-type communication. UNIT - V 8 Hrs Relaying and wireless network coding: The role of relaying and network coding in 5G 8 wireless networks, Multi-flow wireless backhauling, Highly flexible multi-flow relaying, 8 Buffer-aided relaying 1 Interference management, mobility management and dynamic reconfiguration: Network 8 deployment types, Interference management in 5G. Mobility management in 5G, Dynamic network 8 reconfiguration in 5G 7 Course Outcomes: 4 After going through this course the student will be able to: 6 CO1 : Describe the history and concepts of 5G networks and its architecture. CO2 : Analyze the machine-to-machine communication and device to device communication
Interference management in 5G. Mobility management in 5G. Dynamic network Course Outcomes: After going through this course the student will be able to: CO2 Describe the history and concepts of 5G networks and its architecture.
UNIT - V 8 Hrs Relaying and wireless network coding: The role of relaying and network coding in 5G 5G wireless networks, Multi-flow wireless backhauling, Highly flexible multi-flow relaying, 5G Buffer-aided relaying 1 Interference management, mobility management and dynamic reconfiguration: Network 6 deployment types, Interference management in 5G. Mobility management in 5G, Dynamic network 7 reconfiguration in 5G 7 Course Outcomes: After going through this course the student will be able to: 7 CO1 : Describe the history and concepts of 5G networks and its architecture. CO2 : Analyze the machine-to-machine communication and device to device communication
Relaying and wireless network coding: The role of relaying and network coding in 5G wireless networks, Multi-flow wireless backhauling, Highly flexible multi-flow relaying, Buffer-aided relaying Interference management, mobility management and dynamic reconfiguration: Network deployment types, Interference management in 5G. Mobility management in 5G, Dynamic network reconfiguration in 5G Course Outcomes: After going through this course the student will be able to: CO1 : Describe the history and concepts of 5G networks and its architecture.
wireless networks, Multi-flow wireless backhauling, Highly flexible multi-flow relaying, Buffer-aided relaying Interference management, mobility management and dynamic reconfiguration: Network deployment types, Interference management in 5G. Mobility management in 5G, Dynamic network reconfiguration in 5G Course Outcomes: After going through this course the student will be able to: CO1 : Describe the history and concepts of 5G networks and its architecture.
Buffer-aided relaying Interference management, mobility management and dynamic reconfiguration: Network deployment types, Interference management in 5G. Mobility management in 5G, Dynamic network reconfiguration in 5G Course Outcomes: After going through this course the student will be able to: CO1 : Describe the history and concepts of 5G networks and its architecture. CO2 : Analyze the machine-to-machine communication and device to device communication
Interference management, mobility management and dynamic reconfiguration: Network deployment types, Interference management in 5G. Mobility management in 5G, Dynamic network reconfiguration in 5G Course Outcomes: After going through this course the student will be able to: CO1 : Describe the history and concepts of 5G networks and its architecture. CO2 : Analyze the machine-to-machine communication and device to device communication
Course Outcomes: After going through this course the student will be able to: CO1 : Describe the history and concepts of 5G networks and its architecture. CO2 : Analyze the machine-to-machine communication and device to device communication
Course Outcomes: After going through this course the student will be able to: CO1 : Describe the history and concepts of 5G networks and its architecture. CO2 : Analyze the machine-to-machine communication and device to device communication
Course Outcomes: After going through this course the student will be able to: CO1 : Describe the history and concepts of 5G networks and its architecture. CO2 : Analyze the machine-to-machine communication and device to device communication
After going through this course the student will be able to: CO1 : Describe the history and concepts of 5G networks and its architecture. CO2 : Analyze the machine-to-machine communication and device to device communication
CO1 : Describe the history and concepts of 5G networks and its architecture.
CO2: Analyze the machine-to-machine communication and device to device communication
CO2: Design principle analysis of the radio access technologies
CO1. Design principle analysis of the windless network interference menorement and meltities
management
Poference Realts
1 50 Mabile and Winsload Communication Technology AffOregone Leve E Menseuret Detriel- Mensel
1. 5G Mobile and Wireless Communication Technology, AfifOsseran, Jose F Monserrat, Patrick Marsch,
1. 5G Mobile and Wireless Communication Technology, AfifOsseran, Jose F Monserrat, Patrick Marsch, Cambridge University Press, 2016. 2. An Introduction To LTE, LTE-Advanced, SAE, VOLTE And 4G Mobile Communications Second Edition

3. Fundamentals of 5G Mobile Networks, Jonathan Rodriguez, John Wiley & Sons 2015, ISBN: 97811188675253.

4. 5G Core Networks Powering Digitization, Stephen Rommer, Academic Press, 2019 ISBN: 978-0-08-1030009-7.

Scheme of Continuous Internal Evaluation (CIE): 20 + 40 + 40 = 100

QUIZZES: Quizzes will be conducted in online/offline mode. Two quizzes will be conducted & Each Quiz will be evaluated for 10 Marks. The sum of two quizzes will be the Final Quiz marks.

TESTS: Students will be evaluated in test, descriptive questions with different complexity levels (Revised Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating). Two tests will be conducted. Each test will be evaluated for 50 Marks, adding upto 100 Marks. Final test marks will be reduced to 40 Marks.

EXPERIENTIAL LEARNING: Students will be evaluated for their creativity and practical implementation of the problem. Case study-based teaching learning and Program specific requirements (15), Video based seminar/presentation/demonstration (25) adding upto 40 marks.

Scheme of Semester End Examination (SEE) for 100 marks: The question paper will have FIVE questions with internal choice from each unit. Each question will carry 20 marks. Student will have to answer one full question from each unit.

	RUBRIC for	CIE	10.0		RUBRIC for SEE	
SLNo	Content	<u>```</u>	Marks	Q. No	Contents	Marks
1 Quizzes - Q1 & Q2		20	Each u	unit consists of TWO questions of 20 Marks each. Answer FIV.		
2	Tests - T1 & T2	0.	40		full questions selecting ONE from each	unit (1 to 5).
3	Experiential Learning -	EL1 & EL2	40	18:2	Unit-1: Question 1 or 2	20
	12	T <mark>otal Marks</mark>	100	3&4	Unit-2: Question 3 or 4	20
				5&6	Unit-3: Question 5 or 6	20
				7 & 8	Unit-4: Question 7 or 8	20
				9 & 10	Unit-5: Question 9 or 10	20
						Total Marks 100

Go, change the world

G0,	change	the	world
-----	--------	-----	-------

University, B	lelagavi			
		SEMESTER: III		
Course Code	: 22MDC3E1T		CIE Marks	: 100
Credits L-T-P	: 3 - 1 - 0	Adaptive Signal Processing	SEE Marks	: 100
Hours	: 42L + 28T	Elective E (Professional Elective)	SEE Duration	s : 3 Hrs
Faci	ilty Coordinator:	Dr. Ranjani, G. Prof. P Nagaraju		
1 400		UNIT - I		8 Hrs
Introduction: I	Definitions and c	haracteristics, applications, properties, example	s Adaptive linear co	mbiner:
input signal ar	nd weight vectors	performance function-gradient and minimum	mean square error	Gradient
estimation and	l its effect on ada	ptation: Gradient component estimation by der	ivative measuremer	it. the
performance p	enalty	F		
<u> </u>		UNIT - II		9 Hrs
LMS algorithm	: Overview, LMS	Adaptation Algorithms, Stability and Performa	nce analysis of LMS	Algorithms,
Convergence o	f LMS Algorithm	Applications: Adaptive modeling and system id	lentification. Inverse	e adaptive
modeling, deco	onvolution and e	qualization, Adaptive Interference canceling	·····, ····	·
0,		UNIT - III		8 Hrs
Adaptive array	s and adaptive E	eam forming: Side lobe cancellation. Beam form	ning with pilot signa	ls. spatial
configurations	, Adaptive algorit	hms, Narrowband and broadband experiments,	Griffith's LMS bear	n former,
Frost adaptive	beam former, Be	am former with super resolution		,
	/	UNIT - IV		9 Hrs
Particle filterin	g: Motivation for	Use of Particle Filtering, The Basic Idea, The Cl	hoice of Proposal Di	stribution
and Resamplir	ng, Some Particle	Filtering Methods, Comparison of the Methods,	, Kernel-Based Auxi	liary Particle
Filter, Density	-Assisted Particle	Filt <mark>er</mark>		5
, ,	1.5	UNIT - V	41	8 Hrs
Rao-Blackwell	ization. Predictio	n. Smoothing, Convergence Issues, Computatio	nal Issues and Hard	lware
Implementatio	n. Nonlinear Seq	uential State Estimation for Solving Pattern-Cla	ssification Problem	3.
Back-Propagat	ion Learning, Su	pport Vector Machine. The Extended Kalman Fi	ilter	-)
1.10	8, 11		and the local data and the local	
Course Outco	mes:			
After going thr	ough this course	the student will be able to:		
CO1	: Design optima	l minimum mean square linear estimators and	nonlinear	
CO2	: Implement ad	aptive filters and evaluate their performance in	various applications	
CO3	· Design and ar	alvse adaptive Beam formers	- ano do appnoadon	-
C04	· Apply particle	filtering and other nonlinear sequential state es	stimation for	
001	nattern-classi	fication		
Reference Bo	oke			
1 Bernand Wi	drow Somuel D	Stearns Signal Processing ISBN: 0788131705	300 8131705303	Dearson
Education Ind	lia 2016	Stearns, Signar Processing, ISBN: 9700131703	522, 0151705525, 1	. carson
2 Tülay Adali	Simon Havkin	Adaptive Signal Processing: Next Generation Sol	utions ISBN.	
2. Tulay Muall,	517-8 Wiley-IFF	E Press 2010	.utions, isbit.	
$\frac{970-0-470-190}{3}$	Diniz Adaptive F	Filtering: Algorithms and Practical Implementation		
ISBN:078-3-03	20_20057_3 Sprir	gerCham 2020 https://doi.org/10.1007/978-3	JII, 8_030_20057_3	
$\frac{15DN.970-0-00}{4}$	Alexander Adapt	ive Signal Processing: Theory and Applications	1st edition Spring	er 2011
ISBN:078-146	1203828	ive Signal Processing. Theory and Applications,	, ist cutton, spring	2011,
10-1-010-1-0	1470040			
Scheme of Co	ntinuous Into	al Evaluation (CIE): $20 \pm 40 \pm 40 = 100$		
OIIIZZEG.	zzes will be cond	Lat E valuation (CIE): $20 \pm 40 \pm 40 = 100$	e conducted & Fact	Ouiz will bo
evaluated for 1	0 Marke The en	m of two quizzes will be the Final Ouiz marks	C CONTRUCTER & PACI	
TESTS: Stude	nts will be evalue	ated in test descriptive questions with different	complexity levels (R	evised
Bloom's Taxon	omy Levels: Rem	embering. Understanding Annlying Analyzing	Evaluating and Cr	eating) Two
tests will be co	inducted. Each to	est will be evaluated for 50 Marks, adding upto	100 Marks. Final te	st marks will
be reduced to	40 Marks.	apto		
n reduced 10	io mano.			

EXPERIENTIAL LEARNING: Students will be evaluated for their creativity and practical implementation of the problem. Case study-based teaching learning and Program specific requirements (15), Video based seminar/presentation/demonstration (25) adding upto 40 marks.

Autonomous Institution Affiliated Uviversivarya Technological University, Belegavi

Scheme of Semester End Examination (SEE) for 100 marks: The question paper will have FIVE questions with internal choice from each unit. Each question will carry 20 marks. Student will have to answer one full question from each unit.

	Rubri	c for C	IE & \$	SEE Theory courses	
	RUBRIC for CIE			RUBRIC for SEE	
SLNo	Content	Marks	Q. No	Contents	Marks
1	Quizzes - Q1 & Q2	20	Each u	nit consists of TWO questions of 20 Marks each. Answ	er FIVE
2	Tests - T1 & T2	40		full questions selecting ONE from each unit (1 to 5).	
3	Experiential Learning - EL1 & EL2	40	1&2	Unit-1: Question 1 or 2	20
	Total Marks	100	3&4	Unit-2: Question 3 or 4	20
			5&6	Unit-3: Question 5 or 6	20
			7 & 8	Unit-4: Question 7 or 8	20
			9 & 10	Unit-5: Question 9 or 10	20
				Total Marks	100



		g 11		·			
			SEMESTER: III				
Course Code	:	22MDC3E2T	Channel Coding Techniques	CIE Marks	:	100	
Credits L-T-P	:	3 - 1 - 0	chaimer couring rechniques	SEE Marks	:	100	
Hours	:	42L + 28T	Elective E (Professional Elective)	SEE Durations	:	3 Hrs	
Facu	lty	Coordinator:	Dr. K. Nagamani, Dr. G. Ranjani				
			UNIT - I			9 Hrs	
Introduction to	A	lgebra: Group	s, Fields, Construction of Galois Field GF (2m) and i	ts basic properties	s,	Vector	
spaces and Ma	tri	ices. Cyclic Co	des: Introduction, Generator and Parity check Polyn	omials, Encoding	u	sing	
Multiplication	cir	cuits, Systema	tic Cyclic codes – Encoding using Feedback shift re	gister circuits, Ge	n	erator	
matrix for Cycl	ic	codes, Syndro	me computation and Error detection, Meggitt decode	er, Error trapping	d	ecoding.	
			UNIT - II			8 Hrs	
BCH Codes: Bi	na	ary primitive B	CH codes, Decoding of BCH codes , Iterative Algorith	nm for finding the	e	rror	
location polync	m	ial, Simplified	iterative Algorithm for finding the error location poly	ynomial, Impleme	nt	ation of	
Galois field Ari	th	metic, Implem	entation of Error correction.				
			UNIT - III			9 Hrs	
RS Codes: q-ar	y İ	Linear block co	odes, Primitive BCH codes over GF(q),Decoding of No	on – Binary BCH a	ın	d RS	
codes. The Ber	lel	kamp - Massey	Algorithm.Trellis Coding Modulation:Introduction,	TCM code constru	ıc	tion.	
			UNIT - IV			8 Hrs	
Majority Logic	De	ecodable Codes	: One – Step Majority logic decoding, A Class of One	e – Step Majority l	08	gic	
decodable code	es,	Other One-ste	p Majority logic decodable codes Two – step Majorit	y logic decoding, N	۲Ì	ultiple –	
step Majority lo	ogi	ic decoding.					
		100	UNIT - V			8 Hrs	
Turbo Codes: I	nt	roduction to T	urbo coding and their distance properties. LDPC: In	troduction, Encod	lei	r, Tanner	
graph. Concate	ena	ated codes: En	c <mark>oder,</mark> Decoder.				
		07					
Course Outco	me	es:	0				
After going three	ou	gh this course	the student will be able to:				
CO1	:	Analyze the co	ncepts of linear algebra in channel encoding and de	coding			
CO2	:	Analyze prope	rties of BCH and RS codes and design the decoder.				
CO3	:	Apply the deco	oding algorithm to find the error and correct the error	or			
CO4	:	Analyze and in	nplement encoding and decoding circuits.				
		5					
Reference Boo)k	s					
1 Shu Lin & D) 91	viel I. Costello	Jr. "Error Control Coding" Pearson / Prentice Hall	2nd Edition 200	4	ISBN	
013-283796-X	a	ner o. costeno	, or. Error control county rearbon / rendee rian,	211a Dattion, 200		IODI	
2 R E Blahut	2 R F Blabut "Theory and Practice of Error Control Codes" Addison Wesley 1984 ISBN0894120638						
3 F.I. Mac Wil	-]ic	meery and I I A	Slope "The Theory of Error Correcting Codes" Nort	h Holland			
1977 ISBN-10	97	780444851932	Solute, The Theory of Error Contecting Codes Nort	in monana,			
4 Vishwajit Ba	<u>r</u> h	uddhe Shrad	the N Zaniat Bhavana S Karmore "Error Control (oding and			
Cryptography"	I.A	AP Lambert Ac	ademic Publishing 2020 ISBN-13 · 978-62025167	54			
	,		aucinic i ubnoming,2020, 10Div 10 . 970 02020107				
Scheme of Co	n+	inuque Intern	al Evaluation (CIE): $20 \pm 40 \pm 40 = 100$				
OIIIZZES Out	11 U	muous intern	at Evaluation (CIE): $20 \pm 40 \pm 40 = 100$	adjusted & Fash C), , ,	iz will be	
evaluated for 1	220 0	Narke The ou	m of two quizzes will be the Final Quizzes will be col	nuucieu & Bach Ç	yu		
TESTS. Studer	u ntr	wars. Int Su	the in test descriptive questions with different com-	nlevity levels (Pour	in	ed	
Bloom's Tavon	 012	will be evalue w Levels. Rem	embering Understanding Applying Applyzing Fuo	histing and Creat	15 tit	ration Target	
LIOUII S LANOII		Ty Develo, Relli	chioching, onderstanding, Apprying, Miaryzing, DVa	iuuuug, anu cital	ιI	15,11,110	

be reduced to 40 Marks. **EXPERIENTIAL LEARNING:** Students will be evaluated for their creativity and practical implementation of the problem. Case study-based teaching learning and Program specific requirements (15), Video based seminar/presentation/demonstration (25) adding upto 40 marks.

tests will be conducted. Each test will be evaluated for 50 Marks, adding upto 100 Marks. Final test marks will

Scheme of Semester End Examination (SEE) for 100 marks: The question paper will have FIVE questions with internal choice from each unit. Each question will carry 20 marks. Student will have to answer one full question from each unit.

RV Educational Institutions RV College of Engineering Autonomous Institution Affiliated to Vsvesvaraya Technological University, Belagavi

G0,	change	the	world
-----	--------	-----	-------

	RUBRIC for CIE		w	RUBRIC for SEE	
SLNo	Content	Marks	Q. No	Contents	Marks
1	Quizzes - Q1 & Q2	20	Each u	nit consists of TWO questions of 20 Marks each. Answ	ver FIVE
2	Tests - T1 & T2	40]	full questions selecting ONE from each unit (1 to 5).	
3	Experiential Learning - EL1 & EL2	40	1842	Unit-1: Question 1 or 2	20
	Total Marks	100	3&4	Unit-2: Question 3 or 4	20
	·		5&6	Unit-3: Question 5 or 6	20
			78.8	Unit-4: Question 7 or 8	20
			9 & 10	Unit-5: Question 9 or 10	20
				Total Marks	100



		SEMESTER: III	- · · · ·	
Course Code	: 22MDC3E3T	Cryptography and Network Security CIE Marks SEE Marks		0
Credits L-T-P	: 3 - 1 - 0			0
Hours	: 42L + 28T	Elective E (Professional Elective)	SEE Durations : 3 I	Hrs
Facu	lty Coordinator:	Dr. B. Roja Reddy		
		UNIT - I	8]	Hrs
Introduction: C	OSI Security Arch	itecture, Classical Encryption techniques: Symm	ietric Cipher Model,	
Substitution Te	echniques, Trans	portation Techniques. Block Ciphers and Data E	ncryption Standards:	c l
Advanced Encr	votion Standard	· AES Transformation Functions AES Key Expan	ipie, The Strength of DEA	S. AES
Implementation	n.	. The transformation runctions, the Key Expan	ioioii, mi mbo brampic, r	
I		UNIT - II	9]	Hrs
Public Key Cry	ptography and R	SA: Principles of Public-Key Cryptosystems, The	RSA Algorithm.Other	
Public-Key Cry	ptosystems: Diff	e-Hellman Key Exchange, Elgamal Cryptographi	c System, Elliptic Curve	
Arithmetic,Elli	ptic Curve Crypt	ography, Pseudorandom Number Generation Bas	ed on an Asymmetric Cir	oher.
		UNIT - III	81	Hrs
Cryptographic	Hash Functions:	Applications of Cryptographic Hash Functions, '	Two Simple Hash Function	ons,
Hash Function	s Based on Ciph	er Block Chaining, Secure Hash Algorithm (SHA)	, SHA-3.	
Message Authe	entication Codes:	Message Authentication Requirements, Message	Authentication Function	1S,
MACs Based of	n Block Ciphers:	DAA and CMAC Authenticated Encryption: CCM	I on Hash Functions. HM	anc,
Number Gener	ation Using Has	Functions and MACs	Tanu Gew, i seudorande	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
Digital Signatu	res: Digital Sign	atures, Elgamal Digital Signature Scheme, Schno	orr Digital Signature Sche	eme,
NIST Digital Si	gnature Algorith	n <mark>, Elli</mark> ptic Curve Digital Signature Al <mark>gorith</mark> m, RS	A-PSS Digital Signature	,
Algorithm.	2			
		UNIT - IV	9 1	Hrs
Network Acces	s Control and Cl	oud Security: Network Access Control, Extensible	e Authentication Protocol	, IEEE
802.1X Port-Ba	ased Network Ac	cess Control, Cloud Computing, cloud security R	isks and countermeasure	es,
Data protection	n in the cloud, cl	oud security as a service, addressing cloud comp	uting security	
Comprehensive	E Emoil Security	IP Security: Overview IP Security Policy Encore	Inan Inteals and	
Combining Sec	urity Association	In Security Foncy, Encaps	sulating Security Layload	L,
	arrey rissociation	UNIT - V	8]	Hrs
Security Mana	gement for Wirel	ess Communication: User domain Security, Netw	ork Access Security, Netv	work
Domain Securi	ty using MAP se	c, Network Domain Security using IP Security. Se	ecurity for 5G Communic	ation:
Introduction, C	Overview of a Pote	ential 5G Communications System Architecture,	security Issues and Chal	lenges
in 5G Commur	nications System	s- User Equipment, Access Networks, Mobile Ope	erator's Core Network, Ex	ternal
IP Networks.				
a a i				
After going thr	mes:	the student will be able to:		
	Describe the i	ssues addressed by Network Security and unders	stand the concepts of	
001	cryptography	and Network security	tand the concepts of	
CO2	: Apply cryptog	aphic techniques and algorithms to provide secu	urity to the transmitted	
	information.		5	
CO3 : Analyze the concepts of Authentication,Hash functions and Digital Signatures.				
CO4	: Understand a	nd analyze System level security issues and prote	ocols	
Reference Boo	oks			
1. Cryptography And Network Security - Principles and Practices, William Stallings PearsonEducation Limited, 7th Edition, 2017.ISBN-13:978-0134444284 ISBN-10:0134444280.				
2. Cryptography and Network Security, Behrouz A. Forouzan, Tata McGraw-Hill, 2008, ISBN-13: 978-0-13-187319-3.				
3. Fundamenta 978111886752	als of 5G Mobile 2 25.	Networks, Jonathan Rodriguez, 2015 John Wiley	& Sons Ltd. ISBN:	

4. 3G Networks, Architecture, Protocols and procedures – Based on 3GPP Specifications for UMTs WCDMA Networks, Sumit Kasera, Nishit Narang, Tata McGraw Hill Education Private Limited, 2011. ISBN-13: 978-0-07-052799-7

Scheme of Continuous Internal Evaluation (CIE): 20 + 40 + 40 = 100

QUIZZES: Quizzes will be conducted in online/offline mode. Two quizzes will be conducted & Each Quiz will be evaluated for 10 Marks. The sum of two quizzes will be the Final Quiz marks.

TESTS: Students will be evaluated in test, descriptive questions with different complexity levels (Revised Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating). Two tests will be conducted. Each test will be evaluated for 50 Marks, adding upto 100 Marks. Final test marks will be reduced to 40 Marks.

EXPERIENTIAL LEARNING: Students will be evaluated for their creativity and practical implementation of the problem. Case study-based teaching learning and Program specific requirements (15), Video based seminar/presentation/demonstration (25) adding upto 40 marks.

Scheme of Semester End Examination (SEE) for 100 marks: The question paper will have FIVE questions with internal choice from each unit. Each question will carry 20 marks. Student will have to answer one full question from each unit.

	RUBRIC for CIE		RUBRIC for SEE		
SLNo	Content	Marks	Q. No	Contents	Marks
1	Quizzes - Q1 & Q2	20	Each u	nit consists of TWO questions of 20 Marks each. And	swer FIVE
2	Tests - T1 & T2	40		full questions selecting ONE from each unit (1 to 5)-
3	Experiential Learning - EL1 & EL2	40	1 & 2	Unit-1: Question 1 or 2	20
	Total Marks	100	3&4	Unit-2: Question 3 or 4	20
			5&6	Unit-3: Question 5 or 6	20
			7 & 8	Unit-4: Question 7 or 8	20
			9 & 10	Unit-5: Question 9 or 10	20
				Total Mar	rs 100

RV	RV Educational In RV College of	nstitutions [©] of Engineering [®]
Partinines.	Autonomous Institution Affiliated to Visvesvaraya Technological University, Belagavi	Approved by AICTE. New Delhi

Go, change the world

SEMESTER III

Course Code : 22MDC32N		CIE Marks	:	50
Credits L-T-P : 0 - 0 - 6	INTERNSHIP	SEE Marks	:	50
Hours/Week : 12		SEE Durations	:	3 Hrs

Guidelines:

1. The duration of the internship shall be for a period of 6 weeks on full time basis after II semester final exams and before the commencement of III semester.

2. The student must submit letters from the industry clearly specifying his / her name and the duration of the internship on the company letter head with authorized signature.

3. Internship must be related to the field of specialization of the respective PG programme in which the student has enrolled.

4. Students undergoing internship training are advised to report their progress and submit periodic progress reports to their respective guides.

5. Students have to present the internship activities carried out to the departmental committee and only upon approval by the committee, the student can proceed to prepare and submit the hard copy of the final internship report. 6. The reports shall be printed on A4 size with 1.5 spacing and Times New Roman with font size 12, outer cover of the report (wrapper) has to be softbound in Ivory color for PG circuit Programs and Light Blue for Non-Circuit Programs.

Course Outcomes: After going through the internship the student will be able to

CO1: Apply Engineering and Management principles to solve the problems

CO2: Analyze real-time problems and suggest alternate solutions

CO3: Communicate effectively and work in teams

CO4: Imbibe the practice of professional ethics and lifelong learning

Scheme of Continuous Internal Evaluation (CIE):

The evaluation committee shall consist of Guide, Professor, Associate Professor/Assistant Professor. The committee shall assess the presentation and the progress reports.

The evaluation criteria shall be as per the rubrics given below:				
Reviews	Activity	Weightage		
Ι	Application of Engineering knowledge in industries, ability to comprehend the functioning of the Organization/ Departments.	40%		
II	Importance of Resource Management, Environment and Sustainability. Demonstration and Presentation of Internship work with Report Submission	60%		

Scheme for Semester End Evaluation (SEE):

The SEE examination shall be conducted by an external examiner (domain expert) and an internal examiner. Evaluation shall be done in batches, not exceeding 6 students per batch.

RV	RV Educational In RV College of	nstitutions [®] of Engineering
Contraction of the second	Autonomous Institution Affiliated to Visvesvaraya Technological University, Belagavi	Approved by AICTE, New Delhi

Go, change the world

1993 (1994) (1997)	000.070		SEMESTER III			
Course Code	:	22MDC33P		CIE Marks	: 50	
Credits L-T-P	:	0 - 0 - 6	MINOR PROJECT	SEE Marks	: 50	
Hours/Week	:	12		SEE Durations	: 3 Hrs	
Guidelines :						
1. Each projec	tε	group will co	nsist of maximum of two students.			
2. Each stude	nt	/ group has	to select a contemporary topic that will use the te	chnical knowled	lge of their	
program of stu	ldy	y after intens	sive literature survey.			
3. Allocation o	t t	he guides pr	referably in accordance with the expertise of the fa	culty.		
4. The minor p		ject would b	be performed in-house.		blo in the	
department/co	511		project must be preferably carried out using the	resources availa		
Course Outcomese. After completing the course, the students will be able to						
CO1: Concepti	19 19	lize, design a	and implement solutions for specific problems.			
CO2: Commun	nic	ate the solut	tions through presentations and technical reports			
CO3: Apply res	50	urce manage	ements skills for projects.			
CO4: Synthesi	ze	self-learning	g, team work and ethics.			
Scheme of Co	nt	tinuous Inte	ernal Examination			
Evaluation sha	Evaluation shall be carried out in three reviews. The evaluation committee shall consist of Guide, Professor and					
Associate Profe	Associate Professor/Assistant Professor.					
Phase *		03	Activity		Weightage	
T	A	pproval of th	ne <mark>selected</mark> topic, formulation of Problem Statemer	it and	20 %	
-	0	bjectives wit	s with <mark>Synops</mark> is submission			
II	Μ	lid-term sem	lin <mark>ar to rev</mark> iew the progress of the work <mark>with doc</mark> ur	mentation	40 %	
III	0	ral presenta	tion, demonstration and submission of project rep	oort	40 %	

* Phase wise rubrics to be prepared by the respective departments

CIE Evaluation shall be done with weightage / distribution as follows:			
• Selection of the topic & formulation of Problem Statement and Objectives	10 %		
• Design and simulation/ Algorithm development/ Experimental setup	25 %		
Conducting experiments/ Implementation / Testing	25 %		
Demonstration & Presentation	25 %		
• Report writing	15 %		

Scheme of Semester End Examination (SEE):

The evaluation will be done by ONE senior faculty from the department and ONE external faculty member from Academia / Industry / Research Organization. The following weightages would be given for the examination. Evaluation will be done in batches, not exceeding 6 students.

- Brief write up about the project 05%
- Methodology and Experimental Results & Discussion 20%
- Presentation / Demonstration of the Project 25%
- Report 20%
- Viva Voce 30%

			and the second second	
	Go, change	the world		
Autonor	nous Approved by AICTI	E.		
Institutio to Visve	on Affiliated New Delhi svaraya			
Technol Univers	ogical ity, Belagavi			
	- 1 - 1	SEMESTER IV		-
Course Code	: 22MDC41P	CIE	Marks :	100
Credits L-T-F	P : 0 - 0 - 18	MAJOR PROJECT SEI	E Marks :	100
Hours/Week	: 36	SEI	E Durations :	3 Hrs
Guidelines:		•		•
1. Major Proj	ect is to be carr	ried out for a duration of 18 weeks		
2. Students 1	must adhere to	the Project Presentation Schedule, report to their guid	le on a weekly	y basis and
get their Proj	ect diary signed	d by their guide 4. Students must execute the Major P	roject individı	ually and
not in teams				
5. It is mand	atory for the stu	udents to present/publish their project work in Nation	1al/Internatio	nal
Conferences	or Journals			
The report	s shall be print	ed on A4 size with 1.5 spacing and Times New Roman	with font size	e 12, outer
cover of the 1	report (wrapper)) has to be soft bound and in Ivory color for PG circuit	Programs an	d Light Blue
for Non-Circu	uit Programs	Channand C		
Course Outo	comes: After co	ompleting the course, the students will be able to		
CO1: Concep	otualize, Design	and Implement solutions for specific problems.		
CO2: Commu	unicate the solu	itions through presentations and technical reports.	• . •	
CO3: Apply r	project and reso	surce managements skills, professional ethics and soci	ietal concerns	5
CO4: Synthe	size self-learnin	ng, sustainable solutions and demonstrate life-long lea	ırnıng	
~				
Scheme of C	Continuous Int	ernal Examination		1 5 6
Evaluation s	hall be carried o	but in three reviews. The evaluation committee shall c	onsist of Guic	le, Protessor
Associate Pro	ofessor/Assistar	nt Professor.		
Dhago *		A		Waightaga
Thase	Soloction of L	Project Title Formulation of Problem Statement and O	hiaatiwaa	weightage
I		roject fille, Folliulation of Floblem Statement and O	Djectives	20 /0
11	Design, imple	Descrit & Analysis, Canalysis and Datase Same of	We wle	+0 %
II	Experimental	Result & Analysis, Conclusions and Future Scope of	work,	40.0/
. D1 .	Report writin		2	+0 %
Phase wise	rubrics to be p	repared by the respective departments		
Scheme for	Semester End	Evaluation (SEE):		
Major Project	t SEE evaluatio	n shall be conducted in two stages. This is initiated af	ter fulfilment	ot
submission o	of Project Repor	t and CIE marks.		, .
stage-1 Rep	ort Evaluation	: Evaluation of Project Report shall be done by the Gu	ide and an Ex	xternal
examiner.	4 375			1
Stage-2 Proj	ect Viva-voce:	Major Project Viva-voce examination is conducted after	er receipt of e	valuation

reports from Guide and External examiner.

SEE procedure is as follows:					
Report	Internal Examiner: 100 Marks	= 20	00		
Evaluation	External Examiner: 100 Marks	200 / 2 = 100	Α		
Viva-Voce	Jointly evaluated by Internal Guide & External Evaluator	= 100	В		
	Total Marks = (A + B) / 2 =	100			



RV Educational Institutions [®] RV College of Engineering [®]

Autonomous Institution Affiliated to Visvesvaraya Technological University, Belagavi Approved by AICTE, New Delhi



Curriculum Design Process



RV Educational Institutions [®] RV College of Engineering [®]

Autonomous Institution Affiliated to Visvesvaraya Technological University, Belagavi

Approved by AICTE, New Delhi

Process For Course Outcome Attainment



Go, change the world



RV Educational Institutions [®] RV College of Engineering [®]

Autonomous Institution Affiliated to Visvesvaraya Technological University, Belagavi Approved by AICTE, New Delhi

Program Outcome Attainment Process



Innovative Clubs of RVCE

-	+	Ashwa Mability Foundation (AMF) is a student R&D platform that designs and
1	Ashwa Racing	fabricates Formula theme race cars and future mobility solutions to tackle urban transportation problems.
2	Astra Robites	Team involved in the design, fabrication and building application specific robots.
3	Coding Club	To facilitate students the skills, confidence, and opportunity to change their world using coding and help them become successful in GSoC, ACM-ICPC, and other recognized coding competitions.
4	Entrepreneurship Development Cell	E-Cell is a student run body that aims to promote entrepreneurship by conducting workshops, speaker sessions and discussions on business and its aspects. We possess a mentor board to help startups grow.
5	Frequency Club	Team aims at contributing in both software and hardware domains mainly focusing on Artificial Intelligence, Machine Learning and it's advances.
6	Garuda	Design and development of supermileage urban concept electric car. Indigenous development of E-mobility products.
7	Jatayu	Build a low cost Unmanned Aerial Vehicle capable of Autonomous Navigation, Obstacle Avoidance, Object Detection, Localization, Classification and Air Drop of a package of optimum weight.
8	Solar Car	Build a roadworthy solar electric vehicle in order to build a green and sustainable environment.
9	Team Antariksh	Team Antariksh is a Space Technology Student Club whose goal is to understand, disseminate and apply the engineering skills for innovation in the field of Space technology. designing Nano-Satellite payload for ISRO PS4 Orbital platform, RVSAT-1 along with developing experimental rockets of various altitude.
10	Team Chimera	Building a Formula Electric Car through Research and Development in E-Mobility. Electrifying Formula Racing.
11	Helios Racing	Team involved in design, manufacturing and testing of All-Terrain Vehicles and other supportive tasks for the functioning of the team. Participating in BAJA competitions organized by SAE in India and the USA.
12	Team Hydra	Developing autonomous underwater vehicles and use it for various real world applications such as water purification, solid waste detection and disposal etc.
13	Team Krushi	Develop low cost equipments, which help farmers in cultivating and harvesting the crops. Use new technology applications to reduce the labour time hand cost for farmers. Aims at developing implants for Tractors.
14	Team vyoma	Design, fabrication and testing of radio controlled aircrafts and research on various types of unmanned aerial vehicles.
15	Team Dhruva	Organizing activities like quizzes based on astronomy.Stargazing and telescope handling sessions.Construction of a standard observatory. working on small projects with organizations like ICTS, IIA, ARIES etc.
16	Ham club	To popularize Amateur Radio as a hobby among students, alongside exploring technical innovations in the communications domain. Intended to provide human capital for service to the nation at times of natural calamities.

NCC



NSS



"Not me but you" " Education through Community Service & Community Service through education" **Cultural Activity Teams**

- 1. AALAP (Music club)
- 2. DEBSOC (Debating society)
- 3. CARV (Dramatics club)
- 4. FOOTPRINTS (Dance club)
- 5. QUIZCORP (Quizzing society)
- 6. ROTARACT (Social welfare club)
- 7. RAAG (Youth club)
- 8. EVOKE (Fashion team)
- 9. f/6.3 (Photography club)
- 10. CARV ACCESS (Film-making club)

VISION

Leadership in Quality Technical Education, Interdisciplinary Research & Innovation, with a Focus on Sustainable and Inclusive Technology



MISSION

- To deliver outcome based Quality education, emphasizing on experiential learning with the state of the art infrastructure.
- To create a conducive environment for interdisciplinary research and innovation.



- To develop professionals through holistic education focusing on individual growth, discipline, integrity, ethics and social sensitivity.
- To nurture industry-institution collaboration leading to competency enhancement and entrepreneurship.
- To focus on technologies that are sustainable and inclusive, benefiting all sections of the society.

QUALITY POLICY

Achieving Excellence in Technical Education, Research and Consulting through an Outcome Based Curriculum focusing on Continuous Improvement and Innovation by Benchmarking against the global Best Practices.

CORE VALUES

Professionalism, Commitment, Integrity, Team Work, Innovation

