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 COMMUNICATION SYSTEMS (MCS)

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

Academic Year 2022-23



RV-Mercedes Benz Centre for Automotive Mechatronics

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Glossary of Abbreviations

1.	AS	Aerospace Engineering
2.	BS	Basic Sciences
3.	BT	Biotechnology
4.	СН	Chemical Engineering
5.	СНҮ	Chemistry
6.	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



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POSTGRADUATE PROGRAMS

S1. 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	M. Tech in Information Technology	MIT
12.	ME	M. Tech in Product Design & Manufacturing	MPD
13.	ME	M. Tech in Machine Design	MMD





DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

VISION

Imparting quality technical education through interdisciplinary research, innovation and teamwork for developing inclusive & sustainable technology in the area of Electronics and Communication Engineering

MISSION

1. To impart quality technical education to produce industry-ready engineers with a research outlook.

2. To train the Electronics & Communication Engineering graduates to meet future global challenges by inculcating a quest for modern technologies in the emerging areas.

3. To create centres of excellence in the field of Electronics & Communication Engineering with industrial and university collaborations.

4. To develop entrepreneurial skills among the graduates to create new employment opportunities

PROGRAMME OUTCOMES (PO)

- M. Tech in **Communication Systems** graduates will be able to:
- PO1: Independently carry out research/investigation and development work to solve the practical problems related to Communication Systems.
- PO2: Write and present a substantial technical report/document in the field of Communication Systems.
- PO3: Demonstrate a degree of mastery over the area of Communication Systems. The mastery should be level higher than the requirements of bachelor's in Electronics & Communication Engineering program.
- PO4: Abstract the requirements of communication scenarios and offer innovative solutions with available communication modules and interfaces.
- PO5: Design and develop wireless and wireline communication system modules with good economics to meet Quality of Service.

PO6: Acquire professional and intellectual integrity, research ethics and execute socio-concern projects related to communication systems.

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19	22HSS42	Professional Skills Development-II	



M.Tech in Communication Systems: MCS

	I SEMESTER M.Tech												
01	Q1				edit A	lloc	ation			CIE	Max	SEE	Max
	No	Course Code	Course Title	т	Τ/	D	Toto1	BoS	Category	Duration	Marks	Duration	Marks
ľ	110.		11.0		SDA	г	Total		B	(H)	CIE	(H)	SEE
	1	22MAT11DT	Statistical Learning for Communication	3	1	0	4	MA	Theory	1.5	100	3	100
	2	22MCS12TL	Advanced Communication Systems-1	3	0	1	4	EC	Theory+Lab	1.5	100	3	100
	3	22MCS13T	Communication Networks and Protocols	3	1	0	4	EC	Theory	1.5	100	3	100
	4	22MCS14L	Programming and Network Simulation Lab	1	0	1	2	EC	Lab	1.5	50	3	50
	5	22XXX1AXT	Elective A (Professional Elective)	3	0	0	3	EC	Theory	1.5	100	3	100
	6	22MCS1BXT	Elective B (Professional Elective)	3	0	0	3	EC	Theory	1.5	100	3	100
1	Note	e: For the course	code 22HSS42, Students need to select one ONLINE	MO	OC co	ours	e as <mark>re</mark>	<mark>com</mark> mende	d by HSS BoS	5. This cour	rse can	be selected	d
0	any	nytime between I to III semester and it will be evaluated during IV semester.											

		20	
Code	Elective A (Professional Elective)	Code	Elective B (Professional Elective)
22MCS1A1T	Advanced Embedded Computing Devices	22MCS1B1T	Digital System Design Using HDL
22MCS1A2T	Multirate Systems and Filter Banks	22MCS1B2T	Multimedia Communication and Networking
22MVE1A3T	VLSI Digital Signal Processing	22MCS1B3T	Optical Communications and Networks
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II S	II SEMESTER M.Tech											
01			Cr	edit A	lloc	ation		/	CIE	Max	SEE	Max
SI.	Course Code	Course Title		T/	Б	T . (1	BoS	Category	Duration	Marks	Duration	Marks
INO.			L	^L SDA	Р	Total	~/		(H)	CIE	(H)	SEE
1	22IM21T	Research Methodology	3	0	0	3	IM	Theory	1.5	100	3	100
2	22MCS22TL	Advanced Communication Systems-2	3	0	1	4	EC	Theory+Lab	1.5	100	3	100
3	22MCS23T	Smart Antennas and Algorithms	3	0	0	3	EC	Theory	1.5	100	3	100
4	22XXX2CXT	Elective C (Professional Elective)	3	0	0	3	EC	Theory	1.5	100	3	100
5	22XXX2DXXT	Elective D (Global Elective)	3	0	0	3	Res. BoS	Theory	1.5	100	3	100
6	22MCS24L	Simulation and Characterisation of RF Devices	1	0	1	2	EC	Lab	1.5	50	3	50
7	22HSS25T	Professional Skills Development-I	2	0	0	2	HSS	Theory*	1.5	50	2	50
* Ex	ternal Agency u	vill be conducting the classes and both CIE and SEE w	will	be eve	alua	ted by	the Agenci	j.				

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Code	Elective C (Professional Elective)		
22MCS2C1T	Development of Modem SoCs for Wireless, Wireline and IOT applications	22MCS2C4T: Advanced 5G	
22MDC2C1T	RF and Microwave Circuit Design for Wireless Communication Systems		
22MVE2C3T	MVE2C3T Robotics and Industrial Automation		
MCS., M. Tech	. 2022 SCHEME		Pag



Elective D (Global Elective)

		1	
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	10.	

III S	III SEMESTER M.Tech											
01	Course Code			edit A	lloc	ation			CIE	Max	SEE	Max
No.		Course Title	т	Τ/	Б	T-+-1	BoS	Category	Duration	Marks	Duration	Marks
110.			L	SDA	Р	Total			(H)	CIE	(H)	SEE
1	22MCS31T	Error Control Coding for Wireless Communication	3	1	0	4	EC	Theory	1.5	100	3	100
2	22MCS3EXT	Elective E (Professional Electiv <mark>e)</mark>	3	1	0	4	EC	Theory	1.5	100	3	100
3	22MCS32N	Internship	0	0	6	6	EC	Internship	1.5	50	3	50
4	22MCS33P	Minor Project	0	0	6	6	EC	Project	1.5	50	3	50
	20											

Code	Elective E (Professional Elective)
22MCS3E1T	Next Generation Wireless LANs
22MCS3E2T	Cyber Security
22MCS3E3T	Modern Radar Systems

IV SEMESTER M.Tech												
S1.	Course Code		Credit Alloca		ation			CIE	Max Marks	SEE Duration	Max Marks	
No.		Course Title	L	SDA	Р	Total	BoS	Category	(H)	CIE	(H)	SEE
1	22MCS41P	Major Project	0	0	18	18	EC	Project	1.5	100	3	100
2	22HSS42	Professional Skills Development-II	2	0	0	2	HSS	NPTEL		50	ONLINE	50
Stu	Student need to submit the certificate for the evaluation of Course code 22HSS42											

SEMESTER: I Course Code 122MAT11DT Course Code 120MAT12D Faculty Coordinator: Dr. Prakash R 100 Faculty Coordinator: Dr. Prakash R 08 Hrs Introduction to Machine Learning: 08 Hrs Definition of learning systems, Goals and applications of machine learning, Aspects of developing a learning system: training data, concept representation. Opervised learning, Linear repression models and least system: training data, concept learning, Masine and poplications to image processing. Bayes theorem, Bayes theorem concept learning, Masine mi Riellhood, Minimum description length principle, Bayes optimal classifier, Gibbs algorithm, Na've Bayes classifier. Applications to statistical communications. Bayes theorem, Bayes theorem concept learning, Masine mi Riellhood, Minimum description length principle, Bayes theorem, Bayes theorem concept learning, Masine and Congustational Learning: Boyntain mitroes, Performance measures – Precision, recall, F-score, ROC curves, Bias, Variance and model complexity. Model Assessment and Selection: UMT - U Obd Inference, EM algorithm, Bageng and bumping. Applications to communications.			Co change	the world
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SEMESTER: I SEMESTER: I Carures Code [220M/T11DT] Credits L-T-P [3-1:0] Statistical Learning for Communication SEE Marks [100] Hours [:421:428T] Brastical Learning SEE Durations [3 Brastical Learning Particular Coordinator: Dr. Prakash R UNT - I 08 Hrs Introduction to Machine Learning: UNT - I 08 Hrs System: training data, concept representation, Overview of supervised Learning, Linear regression models and least squares, shrinkage methods-ridge regression. Lasso regression, Methods using derived input directions Principal component regression, Multidumestical aphines, Nonparametric logistic regression. Applications to communications. UNT - II OP Hrs Basis Expansions and Regularization: Inplications to image processing. Piccevise polynomials and splines, Wavel et amoothing and applications to statistical communication. UNT - II Model Assessment and Selection: UNT - III OP Hrs Bayesian inference, EM algorithm, Navive Bayes classifier, Applications to statistical communications. UNT - II OP Hrs Bayesian inference, EM algorithm, Bagging and Dumping. Applications to communications. UNT - V OP Hrs <td< td=""><td>Amazonea Approace by ACTE</td><th></th><td></td><td></td></td<>	Amazonea Approace by ACTE			
SEMESTER: I Caurse Code [22MAT11DT Caurse Code [241-287 Not statistical Learning for Communication CIF. Marks : 100 SEMESTER: I Caurse Code 100 SET contraction SET contraction Recurby Coordinator: Dr. Prakash R Image: Contraction Contraction SET contraction DEfinition of learning; DEfinition of learning; OB Hrs Image: Contraction Contracticon Contraction Contraction Contraction Contraction Contra	Institution Afflictuat In University			
SEMESTER: 1 Centris L-T-P (22MAT11DT Statistical Learning for Communication CIE Marks : 100 BEF actuly Coordinator: Dr. Prakash R CIE Marks : 100 Faculty Coordinator: Dr. Prakash R CIE Marks : 100 Definition of learning systems, Goals and applications of machine learning, Jacar cregression models and least squares, shrinkage methods ridge regression, Lasso regression, Methods using drived input directions. Principal component regression, Lasso regression, Methods using drived input directions. Principal component regression, Lasso regression, Anthods using drived input directions of machine learning: OP Principal Component Principal Component Regression, Muticity Principal Component Principal Computational Learning: OP Principal Component Principal Computing and Faure extraction, Smoothing splines, Nonparametric logistic regression, Muticity Principal Computational Learning: Bayes Interima Cassifier, Cibbs algorithm, Nave Bayes Cassifier, Applications to statistical communication. UNIT - III OP Principal Computing Splines, Nonparametric logistic regression, Muticity Principal Computing Splines, Nonparametric logistic regression, Muticity Principal Computing, Maximum likelihood, Minimum description length principle, Bayes and Marchange Bayesian and Computing Splines, Nonparametrice logistic Cregression, Colsplications to statistica	Driversity, Selagast			
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Paculty Coordinator: JD. Prakash R UNIT - I OS Hrs Introduction to Machine Learning: Definition of I carning systems, Goals and applications of machine learning, Aspects of developing a learning system: training data, concept representation, Overview of supervised learning, Linear regression models and least squares, shrinkage methods-ndge regression, Lasso regression, Methods using derived input directions. Principal component regression, Logistic regression, Applications to communications. OP Hrs Basis Expansions and Regularization: INIT - II OP Hrs Piecewise polynomials and splines, Filtering and learure extraction, Smoothing splines, Nonparametric logistic regression, Auduidimensional splines, Wavelet smoothing and applications to statistical communication. OP Hrs Bayes theorem, Bayes theorem concept learning, Maximum likelihood, Minimum description length principle, Bayes optimal classifier, Gibbs algorithm, Naïve Bayes classifier. Applications to statistical communication. UNIT - III OP Hrs Model Assessment and Selection: Confusion matrices, Performance measures – Precision, recall, P-score, ROC curves, Bias, Variance and model complexity, Model selection and the Bias-variance trade-off. Cross-validation, Bootstrap and maximum likelihood methods, Bayesian methods, Relationship between the bootstrap and Bayesian inference, EM algorithm, Bagging and bumping. Applications to communications. UNIT - IV O8 Hrs Tee based Models and Neural Networks: Descision tree, for secression, Random forests, Boosting methods-Steepest descent, Gradinet boosting.	Hours : 42L+28T		SEE Durations	: 3 Hrs
UNIT - I [08 Hrs] Introduction to Machine Learning: Definition of learning systems, Goals and applications of machine learning, Aspects of developing a learning system: training data, concept representation, Overview of supervised learning, Linear regression nodels and least squares, shrinkage methods-ridge regression, Lasso regression, Methods using derived input directions-Principal component regression, Logistic regression, Applications to communications. 09 Hrs Basis Expansions and Regularization: Precewise polynomials and splines, Filtering and feature extraction, Smoothing splines, Nonparametric logistic regression, Multidimensional splines, Wavelet smoothing and applications to statistical communication. 09 Hrs Basis Expansions and Regularization: Precewise polynomials and splines, Wavelet smoothing and applications to statistical communication. 09 Hrs Bayes optimal classifier Gibbs algorithm, Nave Bayes classifier. Applications to statistical communication. 09 Hrs Model Assessment and Selection: Confusion matrices, Performance measures – Precision, recall, F-score, ROC curves, Bias, Variance and model complexity, Model selection and the Bias-variance trade-off. Cross-validation, Bootstrap methods. Model Assessment and Selection: Root Inference, EM Algorithm, Baging, Bayesian methods, Relationship between the bootstrap and Bayesian inference, EM Algorithm, Baging, and bumping. Applications to communications. UNIT - V 08 Hrs Tree based Models and Neural Networks: Robotin free, issues in trabinsion tree, Tree-based meth	Faculty Coordinate	or: Dr. Prakash R		
Introduction to Machine Learning: Definition of learning system: training data, concept representation, Overview of supervised learning, Linear regression models and least squares, shrinkage methods-ridge regression, Lasso regression, Methods using derived input directions-Principal component regression, Logistic regression, Applications to communications. UNT II 09 Hrs Basis Expansions and Regularization: Precewise polynomials and splines, Rittering and feature extraction, Smoothing splines, Nonparametric logistic regression, Multidimensional splines, Wavelet smoothing and applications to image processing. Bayesian and Computational Learning: Bayes theorem, Bayes theorem concept learning, Maximum likelihood, Minimum description length principle, Bayes optimal classifier, Gibbs algorithm, Naïve Bayes classifier, Applications to statistical communication. UNIT III 09 Hrs Model Assessment and Selection: Confusion matrices, Performance measures – Precision, recall, F-score, ROC curves, Bias, Variance and model complexity, Model selection and the Bias-variance trade-off. Cross-validation, Bootstrap methods. Model Inference and Averaging: Bootstrap and maximum likelihood methods, Bayesian methods, Relationship between the bootstrap and Bayesian inference, EM algorithm, Bagging and bumping, Applications to communications. UNIT · IV 108 Hrs Tree based Models and Neural Networks: Decision trees, precisation reges for ergerssion, Random forests, Boosting methods-Steepest descent, Gradient boosting. Neural networks - Neural networks, Bayesian methods , Applications to neural networks and communications. UNIT · V 108 Hrs Support Vector Machines and Kernels, Support vector classifier and phyperplanes, Generalizing linear discriminant analysis, Flexible discriminants: Support vector machines and kernels, Support vector classifier, Separating hyperplanes, Generalizing linear discriminant analysis, Flexible discriminants: COU i Ellustrate the fundamental concepts of various machine learning mode		UNIT - I		08 Hrs
Definition of realing systems, sources and applications of supervised learning, Linear regression models and least squares, shrinkage methods-ridge regression, Logistic regression, Applications to communications. UNIT - II O9 Hrs Basis Expansions and Regularization: Precessing, Linear regression, Methods using derived input directions-Principal component regression, Logistic regression, Mothods using derived input directions-Principal component regression, Logistic regression, Mothods using derived input directions of the probability of the precision tree regresentation and the Bias -variance trade-off. Cross-validation, Bootstrap and Bayesian inference, EM algorithm, Bagging and bumping, Applications to communications. O8 Hrs Tree based Models and Neural Networks: UNIT - IV 08 Hrs Cradient boosting. UNIT - V 08 Hrs Support Vector Machines and Feedble Discriminant analysis, Flexibility discriminant analysis, Fl	Introduction to Machine L	earning:	ota of dovialaning o 1	oomina
system naming una, concept representation, Lasso regression, Methods uning unar dependent and least squares, shrinkage methods ridge regression, Lasso regression, Methods using derived input directions-Principal component regression, Lasso regression, Methods using derived input directions-Principal component regression, Lasso regression, Methods using derived input for precedent of the system of the syst	system: training data conce	nt representation. Overview of supervised learning.	inear regression mo	dels and
directions-Principal component regression, Logistic regression, Applications to communications. UNIT - II OP Hrs Basis Expansions and Regularization: Piecewise polynomials and splines, Filtering and feature extraction, Smoothing splines, Nonparametric logistic regression, Multidimensional splines, Wavelet smoothing and applications to image processing. Bayes theorem concept learning, Maximum likelihood, Minimum description length principle, Bayes optimal classifier, Gibbs algorithm, Naive Bayes classifier, Applications to statistical communication. VINT - III OP Hrs Model Averaging: Confusion matrices, Performance measures – Precision, recall, F-score, ROC curves, Bias, Variance and model complexity, Model selection and the Bias-variance trade-off. Cross-validations, Bootstrap methods. Model Inference and Averaging: Botstrap and maximum likelihood methods, Bayesian methods, Relationship between the bootstrap and Bayesian inference, EM algorithm, Baggring and bumping. Applications to neural networks. Decision tree representation, Inductive bias in decision tree, issues in decision tree, Tree-based methods - Classification tree sfor regression, Random forests, Boosting methods-Steepest descent, Gradient boosting. Neural networks, Bayesian neural networks. Applications to neural networks and communications. UNIT - V O8 Hrs Stopport Vector Machines and Flexib	least squares shrinkage me	thods-ridge regression Lasso regression Methods us	sing derived input	dels allu
UNIT - II Op Hrs Basis Expansions and Regularization: Image: Complexity of the state of the st	directions-Principal compone	ent regression, Logistic regression. Applications to co	ommunications.	
Basis Expansions and Regularization: Precewise polynomials and splines, Filtering and feature extraction, Smoothing splines, Nonparametric logistic regression, Multidimensional splines, Wavelet smoothing and applications to image processing. Bayesian and Computational Learning: Bayes theorem, Bayes theorem concept learning, Maximum likelihood, Minimum description length principle, Bayes optimal classifier, Gibbs algorithm, Naive Bayes classifier, Applications to statistical communication. WINT - III 09 Hrs Model Assessment and Selection: 09 Hrs Confusion matrices, Performance measures – Precision, recall, F-score, ROC curves, Bias, Variance and model complexity, Model selection and the Biase-variance trade-off. Cross-validation, Bootstrap methods. 09 Hrs Model Inference and Averaging: Bootstrap and maximum likelihood methods, Bayesian methods, Relationship between the bootstrap and Bayesian inference, EM algorithm, Bagging and bumping. Applications to communications. 08 Hrs Tree based Models and Neural Networks: Decision tree, Tree-based methods - Classification trees, Decision trees for regression, Random forests, Boosting methods-Stepest descent, Gradient boosting. 08 Hrs Neural networks - Reural networks, Bayesian neural networks. Applications to neural networks and kernels, Support vector classifier, Separating hyperplanes, Generalizing linear discriminant analysis, Prototype methods, k. nearest-neighbor classifiers, Cause and maximus likelihood, Multiayer networks and back propagation algorithms, some issues in training neural hetworks, Applications to array signal processing.	1 1	UNIT - II		09 Hrs
Piecewise polynomials and splines, Filtering and feature extraction, Smoothing splines, Nonparametric logistic regression, Multidimensional splines, Wavelet smoothing and applications to image processing. Bayesian and Computational Learning: Bayes theorem, Bayes theorem concept learning, Maximum likelihood, Minimum description length principle, Bayes optimal classifier, Gibbs algorithm, Naive Bayes classifier, Applications to statistical communication. UNIT · III 09 Hrs Model Assessment and Selection: Conflusion matrices, Performance measures – Precision, recall, F-score, ROC curves, Bias, Variance and model complexity, Model selection and the Bias-variance trade-off. Cross-validation, Bootstrap methods. Model Inference and Averaging: Bootstrap and maximum likelihood methods, Bayesian methods, Relationship between the bootstrap and Bayesian inference, EM algorithm, Bagging and bumping. Applications to communications. UNT · IV 08 Hrs Tree based Models and Neural Networks: Decision tree representation, Inductive bias in decision tree, issues in decision tree, Tree-based methods – Classification trees, Decision trees for regression, Random forests, Boosting methods-Steepest descent, Gradient boosting. Neural networks - Neural network, Bayesian neural networks. Applications to neural networks and communications. UNIT · V 08 Hrs Support Vector Machines and Kernels, Support vector classifier, Separating hyperplanes, Generalizing linear discriminant analysis, Flexible discriminant analysis, Prototype methods, k- nearest-neighbor classifiers, Adaptive nearest-neighbor methods, Applications to array signal processing. CO012 i Illustrate the fundamental concepts of various machine learning models which are used in Communication systems. CO02 i Derive the solution of the problems using appropriate statistical and mathematical learning model techniques to the real world problems arising in many practical situations. CO04 i Compile the overall knowledge of statistical learning for communication systems. CO04 i Compile the o	Basis Expansions and Regu	larization:		
regression, Multidimensional splines, Wavelet smoothing and applications to image processing. Bayesian and Computational Learning: Bayes theorem, Bayes theorem concept learning, Maximum likelihood, Minimum description length principle, Bayes optimal classifier, Gibbs algorithm, Naive Bayes classifier, Applications to statistical communication. Work (09 Hrs) Model Assessment and Selection: (09 Hrs) Confusion matrices, Performance measures – Precision, recall, F-score, ROC curves, Bias, Variance and model complexity, Model selection and the Bias-variance trade-off. Cross-validation, Bootstrap methods. (09 Hrs) Model Inference and Averaging: (00 Hrs) (08 Hrs) Bootstrap and maximum likelihood methods, Bayesian methods, Relationship between the bootstrap and Bayesian inference, EM algorithm, Bagging and bumping. Applications to communications. (08 Hrs) Tere based Models and Neural Networks: 08 Hrs (08 Hrs) Classification trees, Decision trees for regression, Random forests, Boosting methods-Steepest descent, Gradient boosting. (08 Hrs) Neural networks, Bayesian neural networks. Applications to neural networks and back propagation algorithms, Some issues in training neural networks, Bayesian neural networks. Applications to neural networks and Communications. (08 Hrs) Support Vector Machines and Kernels, Support vector classifier, Separating hyperplanes, Generalizing linear discriminant analysis, Prototype methods, k- nearest-neighbor classifiers, Adaptive nearest-neighbor methods, Applications to array signal processing.	Piecewise polynomials and s	plines, Filtering and feature extraction, Smoothing s	plines, Nonparametr	ric logistic
Bayesian and Computational Learning: Bayes theorem, Bayes theorem concept learning, Maximum likelihood, Minimum description length principle, Bayes optimal classifier, Gibbs algorithm, Naïve Bayes classifier, Applications to statistical communication. UNIT • III 09 Hrs Model Assessment and Selection: Confusion matrices, Performance measures – Precision, recall, F-score, ROC curves, Bias, Variance and model complexity, Model selection and the Bias-variance trade-off. Cross-validation, Bootstrap methods. Model Inference and Averaging: Bootstrap and maximum likelihood methods, Bayesian methods, Relationship between the bootstrap and Bayesian inference, EM algorithm, Bagging and bumping, Applications to communications. UNIT • IV 08 Hrs Tree based Models and Neural Networks: Decision tree representation , Inductive bias in decision tree, issues in decision tree, Tree-based methods – Classification trees, Decision trees for regression, Random forests, Boosting methods-Steepest descent, Gradient boosting. Neural networks - Neural network representation, Multilayer networks and back propagation algorithms, Some issues in training neural networks, Bayesian neural networks. Applications to neural networks and communications. UNIT • V 08 Hrs Support Vector Machines and Kernels, Support vector classifier, Separating hyperplanes, Generalizing linear discriminant analysis, Flexible discriminant analysis, Prototype methods, k- nearest-neighbor classifiers, Adaptive nearest-neighbor methods, Applications to array signal processing. CO01 : Illustrate the fundamental concepts of various machine learning models which are used in Communication systems. CO02 : Derive the solution by applying the acquired knowledge of statistics and mathematical learning machine learning approach to model and solve the application problems of Communication systems. CO04 : Compile the esolution of the problems using appropriate statistical and mathematical learning machel techniques to the real world problems arising in many practical situations. CO0	regression, Multidimensiona	l splines, Wavelet smoothing and applications to ima	ige processing.	
Bayes theorem, Bayes theorem concept learning, Maximum likelihood, Minimum description length principle, Bayes optimal classifier, Gibbs algorithm, Naïve Bayes classifier, Applications to statistical communication. UNIT - III OP Hrs Model Assessment and Selection: Confusion matrices, Performance measures – Precision, recall, F-score, ROC curves, Bias, Variance and model complexity, Model selection and the Bias-variance trade-off. Cross-validation, Bootstrap methods. Model Inference and Averaging: Bootstrap and maximum likelihood methods, Bayesian methods, Relationship between the bootstrap and Bayesian inference, EM algorithm, Bagging and bumping, Applications to communications. UNIT - IV O8 Hrs Tree based Models and Neural Networks: Decision tree representation , Inductive bias in decision tree, issues in decision tree, Tree-based methods – Classification trees, Decision trees for regression, Random forests, Boosting methods-Steepest descent, Gradient boosting. Neural networks, Bayesian neural networks and back propagation algorithms, Some issues in training neural network representation, Multilayer networks and back propagation algorithms, Some issues in training neural networks, Bayesian neural networks. Applications to neural networks and communications. UNIT - V O8 Hrs Support Vector Machines and Flexible Discriminants: Support vector machines and Kernels, Support vector classifier, Separating hyperplanes, Generalizing linear discriminant analysis, Prototype methods, k- nearest-neighbor classifiers, Adaptive nearest-neighbor methods, Applications to array signal processing. Course Outcomes: Atter going through this course the student will be able to: CO1 : Illustrate the fundamental concepts of various machine learning models which are used in Communication systems. CO3 : Evaluate the solution of the problems using appropriate statistical and mathematical learning model techniques to the real world problems arising in many practical situations. CO3 : Evaluate the solution of the problems	Bayesian and Computation	al Learning:	6	
Bayes optimal classifier, Gibbs algorithm, Naïve Bayes classifier, Applications to statistical communication. O9 Hrs Model Assessment and Selection: 09 Hrs Confusion matrices, Performance measures – Precision, recall, F-score, ROC curves, Bias, Variance and model complexity, Model selection and the Bias-variance trade-off. Cross-validation, Bootstrap methods. Model Inference and Averaging: Boytstrap and maximum likelihood methods, Bayesian methods, Relationship between the bootstrap and Bayesian inference, EM algorithm, Bagging and bumping. Applications to communications. 08 Hrs Tree based Models and Neural Networks: Decision tree, issues in decision tree, issues in decision tree, Tree-based methods – Classification trees, Decision trees for regression, Random forests, Boosting methods-Steepest descent, Gradient boosting. 08 Hrs Neural networks - Neural networks representation, Multilayer networks and back propagation algorithms, Some issues in training neural networks, Bayesian neural networks. Applications to neural networks and communications. 08 Hrs Support Vector Machines and Flexible Discriminants: UNIT - V 08 Hrs Support vector machines and Kernels, Support vector classifier, Separating hyperplanes, Generalizing linear discriminant analysis, Flexible discriminant analysis, Prototype methods, k- nearest-neighbor classifiers, Adaptive nearest-neighbor methods, Applications to array signal processing. CO11 : Illustrate the fundamental concepts of various machine learning models which are used in Communication systems. CO21 : Derive the solution by applyi	Bayes theorem, Bayes theore	em concept learning, Maximum likelihood, Minimum	description length	principle,
UNIT - III O9 Hrs Model Assessment and Selection: Confusion matrices, Performance measures – Precision, recall, F-score, ROC curves, Bias, Variance and model complexity, Model selection and the Bias-variance trade-off. Cross-validation, Bootstrap methods. Model Inference and Averaging: Bootstrap and maximum likelihood methods, Bayesian methods, Relationship between the bootstrap and Bayesian inference, EM algorithm, Bagging and bumping. Applications to communications. 08 Hrs Bayesian inference, EM algorithm, Bagging and bumping. Applications to communications. 08 Hrs Classification trees, Decision trees for regression, Random forests, Boosting methods-Steepest descent, Gradient boosting. 08 Hrs Neural networks - Neural networks representation, Multilayer networks and back propagation algorithms, Some issues in training neural networks, Bayesian neural networks. Applications to neural networks and communications. 08 Hrs Support Vector Machines and Flexible Discriminants: Support Vector Machines and Flexible Discriminants: Support vector machines and kernels, Support vector classifier, Separating hyperplanes, Generalizing linear discriminant analysis, Prototype methods, k- nearest-neighbor classifiers, Adaptive nearest-neighbor methods, Applications to array signal processing. CO11 Illustrate the fundamental concepts of various machine learning models which are used in communication systems. CO21 Derive the solution of the problems using appropriate statistical and mathematical learning model techniquese t	Bayes optimal classifier, Gib	bs algorithm, Naïve Bayes classifier. Applications to	statistical communi	cation.
Model Assessment and Selection: Confusion matrices, Performance measures - Precision, recall, F-score, ROC curves, Bias, Variance and model complexity, Model selection and the Bias-variance trade-off. Cross-validation, Bootstrap methods. Model Inference and Averaging: Bootstrap and maximum likelihood methods, Bayesian methods, Relationship between the bootstrap and Bayesian inference, EM algorithm, Bagging and bumping, Applications to communications. 08 Hrs Tree based Models and Neural Networks: UNIT - IV 08 Hrs Tere based Models and Neural Networks: Concision tree, presentation, Inductive bias in decision tree, issues in decision tree, Tree-based methods - Classification trees, Decision trees for regression, Random forests, Boosting methods-Steepest descent, Gradient boosting. Neural networks - Neural network representation, Multilayer networks and back propagation algorithms, Some issues in training neural networks, Bayesian neural networks. Applications to neural networks and communications. 08 Hrs Support Vector Machines and Kernels, Support vector classifier, Separating hyperplanes, Generalizing linear discriminant analysis, Prototype methods, k- nearest-neighbor classifiers, Adaptive nearest-neighbor methods, Applications to array signal processing. Course Outcomes: Acter going through this course the student will be able to: Course outcomes: CO1 CO2 Evaluate the solution of the problems using appropriate statistical and mathematics via machine learning approach to model and solve the application problems of Communication systems. CO4 CO3		UNIT - III		09 Hrs
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Complexity, Model selection and the Bias-variance trade-oil. Cross-validation, Bootstrap methods. Model Inference and Averaging: Bootstrap and maximum likelihood methods, Bayesian methods, Relationship between the bootstrap and Bayesian inference, EM algorithm, Bagging and bumping. Applications to communications. UNIT - IV 08 Hrs Tree based Models and Neural Networks: Decision tree, presentation , Inductive bias in decision tree, issues in decision tree, Tree-based methods - Classification trees, Decision trees for regression, Random forests, Boosting methods-Steepest descent, Gradient boosting. Neural networks - Neural network representation, Multilayer networks and back propagation algorithms, Some issues in training neural networks, Bayesian neural networks. Applications to neural networks and communications. 08 Hrs Support Vector Machines and Flexible Discriminants: 08 Hrs Support Vector machines and kernels, Support vector classifier, Separating hyperplanes, Generalizing linear discriminant analysis, Flexible discriminant analysis, Prototype methods, k- nearest-neighbor classifiers, Adaptive nearest-neighbor methods, Applications to array signal processing. CO11 : Illustrate the fundamental concepts of various machine learning models which are used in Communication systems. CO2 : Derive the solution by applying the acquired knowledge of statistical and mathematics via machine learning approach to model and solve the application problems of Communication systems. CO3 : Evaluate the solution of the problems using appropriate statistical and mathematical learning model technique	Confusion matrices, Perform	ance measures – Precision, recall, F-score, ROC curv	ves, Bias, Variance a	and model
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Bootstap and maximum incluitods, Bagesian methods, Relationship between the bootstap and Bagesian inference, EM algorithm, Bagging and bumping. Applications to communications. UNIT - IV O8 Hrs Tree based Models and Neural Networks: Decision trees representation, Inductive bias in decision tree, issues in decision tree, Tree-based methods – Classification trees, Decision trees for regression, Random forests, Boosting methods-Steepest descent, Gradient boosting. Neural networks representation, Multilayer networks and back propagation algorithms, Some issues in training neural networks, Bayesian neural networks. Applications to neural networks and communications. UNIT - V O8 Hrs Support Vector Machines and Kernels, Support vector classifier, Separating hyperplanes, Generalizing linear discriminant analysis, Flexible discriminant analysis, Prototype methods, k- nearest-neighbor classifiers, Adaptive nearest-neighbor methods, Applications to array signal processing. Course Outcomes: After going through this course the student will be able to: CO2 : Derive the solution by applying the acquired knowledge of statistics and mathematics via machine learning approach to model and solve the application problems of Communication systems. CO3 : Evaluate the solution of the problems using appropriate statistical and mathematical learning model techniques to the real world problems arising in many practical situations. CO4 : Compile the overall knowledge of statistical and mathematical learning model techniques to the re	Model Interence and Avera	ging:	twoon the bootstrar	and
Interfactors of communications. UNT - IV O8 Hrs Tree based Models and Neural Networks: Decision tree representation , Inductive bias in decision tree, issues in decision tree, Tree-based methods – Classification trees, Decision trees for regression, Random forests, Boosting methods-Steepest descent, Gradient boosting. Neural networks - Neural network representation, Multilayer networks and back propagation algorithms, Some issues in training neural networks, Bayesian neural networks. Applications to neural networks and communications. 08 Hrs Support Vector Machines and Kernels, Support vector classifier, Separating hyperplanes, Generalizing linear discriminant analysis, Flexible discriminant analysis, Prototype methods, k- nearest-neighbor classifiers, Adaptive nearest-neighbor methods, Applications to array signal processing. Course Outcomes: CO1 Illustrate the fundamental concepts of various machine learning models which are used in Communication systems. CO2 Eperive the solution by applying the acquired knowledge of statistics and mathematics via machine learning approach to model and solve the application problems of Communication systems. CO3 Evaluate the solution of the problems using appropriate statistical and mathematical learning model techniques to the real world problems arising in many practical situations. CO4 Compile the overall knowledge of statistics, 2nd Edition, 2009 2 Every the solution of the problems using app	Boyesian inference, FM aloo	rithm Bagging and humping Applications to commu	inications) and
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Gradient boosting. Neural networks - Neural networks representation, Multilayer networks and back propagation algorithms, Some issues in training neural networks, Bayesian neural networks. Applications to neural networks and communications. UNIT - V O8 Hrs Support Vector Machines and Flexible Discriminants: Support Vector Machines and Kernels, Support vector classifier, Separating hyperplanes, Generalizing linear discriminant analysis, Flexible discriminant analysis, Prototype methods, k- nearest-neighbor classifiers, Adaptive nearest-neighbor methods, Applications to array signal processing. Course Outcomes: After going through this course the student will be able to: CO1 Illustrate the fundamental concepts of various machine learning models which are used in Communication systems. CO2 Derive the solution by applying the acquired knowledge of statistics and mathematics via machine learning approach to model and solve the application problems of Communication systems. CO3 Evaluate the solution of the problems using appropriate statistical and mathematical learning model techniques to the real world problems arising in many practical situations. CO4 Compile the overall knowledge of statistical learning for communication gained to apply and engage in life – long learning. Reference Books: 1 The Elements of Statistical Learning: Data Mining, Inference, and Prediction, Trevor Hastie, Robert Tibshirani, Jerome Frie	Classification trees, Decision	trees for regression, Random forests, Boosting meth	nods-Steepest desce	nt,
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UNIT - V O8 Hrs Support Vector Machines and Flexible Discriminants: Support vector machines and kernels, Support vector classifier, Separating hyperplanes, Generalizing linear discriminant analysis, Flexible discriminant analysis, Prototype methods, k- nearest-neighbor classifiers, Adaptive nearest-neighbor methods, Applications to array signal processing. Course Outcomes: After going through this course the student will be able to: COI : Illustrate the fundamental concepts of various machine learning models which are used in Communication systems. CO2 : Derive the solution by applying the acquired knowledge of statistics and mathematics via machine learning approach to model and solve the application problems of Communication systems. CO3 : Evaluate the solution of the problems using appropriate statistical and mathematical learning model techniques to the real world problems arising in many practical situations. CO4 : Compile the overall knowledge of statistical learning for communication gained to apply and engage in life – long learning. Reference Books: 1 1. The Elements of Statistical Learning: Data Mining, Inference, and Prediction, Trevor Hastie, Robert Tibshirani, Jerome Friedman, Springer Series in Statistics, 2nd Edition, 2009 2. Statistical Machine Learning: A Unified Framework, Richard M. Golden, Chapman and Hall/CRC; 1st edition, 2020, ISBN-10:1138484695 3. K R Murphy, "Machine Learning-A Probabilistic Perspective", 1st Edition, MIT Press, 2012, ISBN-10:1138484695<	issues in training neural net	wor <mark>ks, Bayes</mark> ian neural networks. A <mark>pplicatio</mark> ns to ne	eural networks and	
UNIT - V [08 Hrs] Support Vector Machines and Flexible Discriminants: Support vector machines and kernels, Support vector classifier, Separating hyperplanes, Generalizing linear discriminant analysis, Flexible discriminant analysis, Prototype methods, k- nearest-neighbor classifiers, Adaptive nearest-neighbor methods, Applications to array signal processing. Course Outcomes: After going through this course the student will be able to: CO1 : Illustrate the fundamental concepts of various machine learning models which are used in Communication systems. CO2 : Derive the solution by applying the acquired knowledge of statistics and mathematics via machine learning approach to model and solve the application problems of Communication systems. CO3 : Evaluate the solution of the problems using appropriate statistical and mathematical learning model techniques to the real world problems arising in many practical situations. CO4 : Compile the overall knowledge of statistical learning for communication gained to apply and engage in life – long learning. Reference Books: 1. The Elements of Statistical Learning: Data Mining, Inference, and Prediction, Trevor Hastie, Robert Tibshirani, Jerome Friedman, Springer Series in Statistics, 2nd Edition, 2009 2. Statistical Machine Learning: A Unified Framework, Richard M. Golden, Chapman and Hall/CRC; 1st edition, 2020, ISBN-10:1138484695 3. K R Murphy, "Machine Learning-A Probabilistic Perspective", 1st Edition, MIT Press, 2012, ISBN-10:2062018020	communications.		/	
Support Vector Machines and Flexible Discriminants: Support vector machines and kernels, Support vector classifier, Separating hyperplanes, Generalizing linear discriminant analysis, Flexible discriminant analysis, Prototype methods, k- nearest-neighbor classifiers, Adaptive nearest-neighbor methods, Applications to array signal processing. Course Outcomes: After going through this course the student will be able to: CO1 : Illustrate the fundamental concepts of various machine learning models which are used in Communication systems. CO2 : Derive the solution by applying the acquired knowledge of statistics and mathematics via machine learning approach to model and solve the application problems of Communication systems. CO3 : Evaluate the solution of the problems using appropriate statistical and mathematical learning model techniques to the real world problems arising in many practical situations. CO4 : Compile the overall knowledge of statistical learning for communication gained to apply and engage in life – long learning. Reference Books: 1. The Elements of Statistical Learning: Data Mining, Inference, and Prediction, Trevor Hastie, Robert Tibshirani, Jerome Friedman, Springer Series in Statistics, 2nd Edition, 2009 2. Statistical Machine Learning: A Unified Framework, Richard M. Golden, Chapman and Hall/CRC; 1st edition, 2020, ISBN-10:1138484695 3. K R Murphy, "Machine Learning-A Probabilistic Perspective", 1st Edition, MIT Press, 2012		UNIT - V	/	08 Hrs
Support vector machines and kernels, Support vector classifier, Separating hyperplanes, Generalizing linear discriminant analysis, Flexible discriminant analysis, Prototype methods, k- nearest-neighbor classifiers, Adaptive nearest-neighbor methods, Applications to array signal processing. Course Outcomes: After going through this course the student will be able to: CO1 : Illustrate the fundamental concepts of various machine learning models which are used in Communication systems. CO2 : Derive the solution by applying the acquired knowledge of statistics and mathematics via machine learning approach to model and solve the application problems of Communication systems. CO3 : Evaluate the solution of the problems using appropriate statistical and mathematical learning model techniques to the real world problems arising in many practical situations. CO4 : Compile the overall knowledge of statistical learning for communication gained to apply and engage in life – long learning. Reference Books: 1. The Elements of Statistical Learning: Data Mining, Inference, and Prediction, Trevor Hastie, Robert Tibshirani, Jerome Friedman, Springer Series in Statistics, 2nd Edition, 2009 2. Statistical Machine Learning: A Unified Framework, Richard M. Golden, Chapman and Hall/CRC; 1st edition, 2020, ISBN-10:1138484695 3. K R Murphy, "Machine Learning-A Probabilistic Perspective", 1st Edition, MIT Press, 2012, ISBN-10:0262018020	Support Vector Machines a	and Flexible Discriminants:		
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Course Outcomes: After going through this course the student will be able to: CO1 : Illustrate the fundamental concepts of various machine learning models which are used in Communication systems. CO2 : Derive the solution by applying the acquired knowledge of statistics and mathematics via machine learning approach to model and solve the application problems of Communication systems. CO3 : Evaluate the solution of the problems using appropriate statistical and mathematical learning model techniques to the real world problems arising in many practical situations. CO4 : Compile the overall knowledge of statistical learning for communication gained to apply and engage in life – long learning. Reference Books: In the Elements of Statistical Learning: Data Mining, Inference, and Prediction, Trevor Hastie, Robert Tibshirani, Jerome Friedman, Springer Series in Statistics, 2nd Edition, 2009 2. Statistical Machine Learning: A Unified Framework, Richard M. Golden, Chapman and Hall/CRC; 1st edition, 2020, ISBN-10:1138484695 3. K R Murphy, "Machine Learning-A Probabilistic Perspective", 1st Edition, MIT Press, 2012, ISBN-10:0262018020	Adaptive hearest-heighbor h	lethous, Applications to array signal processing.		
CO1 : Illustrate the fundamental concepts of various machine learning models which are used in Communication systems. CO2 : Derive the solution by applying the acquired knowledge of statistics and mathematics via machine learning approach to model and solve the application problems of Communication systems. CO3 : Evaluate the solution of the problems using appropriate statistical and mathematical learning model techniques to the real world problems arising in many practical situations. CO4 : Compile the overall knowledge of statistical learning for communication gained to apply and engage in life – long learning. Reference Books: 1. The Elements of Statistical Learning: Data Mining, Inference, and Prediction, Trevor Hastie, Robert Tibshirani, Jerome Friedman, Springer Series in Statistics, 2nd Edition, 2009 2. Statistical Machine Learning: A Unified Framework, Richard M. Golden, Chapman and Hall/CRC; 1st edition, 2020, ISBN-10:1138484695 3. K R Murphy, "Machine Learning-A Probabilistic Perspective", 1st Edition, MIT Press, 2012, ISBN-10:0262018020	Course Outcomes:	ourse the student will be able to:		
CO1 Indistrate the fundamental concepts of various machine fearining models which are used in Communication systems. CO2 Derive the solution by applying the acquired knowledge of statistics and mathematics via machine learning approach to model and solve the application problems of Communication systems. CO3 Evaluate the solution of the problems using appropriate statistical and mathematical learning model techniques to the real world problems arising in many practical situations. CO4 Compile the overall knowledge of statistical learning for communication gained to apply and engage in life – long learning. Reference Books: 1. The Elements of Statistical Learning: Data Mining, Inference, and Prediction, Trevor Hastie, Robert Tibshirani, Jerome Friedman, Springer Series in Statistics, 2nd Edition, 2009 2. Statistical Machine Learning: A Unified Framework, Richard M. Golden, Chapman and Hall/CRC; 1st edition, 2020, ISBN-10:1138484695 3. K R Murphy, "Machine Learning-A Probabilistic Perspective", 1st Edition, MIT Press, 2012, ISBN-10:0262018020	CO1 · Illustrate th	pe fundamental concepts of various machine learning	models which are	used in
CO2 : Derive the solution by applying the acquired knowledge of statistics and mathematics via machine learning approach to model and solve the application problems of Communication systems. CO3 : Evaluate the solution of the problems using appropriate statistical and mathematical learning model techniques to the real world problems arising in many practical situations. CO4 : Compile the overall knowledge of statistical learning for communication gained to apply and engage in life – long learning. Reference Books: 1. The Elements of Statistical Learning: Data Mining, Inference, and Prediction, Trevor Hastie, Robert Tibshirani, Jerome Friedman, Springer Series in Statistics, 2nd Edition, 2009 2. Statistical Machine Learning: A Unified Framework, Richard M. Golden, Chapman and Hall/CRC; 1st edition, 2020, ISBN-10:1138484695 3. K R Murphy, "Machine Learning-A Probabilistic Perspective", 1st Edition, MIT Press, 2012, ISBN-10:0262018020	Communic	ation systems	g mouchs which are	uscu III
CO3 Derive the contaction by upplying the dequired information interfaces that machine learning approach to model and solve the application problems of Communication systems. CO3 Evaluate the solution of the problems using appropriate statistical and mathematical learning model techniques to the real world problems arising in many practical situations. CO4 Compile the overall knowledge of statistical learning for communication gained to apply and engage in life – long learning. Reference Books: 1. The Elements of Statistical Learning: Data Mining, Inference, and Prediction, Trevor Hastie, Robert Tibshirani, Jerome Friedman, Springer Series in Statistics, 2nd Edition, 2009 2. Statistical Machine Learning: A Unified Framework, Richard M. Golden, Chapman and Hall/CRC; 1st edition, 2020, ISBN-10:1138484695 3. K R Murphy, "Machine Learning-A Probabilistic Perspective", 1st Edition, MIT Press, 2012, ISBN-10:0262018020	CO2 · Derive the s	solution by applying the acquired knowledge of statis	stics and mathemati	cs via
systems. CO3 : Evaluate the solution of the problems using appropriate statistical and mathematical learning model techniques to the real world problems arising in many practical situations. CO4 : Compile the overall knowledge of statistical learning for communication gained to apply and engage in life – long learning. Reference Books: 1. The Elements of Statistical Learning: Data Mining, Inference, and Prediction, Trevor Hastie, Robert Tibshirani, Jerome Friedman, Springer Series in Statistics, 2nd Edition, 2009 2. Statistical Machine Learning: A Unified Framework, Richard M. Golden, Chapman and Hall/CRC; 1st edition, 2020, ISBN-10:1138484695 3. K R Murphy, "Machine Learning-A Probabilistic Perspective", 1st Edition, MIT Press, 2012, ISBN-10:0262018020	machine lea	arning approach to model and solve the application r	problems of Commu	nication
CO3 : Evaluate the solution of the problems using appropriate statistical and mathematical learning model techniques to the real world problems arising in many practical situations. CO4 : Compile the overall knowledge of statistical learning for communication gained to apply and engage in life – long learning. Reference Books: 1. The Elements of Statistical Learning: Data Mining, Inference, and Prediction, Trevor Hastie, Robert Tibshirani, Jerome Friedman, Springer Series in Statistics, 2nd Edition, 2009 2. Statistical Machine Learning: A Unified Framework, Richard M. Golden, Chapman and Hall/CRC; 1st edition, 2020, ISBN-10:1138484695 3. K R Murphy, "Machine Learning-A Probabilistic Perspective", 1st Edition, MIT Press, 2012, ISBN-10:0262018020	systems.	STF 1		
model techniques to the real world problems arising in many practical situations. CO4 : Compile the overall knowledge of statistical learning for communication gained to apply and engage in life – long learning. Reference Books: 1. The Elements of Statistical Learning: Data Mining, Inference, and Prediction, Trevor Hastie, Robert Tibshirani, Jerome Friedman, Springer Series in Statistics, 2nd Edition, 2009 2. Statistical Machine Learning: A Unified Framework, Richard M. Golden, Chapman and Hall/CRC; 1st edition, 2020, ISBN-10:1138484695 3. K R Murphy, "Machine Learning-A Probabilistic Perspective", 1st Edition, MIT Press, 2012, ISBN-10:0262018020	CO3 : Evaluate th	ne solution of the problems using appropriate statisti	cal and mathematic	al learning
CO4 : Compile the overall knowledge of statistical learning for communication gained to apply and engage in life – long learning. Reference Books: 1. The Elements of Statistical Learning: Data Mining, Inference, and Prediction, Trevor Hastie, Robert Tibshirani, Jerome Friedman, Springer Series in Statistics, 2nd Edition, 2009 2. Statistical Machine Learning: A Unified Framework, Richard M. Golden, Chapman and Hall/CRC; 1st edition, 2020, ISBN-10:1138484695 3. K R Murphy, "Machine Learning-A Probabilistic Perspective", 1st Edition, MIT Press, 2012, ISBN-10:0262018020	model tech	niques to the real world problems arising in many pr	actical situations.	U
engage in life – long learning. Reference Books: 1. The Elements of Statistical Learning: Data Mining, Inference, and Prediction, Trevor Hastie, Robert Tibshirani, Jerome Friedman, Springer Series in Statistics, 2nd Edition, 2009 2. Statistical Machine Learning: A Unified Framework, Richard M. Golden, Chapman and Hall/CRC; 1st edition, 2020, ISBN-10:1138484695 3. K R Murphy, "Machine Learning-A Probabilistic Perspective", 1st Edition, MIT Press, 2012, ISBN-10:0262018020	CO4 : Compile the	e overall knowledge of statistical learning for commu	nication gained to a	pply and
Reference Books: 1. The Elements of Statistical Learning: Data Mining, Inference, and Prediction, Trevor Hastie, Robert Tibshirani, Jerome Friedman, Springer Series in Statistics, 2nd Edition, 2009 2. Statistical Machine Learning: A Unified Framework, Richard M. Golden, Chapman and Hall/CRC; 1st edition, 2020, ISBN-10:1138484695 3. K R Murphy, "Machine Learning-A Probabilistic Perspective", 1st Edition, MIT Press, 2012, ISBN-10:0262018020	engage in li	ife – long learning.		
 The Elements of Statistical Learning: Data Mining, Inference, and Prediction, Trevor Hastie, Robert Tibshirani, Jerome Friedman, Springer Series in Statistics, 2nd Edition, 2009 Statistical Machine Learning: A Unified Framework, Richard M. Golden, Chapman and Hall/CRC; 1st edition, 2020, ISBN-10:1138484695 K R Murphy, "Machine Learning-A Probabilistic Perspective", 1st Edition, MIT Press, 2012, ISBN-10:0262018020 	Reference Books:			
Tibshirani, Jerome Friedman, Springer Series in Statistics, 2nd Edition, 2009 2. Statistical Machine Learning: A Unified Framework, Richard M. Golden, Chapman and Hall/CRC; 1st edition, 2020, ISBN-10:1138484695 3. K R Murphy, "Machine Learning-A Probabilistic Perspective", 1st Edition, MIT Press, 2012, ISBN-10:0262018020	1. The Elements of Statistica	al Learning: Data Mining, Inference, and Prediction, 7	Γrevor Hastie, Rober	rt 🗌
 Statistical Machine Learning: A Unified Framework, Richard M. Golden, Chapman and Hall/CRC; 1st edition, 2020, ISBN-10:1138484695 K R Murphy, "Machine Learning-A Probabilistic Perspective", 1st Edition, MIT Press, 2012, ISBN-10:0262018020 	Tibshirani, Jerome Friedmar	n, Springer Series in Statistics, 2nd Edition, 2009		
3. K R Murphy, "Machine Learning-A Probabilistic Perspective", 1st Edition, MIT Press, 2012, ISBN-10:0262018020	2. Statistical Machine Learn edition, 2020, ISBN-10:1138	ing: A Unified Framework, Richard M. Golden, Chap 3484695	man and Hall/CRC;	1st
	3. K R Murphy, "Machine Le	arning-A Probabilistic Perspective", 1st Edition, MIT	Press, 2012,	

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4. C M Bishop, "Pattern Recognition and Machine Learning", 1st Edition, Springer, 2006, ISBN-10:0387310738

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				
LNo	Content	Marks	Q. No	Contents	Morks			
1	Quizzes - Q1 & Q2	20	Each u	nit 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			

Dubrie for CIE & SEE Theory

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Dresemany, d	elagosi				
0 0 1		SEMESTER: I			
Course Code	: 22MCS121L	Advanced Communication &	Systems-1	CIE Marks	: 100
Credits L-T-P	: 3-0-1	(Theory & Practice)	2)	SEE Marks	: 100
Hours	: 42L + 28P	(Professional Core - 2	2)	SEE Durations	: 3 Hrs
Facu	ilty Coordinator:	Dr. S Ravishankar			
		UNIT - I			9 Hrs
Signal Represe random proces Modulation: M and Power Lim PSD for Modul	ntation – Low pa s. Multiplexing, odulation Schem ited Schemes – H ation Schemes.	ss representation of bandpass signa De-multiplexing and Frame Synchro es without memory (Band Limited S 'SK, MFSK, DPSK, DQPSK), modula	als, Low pass re onization of Sigr Schemes - PAM, tion schemes w	presentation of ba nals. BPSK, QPSK, MP rith memory (MSK)	ndpass SK, MQAM,), Transmit
D 11.					9 Hrs
Demodulation Optimum Cohe Optimal Non –	- Vector Channe erent Detection for Coherent detection	, Vector Channel +AWGN, Performa or power limited and Bandlimited sc on for schemes without and with m	nce parameters chemes, Optima emory (FSK, DF	s – SER,BER and I 1 Coherent detections PSK, DQPSK).	ON for MSK
		UNIT - III	- 6	-	8 Hrs
channels, Sinc ISI and AWGN Equalizers. Per Non-Linear Eq	allinets: Dahum , RC, Duobinary . Linear Equalize formance of ZFE ualizers: Decision	and Modified Duobinary signaling s rs: Zero forcing Equalizer, MSE and and MSE. UNIT - IV a - feedback equalization, Predictive	MMSE, Baseba	um receiver for ch and and Passband nce of DFE. Adapt	annel with Linear 8 Hrs
equalization: A Equalizer (Tap	daptive linear eq Leakage Algorith	ualizer, adaptive decision feedback (m).	equalizer, Adap	tive Fractionally s	paced
Supohronizatio	n Signal Daram	oter Estimation The Likelihood Eu	notion for Com	ion Decorrows and C	ons
Synchronizatic Effect of Additi Timing Estima	on in Signal Dem ve Noise on the I tion - ML Timing	Dedulation. Carrier Phase Estimation Phase Estimate, Decision-Directed a Estimation, Non-Decision-Directed	- ML Carrier Pl nd Non-Decisio Estimation	hase Estimation, 7 n-Directed Loops.	The PLL, Symbol
1 Concration	and study the pr	portion of Line order			20 1115
 2. Pulse Ampli 3. ASK Modula 4. Binary Phas 5. Frequency S 6. QPSK Modul 7. QAM Modul 8. Minimum SI 9. Generation of I 10. Design of I 	tude Modulation ation and Demod Shift Keying M Shift Keying Gene lation and Demod ation and Demod hift Keying Modu of PN Sequence a Linear Equalizers	and Demodulation. alation odulation and Demodulation ration and detection dulation ulation lation nd Gold sequence and AI based Equalizer	S)		
Course Outco After going thr	mes: ough this course	the student will be able to:			
C01	: Explain the co process of Det	ncept of low pass and Bandpass sig ection and Estimation at the receive	gnals representa er in the presen	ations at the Trans ce of AWGN only.	smitter, the
CO2	: Evaluate Rece ideal and AWC	iver performance for various types o N Non-band limited and band limit	of single carrier ed channels.	symbol modulation	ns through
CO3	: Design single methods for d performance r	carrier equalizers for various symbo efined channel models, and compute equirements.	l modulation so e parameters to	hemes and detect meet desired rate	ion and
CO4	: Design and de specific single	velop Carrier recovery , Timing reco carrier application in wireless, wire	very and Frame line domains	e recovery schemes	s for
Reference Boo	oks				

1. Digital Communications, John G. Proakis, Masoud Salehi, 5th Edition, Pearson Education, 2014, ISBN:9789339204792

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2. Digital Communications: Fundamentals and Applications: Fundamentals & Applications, Bernard Sklar, 2nd Edition, Pearson Education, 2009, ISBN:978-8131720929

3. Digital Communications Systems, Simon Haykin ,1st Edition ,Wiley, 2014, ISBN:978-8126542314

4. Signal Detection and Estimation, Mourad Barkat, 2nd Edition, Artech house, 2005, ISBN: 1580530702

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	1		RUBRIC of SEE			
SLNo	Content	Marks	Q. No	Contents	Merks		
1	Quizzes - Q1 & Q2	10	Each u	nit consists of TWO questions of 16 Marks each. Answ	er FIVE		
2 Tests - T1 & T2 30 Guestion No. 11 is compulsory (Laboratory component) for 20 Mark							
3	Experiential Learning - EL1 & EL2	30	1 & 2	Unit-1: Question 1 or 2	16		
4	Laboratory	30	38:4	Unit-2: Ques <mark>tion 3 or 4</mark>	16		
	Total Marks	100	5&6	Unit-3: Que <mark>stion 5 or</mark> 6	16		
			7 & 8	Unit-4: Qu <mark>estion 7 o</mark> r 8	16		
	NO SEE for Laboratory		9 & 10	Unit-5: Question 9 or 10	16		
	NO SEE IOT LABORATORY		11	Laboratory Component (Compulsory)	20		
				Total Marks	100		

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Drésensity, B	elegini				
		SEMESTER: I			
Course Code	: 22MCS13T		CIE Marks	: 10	00
Credits L-T-P	: 3-1-0	Communication Networks and Protocols	SEE Marks	: 10)0
Hours	: 42L+ 28T	(Professional Core - 3)	SEE Durations	: 3	Hrs
Facu	ltv Coordinator:	Dr. Kiran V		<u> </u>	
		UNIT - I		9	Hrs
Foundation B	uilding a Networ	k Requirements Perspectives Scalable Connectiv		Res	
sharing, Suppo Delay X Bandy Stop-and-Wait	ort for Common S vidth Product, Pe Sliding Windov	Services, Manageability, Protocol layering, Perform erspectives on Connecting, Classes of Links, Reliat w. Concurrent Logical Channels.	ance, Bandwidth a ble Transmission,	nd La	atency,
	,	UNIT - II		9	Hrs
Internetworkin	g I. Switching ar	nd Bridging Datagram's Virtual Circuit Switching	Source Routing F	3ridg	es and
LAN Switches, Datagram Forv Configuration(Basic Internetwo warding in IP, Su DHCP), Error Re	orking (IP), What is an Internetwork?, Service Mod bnetting and classless addressing, Address Trans porting(ICMP), Virtual Networks and Tunnels	el, Global Addresse lation (ARP) Host	s,	oo ana
		UNIT - III	8	8	Hrs
Internetworkin Routing Areas,	g- II: Network as Routing among	a Graph, Distance Vector(RIP), Link State(OSPF), Autonomous systems(BGP), IP Version 6(IPv6), Mo	Metrics, The Globa obility and Mobile II	ıl İnte P	ernet,
_		UNIT - IV		8	Hrs
End-to-End Pr	otocols: Simple I	Demultiplexer (UDP), Reliable Byte Stream(TCP), E	nd-to-End Issues, S	Segm	ient
Format, Conne	ecting Establishn	nent and Termination, Triggering Transmission, Ad	daptive Retransmis	sion,	,
Record Bounda	aries, TCP Exten	sions	\		
	1.2	UNIT - V		8	Hrs
Detection (REI Mail(SMTP,PO)	D), Source-Based P,IMAP,MIME),W	Congestion Avoidance. The Domain Name System Corld Wide Web(HTTP), Network Management(SNMF) (DNS),Electronic		у
Course Outco	mes:				
After going thr	ough this course	the student will be able to:			
CO1	: Analyze the re	equirements for a given organizational structure ar	nd select the most		
CO2	: Design and co	onfigure network topology and addressing scheme	for the given applic	atior	
CO3	· Analyze TCP/	IP suite routing Algorithm's Protocols and their fi	unctionalities		
C04	: Design analy	se and evaluate networks and services for homes	data centres IoT/I		LANS
04	and WANs	se, and evaluate networks and services for nomes,	uata centres, 101/1	.012, 1	LAINS
	and writts.	112			
Reference Bo	nke	CITATION /			
1 Lorry Deters	on and Bruce S	Davis "Computer Networks : A System Approach" 5	th Edition Elsevie		214
1. Larry reters	Somer "Internet	working with TCD/ID. Dringinlag. Drotocols and Ar	ohitaatura" 6th Edit	$\frac{1-20}{1-20}$	
2. Douglas E C 2014	Joiner, internet	working with TCP/IP, Principles, Protocols and Are		.1011,	PHI -
3. Uyless Black 8120310411, 1	k "Computer Net 1996	works, Protocols , Standards and Interfaces" 2nd I	Edition – PHI, ISBN	:	
4. Behrouz A F	forouzan "TCP /I	P Protocol Suite" 4th Edition – Tata McGraw-Hill,	ISBN: 0070706522	, 201	17
Scheme of Co	ntinuous Intern	al Evaluation (CIE): 20 + 40 + 40 = 100			
QUIZZES: Qui	zzes will be cond 0 Marks. The su	ucted in online/offline mode. Two quizzes will be of mode of two quizzes will be the Final Ouiz marks.	conducted & Each (Quiz	will be
TESTS: Stude	nts will be evalua	ated in test, descriptive questions with different co	mplexity levels (Rev	vised	
Bloom's Taxon	omy Levels: Rem inducted, Each to	nembering, Understanding, Applying, Analyzing, Events, adding upto 10	valuating, and Crea 0 Marks, Final test	ting) mar	. Two ks will
be reduced to	40 Marks.				
EXPERIENTIA	L LEARNING: S	tudents will be evaluated for their creativity and p	ractical implementa	ation	of the
seminar/prese	study-based tea	tration (25) adding upto 40 marks.	(15), video based		

RV Edecational Institutions [®] RV College of Engineering [®] Amazones Mathice, Alfierd to Weekenyee Toderotopod Internity, Belagae

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	i <mark>c for C</mark>	SIE & \$	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



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SEMESTER: I

Course Code	:	22MCS14L	Brogromming and Network simulation IAB	CIE Marks	:	50
Credits L-T-P	:	1-0-1	Fiogramming and Network Simulation LAD	SEE Marks	:	50
Hours	:	14L + 28P	(Coding / Skill Laboratory)	SEE Durations	:	3 Hrs
Facu	lt	y Coordinator:	Dr. Kiran V			

28 Hrs

"Part –I: Experiments Using C/C++ programming. 1. Bit stuffing & character stuffing. 2. Cyclic Redundancy check. 3. Implement leaky bucket congestion control algorithm

Content

4. Minimum spanning tree. Part-II

1. Design an Ethernet network comprising of 25 nodes and calculate Packet delivery ratio given

the packet size to be 1024 bytes, consider the following application layer protocols a. FTP b. CBR

2. Simulate an IBSS (Independent Basic Service Set) network / Ad-hoc network using 500 sq.km. terrain and plot the output characteristics for a). Packet Delivery Ratio b) Throughput c). Average Jitter d) RTS / CTS and acknowledgement.

3. Simulate a wireless scenario with different two routing protocol distance vector routing protocol (AODV) and Link state routing protocol (OLSR), analyze statistics for two routing protocol.

4. Implement a four node point to point network with links n0-n2, n1-n2and n2-n3. Apply TCP agent between n0-n3 and UDP between n1-n3. Apply relevant applications over TCP and UDP agents by changing the parameters and determine the number of packets sent by TCP/UDP

5. Implementation of Link state routing algorithm." 6. Illustration of Cryptography in practical applications- A case study

Course Outcomes:

After going through this course the student will be able to:

CO1 : Explain the performance of various Flow control protocols.

CO2 : Design the network protocol for given specifications of applications.

CO3 : Design & develop the scheduling algorithms for various performance metrics.

CO4 : Develop various network traffic management and control techniques for given specification

Reference Books

 Larry Peterson and Bruce S Davis "Computer Networks :A System Approach" 5th Edition , Elsevier -2014
 Douglas E Comer, "Internetworking with TCP/IP, Principles, Protocols and Architecture" 6th Edition, PHI -2014

3. Uyless Black "Computer Networks, Protocols , Standards and Interfaces" 2nd Edition – PHI, ISBN: 8120310411, 1996

4. Behrouz A Forouzan "TCP / IP Protocol Suite" 4th Edition – Tata McGraw-Hill, ISBN: 0070706522, 2017

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

omoss Bon Alfilated volvatbys clogical mity, Selagad	Approve by ADCTE. Now Delfy			
	RUBRIC FOR CIE		RUBRIC FOR SEE	
Sl.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 Edeca	liege of Engineering *		cont critinger	
Amazonosa kultukov M	Approace by AICTE			
is Wineware Technologics	44 1			
Drésensty, Be	elagosi			
		SEMESTER: I		
Course Code	: 22MCS1A1T	Advanced Embedded Computing Devices	CIE Marks	: 100
Credits L-T-P	: 3-0-0		SEE Marks	: 100
Hours	: 42L	Elective A (Professional Elective)	SEE Durations	: 3 Hrs
Facu	lty Coordinator:	Dr. Govindaraju M		
		UNIT - I		9 Hrs
Introduction to Introduction, C in Embedded S	Embedded Sys Characteristics o System Design, I	tem Design f Embedding Computing Applications, Concept of R Design Process: Requirements, Specifications, Hardy	eal time Systems, (ware Software Parti	Challenges tioning.
Embedded Svs	tem Architectur	e		, see 20,
Instruction Set	Architectures w	vith examples, Memory system Architecture: Caches	s, Virtual Memory, I	Memory
Management, I	/O sub system:	Busy wait I/O, DMA, Interrupt Driven I/O, Co-Prod	cessor & Hardware	Ū.
Accelerators, C	PU Power Const	amption, Benchmarking Standards: MIPS, MFLOPS	, MMACS, Coremai	rk
		UNIT - II		9 Hrs
Designing Emb	oedded System H	Iardware –I		1
CPU Bus: Bus	Protocols, Bus (Organization, Introduction to SATA, PCI, PCI-e, Mem	ory Devices and the	eir
Characteristics Timers, Interru	s: RAM, EEPRON apt, Controllers,	A, Flash Memory, DRAM, DDRAM; I/O Devices: Tim DMA Controllers, A/D and D/A Converters, LED,O	iers and Counters, LED	Watchdog
		UNIT - III		8 Hrs
Designing Emb	oedded System H	Iardware –II		·
Programmed IC	D, Memory Mapp	oed IO, Interfacing Protocols: SPI, I2C, CAN, Reset C	vircuits, Designing	with
Processors: Sys	stem Architectur	re, FPGA based Design, Processor Sel <mark>ecti</mark> on Criteria		
	12	UNIT - IV		8 Hrs
Designing Emb Application Sol tools: Editor, C Library, Embed	bedded System S ftware, System S Compiler, Linker, Ided System Coo	Software –I Software, Use of High Level Languages, Integrated D Automatic Code Generators, Debugger, Board Sup ding Standards: MISRA C 2012/CERT.	evelopment Environ port Library, Chip (nment Support
		UNIT - V		8 Hrs
Designing Emb	oedded System S	Software –II		•
OS based Desig	gn, Real Time Ke	ernel, Process& Thread, Inter Process Communicati	ons, Synchronizatio	on, Case
Study: RTX-AR	M/FreeRTOS, E	w <mark>aluating</mark> and Optimizing Operatin <mark>g System</mark> Perform	nance: Response ti	me
Calculation, Ti	me Loading, Me	m <mark>ory, Loadi</mark> ng, Case Study: Embe <mark>dded Con</mark> trol App	lications-Software (Coding of a
PID Controller,	PID Tuning			
Course Outco	mes:			
After going three	ough this course	e the student will be able to:		
CO1	: Interpret hard processor arc	lware & software of an embedded systems for real t hitecture, memory and communication interface.	ime applications wi	th suitable
CO2	: Design embed operational an	lded software & hardware to meet given constraints nd non-operational attributes.	pertaining to both	
CO3	: Demonstrate operating sys	the concurrent execution of different operations wit tems.	h the support of rea	al time
CO4	: Engage in usa embedded pro	age of tools to formulate, design and analyze differencessors.	nt applications real	ized with
Reference Boo	oks			
1. Embedded S 2008, ISBN: 0-	Systems – A cont 444-51616-6	emporary Design Tool, James K Peckol, 2nd edition	, John Weily,	
2. Introduction 2009. ISBN: 10	to Embedded S): 0070678790	ystems, Shibu K V, 1st edition, Tata McGraw Hill E	ducation Private Li	mited,
3. Embedded S	Software Primer	David E.Simon, Addison Wesley 2nd edition John	Weily.	
2002, ISBN-13	: 978-02016156	92	,,	

4. The Intel Micro-processors, Architecture, Programming and Interfacing, Barry B.Brey, 6th Edition, Pearson Education, 2008, ISBN-10: 8131726223

A Contraction

RV Educational Institutions * RV College of Engineering Astraction Affields to Waveways Technological University, Belgand

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. Answ	er FIVE
2	Tests - T1 & T2	40	110	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



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Drevensty, Be	lingini				
			SEMESTER: I		<u>, </u>
Course Code	: 22MCS14	A2T	Multirate Systems and Filter Banks	CIE Marks	: 100
Credits L-T-P	: 3- 0- 0		Multifate Systems and Filter Danks	SEE Marks	: 100
Hours	: 42L		Elective A (Professional Elective)	SEE Durations	: 3 Hrs
Facu	lty Coordina	ator: D	r. Uttarakumari M		
			UNIT - I		9 Hrs
Basics of Signa Signal Processi factor D, Interp Sampling Rate samplers/Up s	ls and Syst ing and Propolation by a Conversion amplers.	tems, K gramm a factor 1 on DS	nowledge of Linear Algebra and Probability Theo ing Skills. Fundamentals of Multirate Systems I I, Sampling Rate Conversion by a Rational Fac P processor : Polyphase Filter Structures, Interc	ory, Fundamental C introduction, Decim tor I/D. Implementa change of Filters an	oncepts of ation by a ation of d down
			UNIT - II		9 Hrs
Sampling Rate Interpolation fi Sampling Rate	Conversion lters and St Conversion	n with C tructure 1,Sampl	Cascaded Integrator Comb Filters, Polyphase Str es for Rational Sampling Rate Conversion. Mult ling Rate Conversion by an Arbitrary Factor, Dig	uctures for Decima istage Implementati gital Filter Banks.	tion and on of
T 01 1 0	<u> </u>	7.6.		C + D +	
Polyphase form band Coding, N	of the QMI	Mirror F Bank QMF Ba	Filter Bank Elimination of Aliasing, Condition fo , IIR QMF Bank, Perfect Reconstruction TwoCha ank	annel FIR QMF Ban	ks in Sub
		10	UNIT - IV		8 Hrs
The Wavelet Tr	ansform an	id its re	lation to Multirate Filter Banks Introduction, Th	ne short-Time Fouri	er
transform, The	wavelet tra	nsform	n, Discrete-Time orthonormal wavelets, Continue	ous- Time orthonori	mal wavele
Time frequency	v analysis, P	Noise ai	nalysis and removal.	4.	
** * * * *		1 1	UNIT - V		8 Hrs
Various Applica	ation of Filt	er bank	in Image- processing, speech Processing using	, DSP processor.Use	ofDCT
filter Banks for	· JPEG imag	ge comp	pression and modifications of sub-bands for ima	age modifications	
Course Outco	mes:				
After going thre	bugh this co	ourse th	he student will be able to:		
CO1	: Design &	analyz	the practical aspects of sampling and reconst	ruction and select a	suitable
	sampling	g rate to	r a given signal processing problem.	<u></u>	
CO2	: Design &	develo	pment of tree-structured maximally decimated	filter bank through	the conce
	of discret	te-time	wavelets.	/	
CO3	: Design ai	nd anal	lyze multi-rate filters for a given specification.		
CO4	: Implement	nt Mult ons	irate QMF, PR orthogonal filter banks and wave	let filters for various	S
Deference Dec	120				
1 Digital airea	1 processing	a Droci	tis and Manalalis 3rd edition Drantice Usl 1	006 ISBN 0121072	7/1
		g, FIUal	Ris and Manolakis, Sid Culturi, Fichalder Hall, 19	inhora India 0000	/ + 1.
2. Modern Digi	iai signai pi	rocess11	ng, Robert. O. Cristi, 2nd edition, Cengage Publ	isiters, india, 2003,	
2 Multinoto Su	400956	Filton D	Contra Vaidmanathan D.D. 1st adition Dearson D	hublication 2006 IS	DN.
3. Multifate Sy		rmer B	anks, valuyanaman r.r, 1st eution, rearson P	ublication, 2000, 15	DIN.
$\frac{01-1150-942-3}{4}$	1	~ ^ ~ ~	mustan based engrases K Mitne 2nd edition T	WII India 0007 IS	אסי
4. Digital signa	ii processinį	g: A coi	nputer-based approach, K. Mitra, 3rd edition, 1	MH, IIIdia, 2007, 18	BIN
918001000130	5				
Qalaanse A.C	-				
Scheme of Co			Evaluation (CIE): $20 + 40 + 40 = 100$	and used 0. Trail 4	Dute:11 1
QUILLES: QUIL	O Moriro Ti		of two quizzes will be the Finel Onig merica	conducted & Each (yuiz will b
TESTE Stude	u marks. If	ne sum	of two quizzes will be the fillal Quiz Harks.	mnlevity levels (Per	rised
Bloom's Tayon	ILS WIII DE E	Remer	nhering Understanding Applying Applyzing F	mpickity levels (Kev	ting) Two
tests will be co	nducted Fr	ach test	t will be evaluated for 50 Marks, adding up to 10)0 Marke Final test	marke wi
he reduced to 4	10 Marke	uch itsi	win be evaluated for 50 marks, adding upto 10	, marks, rina iest	marks WI
		IG. Stu	dents will be evaluated for their creativity and r	practical implement	ation of th
problem Case	study-base	d teach	ing learning and Program specific requirements	x (15) Video based	
seminar/nrese	ntation /der	nonetre	ation (25) adding unto 40 marks	(10), (10) based	
sommar / prese	manon/uer	nonsus	$\frac{1}{1000}$ $\frac{1}{100}$ 1		

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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	i <mark>c for C</mark>	SIE & \$	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



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Techniciogical University, Sel	lagist			
		SEMESTER: I		
Course Code	: 22MVE1A3T		CIE Marks :	100
Credits L-T-P	: 3-0-0	VLSI Digital Signal Processing	SEE Marks :	100
Hours	: 42L	Elective A (Professional Elective)	SEE Durations :	3 Hrs
Facul	Ity Coordinator:	Dr. Abhay Deshnande		0 1110
Pacu				0 U#c
Introduction to	Digital Cigra al D	UNIT-I	Delgenithma DCD Angliasti	9 1115
demands, Scale	ed CMOS Techn	blogies, Representations of DSP algorithms.	P algorithms, DSP Applicati	011
		UNIT - II		9 Hrs
Pipelining and I	Parallel Process	ng Introduction, Pipelining of FIR Digital Fi	Iters, Parallel Processing, Pi	pelining
and Parallel pro	ocessing for low	power using Candence tool.		
		UNIT - III		8 Hrs
Algorithmic stre	ength reduction	in filters and transforms Introduction, Para	llel FIR filters, Discrete Cosi	ine
Transform and	Inverse DCT, Pa	rallel Architectures for Rank-Order Filters.		
		UNIT - IV		8 Hrs
Pipelined and p for IIR filters, La Adaptive Digita	oarallel Recursiv ow power IIR diş 1 filter design.	e and Adaptive Filters Introduction, Combir gital filter design using pipelining and parall	red pipelining and parallel p lel processing on Cadence, p	rocessing vipelined
		UNIT - V		8 Hrs
Programmable VLSI-DSP proce Signal Processin	Digital Signal Pr essor, applicatio ng etc.	ocessor Introduction, Evaluation and impor	rtant features of programma less Communication, Multir	ble nedia
Course Outcor	mes			
After going thro	nes.	the student will be able to:		
	· Analyze DSP	rchitectures and CMOS technologies		
C01	· Anniu ninclini	ag parallel processing and ratiming in DSP		
CO2	. Apply pipelilli	ad and as well-1 as services a deating fit bost		
C03	: Design pipelir	ed and parallel recursive adaptive litters		
CO4	: Develop appli	cations using general purpose digital signal	processors	
Reference Boo	ks			
1. Keshab K. Pa Edition, ISBN: 8	arthi , "VLSI Dig 81-265-1098-6	ital Signal Processing Systems :Design and	implementation" Wiley 1999), 3rd
2. Rulph chass edition, ISBN: 9	eing, "Digital Sig 978-047013866	mal Processing and Applications " with C67	13 and C6416 DSK, Wiley 2	005, 2nd
3. Nasser Kehta Academic press	arnavaz, "Digital s 2008. 2nd edit	Signal Processing System Design: Lab view on, ISBN: 978-0123744906.	v based hybrid programming	, ²⁹ ,
4. Naim Dahno	un "Digital Sign	al Processing Implementation" Prentice Hall	l, 2000, ISBN: 978-0201619	164
Scheme of Cor QUIZZES: Quiz	ntinuous Interr zzes will be cond	al Evaluation (CIE): 20 + 40 + 40 = 100 ucted in online/offline mode. Two quizzes w	vill be conducted & Each Qu	iz will be
evaluated for 10	0 Marks. The su	m of two quizzes will be the Final Quiz mar	ks.	_
TESTS: Studen	nts will be evalua	ited in test, descriptive questions with differ	cent complexity levels (Revise	ed
Bloom's Taxono	omy Levels: Rem	embering, Understanding, Applying, Analyz	ring, Evaluating, and Creatir	ng). Two
tests will be cor	nducted. Each t	est will be evaluated for 50 Marks, adding u	pto 100 Marks. Final test m.	arks will.
be reduced to 4	0 Marks.	· · · · · · · · · · · · · · · · · · ·		<u> </u>
EXPERIENTIA	L LEARNING: S	tudents will be evaluated for their creativity	and practical implementation	on of the
problem. Case s	study-based tea	ching learning and Program specific require	ments (15), Video based	
seminar/preser	ntation/demons	tration (25) adding upto 40 marks.		
Scheme of Sen	nester End Exa	mination (SEE) for 100 marks: The questi	on paper will have FIVE $\overline{\mathrm{qu}}$	estions
with internal ch	noice from each	unit. Each question will carry 20 marks. St	udent will have to answer or	ne full

question from each unit.

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	Rubri	c for C	SIE & \$	SEE Theory courses				
	RUBRIC for CIE	1		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	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			



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			SEMESTER: I	-	
Course Code	:	22MCS1B1T		CIE Marks	: 100
Credits L-T-P	:	3-0-0	Digital System Design using HDL	SEE Marks	: 100
Hours	:	42L	Elective B (Professional Elective)	SEE Durations	: 3 Hrs
Facu	ltv	Coordinator.	Dr. Arun Kumar P.Chavan		
1 dod	109	e containatori	UNIT - I		9 Hrs
Introduction to	V	erilog and Des	ign Methodology: Introduction to Verilog: Verilog IE	EE standards. Ap	plication
Areas and Abst	ra	ction levels, N	eed of verification of HDL design, Simulation and Sy	nthesis, Test-ben	ches.
Verilog Data Ty	pe	es: Net, Regist	er and Constant. Verilog Operators: Logical, Arithme	etic, Bitwise, Redu	iction,
Relational, Con	ica	atenation and	Conditional, Number representation and Verilog por	ts.	
Verilog Primitiv	ves	s. Logic Simula	tion, Design Verification, and Test Methodology: For	ur-Value Logic an	d Signal
Resolution in V	/er	ilog, Test Metl	nodology Signal Generators for Test benches, Event-	Driven Simulation	n, Sized
Numbers.Propa	aga	ation Delay.			
Introduction to	D	esign Methode	blogy: Digital Systems and Embedded Systems, Real	-world circuits. D	esign
Methodology: L	Jes	sign Flow-Arch	Deven Suprementation and verification, Synthe	sis, Physical desig	gn. Design
Optimization-A	re	a, mining and	rower, System representation.	<u> </u>	O Hee
Number Desies		nd Varilar Ma	delling Studen Number Design Unsigned and Signed	Interne Fined a	9 HIS
Floating point	s a Mi	mbers Boole	are bunctions and Boolean Algebra, Verilog models for	r Boolean switch	ing
function Binar	1 V U	Coding	an Functions and Boolean Algebra, verifog models ic	n Doolean Switch	iiig
Behavioural M	y od	elling: Latches	and Level-Sensitive Circuits in Verilog. Cyclic Beha	vioural Models of	Flip-Flops
and Latches, C	vc	lic Behaviour	and Edge Detection. A Comparison of Styles for Beh	avioural modellin	g.
Behavioural M	od	els of Multiple	xers, Encoders, Decoders and Arithmetic circuits. D	ataflow Modelling	: Boolean
Equation-Base	d l	Models of Com	binational Logic, Propagation Delay and Continuous	s Assignments. Da	ataflow
Models of a Lin	lea	r-Feedback Sl	n <mark>ift Reg</mark> ister. Modelling Digital Machi <mark>nes wit</mark> h Repeti	tive Algorithms M	achines
with Multicycle	e C	perations. Tas	sks & Functions.		
Structural Mod	lel	ling: Design of	Combinational Logic, Verilog Structural Models, Mo	odule Ports, Top-I	Down
Design and Net	ste	ed Modules. Ga	ate level modelling. (Hands on using Xilinx vivado to	ol). High level syn	thesis.
	•	101			8 Hrs
Synthesis of Di	.gı	tal Sub-systen	is: Synthesis of Combinational Sub-systems: Introd	uction to Synthes	18,
and Bus Interf		s Synthesis	of Sequential Sub-systems: Synthesis of Sequential	lesis of fillee-sta	lie Devices
Synthesis of Ex	znl	licit State Mac	hines Registered Logic State Encoding Synthesis of	of Implicit State M	achines
Registers and (Co	unters. (Hand	on using Xilinx Vivado)	i implicit State in	actimes,
			UNIT - IV		8 Hrs
System Implem	ner	ntation and Fa	brics: CPLD vs FPGA Architecture - Programming To	echnologies-Chip	I/O-
Programmable	Lo	gic Blocks- Fa	bric and Architecture of FPGA. Xilinx Virtex 5.0 Arc	hitecture - Xilinx	Virtex VI
Architecture –	AL	TERA Cyclone	II Architecture - ALTERA Stratix IV Architecture, H	ardcore and Softc	ore FPGA. (
Examples such	ı a	s counter, seq	uence detector, sequence generated etc are impleme	nted on Airtex-7 1	FPGA
board)					_
			UNIT - V		8 Hrs
Processor Desi	gn	and System I	Development: Design of Processor Architectures: Fur	ctional Units for A	Addition,
Subtraction an	d	Multiplication	(overview). Design: Hierarchical Decomposition STG	-Based Controller	Design,
Efficient SIG-E	Sas	sed Sequential	Binary Multiplier.		
Interfacing Cor		epts: Embedde	a Computer Organization, Instruction and Data, Me	mory interlacing.	1/0
Interfacing: 1/C) (levices, 1/0 co	ntrollers, Parallel Buses, Serial Transmission.		
Course Outee					
After going thr		s: ah this course	the student will be able to:		
	Ju I	Define IEEE-1	364 standard and identify different styles of modelli	ng to build digital	systems
	·	Analyze digita	systems and huild small scale applications using l	nterfacing concer	te
	: .	Design and ve	rify the behavior of digital circuits using digital flow		
	· .	Demonstrato	the skill on cost effective system designs through pr		
	$\left \cdot \right $	implementatio	ne sam on cost-enecuve system designs unough pro	sper selection of	
	Ц	promontatio			

W Educational Institutiona RV College of Engineering Approace by AICTE. New Delivi Amonorea Institution Affinited Technological Driventry, Bellegini

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1. Advanced Digital Design With the Verilog HDL, Michael D. Ciletti, 2nd Edition, PHI, ISBN: 9789332584464, 2017.

2. Digital Design: An Embedded Systems Approach Using VERILOG, Peter J. Ashenden, Elsevier, ISBN: 8190935631, 2010.

3. Digital Systems Design Using Verilog, Charles Roth, Lizy K. John, ByeongKil Lee, Cengage Learning, ISBN: 1305120744, 2016.

4. Fundamentals of Digital Logic with Verilog Design, Stephen Brown and ZvonkoVranesic, 6th Edition, McGraw Hill publication, ISBN: 0073380547, 2013.

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 fo	r CIE			RUBRIC for SEE				
SLNo	Content		Marks	Q. No	Contents	:	Marks		
1	Quizzes - Q1 & Q2		20	Each u	nit consists of TW <mark>O quest</mark> ions of 20 Mar	ks each. Answe	er FIVE		
2	Tests - T1 & T2		40		full questions s <mark>electing O</mark> NE 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: Ques <mark>tion 7 or 8</mark>		20		
				9 & 10	Unit-5: Que <mark>stion 9 or 1</mark> 0		20		
						Total Marks	100		

RV Educational Institutions * RV College of Engineering * Amnonous subside Affinities subside Affinities how Delty

Dreisensty, S	Selagoul			
		SEMESTER: I		
Course Code	: 22MCS1B2T	Multimodio Communication and Naturalia	CIE Marks	: 100
Credits L-T-P	: 3-0-0		SEE Marks	: 100
Hours	: 42L	Elective B (Professional Elective)	SEE Durations	: 3 Hrs
Facı	alty Coordinator:	Dr. Kiran V		- 1 - 1
	5	UNIT - I		9 Hrs
Multimedia Co	mmunications:	multimedia information representation, multimed	ia networks, multin	nedia
applications, r	network QoS and	application QoS.		
		UNIT - II		9 Hrs
Compression 1	orinciples: lossle	ss and lossy, Source encoders and destination de	coders, Entropy end	oding,
Source encodi	ng, Statistical en	coding text compression- Runlength, static Huffm	an Coding,Dynamic	Huffman
coding,Arithm	etic coding,LZ77	LZ78 LZW, Image compression- GIF, TIFF and JF	PEG.	
		UNIT - III		8 Hrs
Audio and vide	eo compression:	Introduction, audio compression, DPCM, ADPCM	, APC, LPC, video co	ompression
principles.	-			-
		UNIT - IV	6	8 Hrs
Video compres	sion standards:	H.261, H.263, MPEG, MPEG 1, MPEG 2, MPEG-4	and Reversible VL	Cs.
1		UNIT - V		8 Hrs
Multimedia Pr	otocols: Introduc	tion, IP datagrams, fragmentation, Internet proto	col address. ARP ar	d RARP.
OoS. Transpor	rt Protocol: Intro	luction, TCP/IP, TCP, UDP, RTP and RTCP, RSVP	· · · · · · · · · · · · · · · · · · ·	,
	7.9			
Course Outco	mes:	· · · · · · · · · · · · · · · · · · ·		
After going thr	ough this course	e th <mark>e student will be able to:</mark>		
CO1	· Enumerate te	chnical characteristics and performance of variou	s multimedia data	
CO2	Deploy the ar	propriate compression algorithm for multimedia	lata	
C03	: Apply OoS to	multimedia network applications	in the second se	
C03	: Evoluate the	provide and architectures and real time transport	aratacala	
04		broadband architectures and rear time transport		
Defense De	• 1 -•			
			IODN 0121700040	2002
1. Fred Halsal		Diminumications, 1st Edition, Pearson education,	ISBN: 8131709949	, 2002.
2. K. K. Kao, Z	ran S. Bojkovic	, Dragorad A. Milovanovic, Multimedia Communi	ication Systems, Po	earson
education, ISE	SN:013031398A,		1 A 1' (' " D	
3. Rall steinme	etz, Klara Nanrst	17, 2000	nd Applications, Po	earson
4 John Willow	$\frac{1}{1}$	"Multimodio : An Introduction" DIIL ISDN: 1575	765578 0000	
4. John villan	iii, Louis Molifia,	Multimedia : An Introduction , PHI, ISBN: 1575	105518,2002	
<u> </u>				
Scheme of Co	ntinuous Interi	$\begin{array}{c} \text{ial Evaluation (CIE): } 20 + 40 + 40 = 100 \\ isometry in the second $	1	O' '11 1
QUIZZES: Qui	zzes will be cond	lucted in online/online mode. Two quizzes will be	conducted & Each	Quiz will b
evaluated for	IU Marks. The st	Im of two quizzes will be the Final Quiz marks.	·····1····1····1····1· /D·	!
TESTS: Stude	nts will be evalu	ated in test, descriptive questions with different co	omplexity levels (Re	visea
Bloom's Taxon	iomy Levels: Ren	iembering, Understanding, Applying, Analyzing, E	valuating, and Crea	ating). Two
tests will be co	nducted. Each t	est will be evaluated for 50 Marks, adding upto 10	00 Marks. Final tes	t marks wil
be reduced to	40 Marks.			C . 1
EXPERIENTIA	AL LEARNING: S	tudents will be evaluated for their creativity and j	(15) V^{-1}	ation of the
problem. Case	study-based tea	tration (05) adding unto 40 man ¹ -	s (15), video based	
seminar/prese	manual action / demons	uration (25) adding upto 40 marks.		
O al and a C C	mester End Exa	mination (SEE) for 100 marks: The question pa	per will have FIVE	questions
Scheme of Se	haina furra 1	mait Each anneation 00 1 0/ 1	+-	11
Scheme of Se with internal of	choice from each	unit. Each question will carry 20 marks. Student	will have to answer	r one full

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	Rubri	c for C	SIE & 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 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	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			



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Technickogios Dresenitių, Be	elagist			
		SEMESTER: I		
Course Code	: 22MCS1B3T	CIE Marks	:	100
Credits L-T-P	: 3-0-0	SEE Marks	:	100
Hours	: 42L	Elective B (Professional Elective) SEE Duration	.s :	3 Hrs
Facu	Ity Coordinator:	Dr. Prakash Biswagar		-
	0	UNIT - I		9 Hrs
Introduction				
Overview of op	tical fiber comm	unications, Basic principles of light propagation, Ray-Model, Wave-		
Model, Optical	fiber modes, sin	gle and multi-mode fibers, single and multi-core fibers.		
Transmission S	System Engineer	ing		
System Model,	Power penalty, '	Transmitter, Receiver, Different optical amplifiers - SOA, EDFA.		
		UNIT - II		9 Hrs
Introduction to	o Optical Compo	nents and Networks Optical Components - Couplers, Isolators and	Circ	culators,
Solitons, Multi	plexes and Filter	rs, Optical Amplifiers. Transmitters, Detectors, Switches, Waveleng	th C	onverters.
Optical Networ	ks - Telecommu	nication networks, First generation optical networks, Multiplexing	ech	niques,
Second genera	tion optical netw	orks, System and network evolution and Demultiplexing Technique	es	
		UNIT - III		8 Hrs
Optical Networ	ks Architecture	SONET/SDH, Computer interconnects, MANS, Layered architectur	e fo	r SONET
and second ger	neration networl	s. Broadcast and Select Networks – Topologies for Broadcast Netwo	orks	۶,
Media-Access (Control Protocol	s, Operational principle of WDM, WDM network elements and Arch	.tect	ures,
Introduction to	DWDM.			1
	1.5	UNIT - IV		8 Hrs
Wavelength Ro	outing Networks-	Optical layer, Node design, Network design and operation, routing	and	1
wavelength ass	signment archite	c <mark>tural vari</mark> ations ,Optical Network Ro <mark>uting</mark> Principles - Impairment	Aw	are
Routing ,Optic	al Circuit Switch	ning ,Optical Packet Switching		
Optical Burst S	Switching, Energ	y Awareness in Optical Networking, Network Modelling Tools Netwo	ork	Design
Guidelines.				0.11
T 7', 1, 1	N. 1.0. 1			8 HIS
Virtual topolog	y, Network Cont	rol and Management Virtual topology design problem, Combines S	JNE	JT/WDM
network design	i, an ILP Iormula	ation, Regular virtual topologies, Control and management, Network	c ma	anagement
Configuration I	nanagement, Pe	normance management, laut management. Network management	lune	cuons,
Optical salety.		En l		
Course Outoo				
After going thr	mes:	the student will be able to:		
		a construm requirements and the standards used for Onticel some		vication
		he spectrum requirements and the standards used for Optical com	nui	lication
CO2		the basics of wDM Technology and various components it uses		
C03	: Apply the kno	whedge to delve into contemporary applications and research in the	are	eas of
004	Optical comm	unication.		- 4:
04	Explore conce	pis of designing and operating principles of modern optical commu	IIICa	1000
	systems and i	letworks		
	- 1 -			
Reference Boo				
1. Kumar Sıvar Elsevier Public	rajan and Rajiv I ation Elsevier In	Ramaswamy, Morgan Kauffman, Optical Networks: A Practical Pers dia Pvt. Ltd, 3rd Edition, 2010.	pect	uve,
2. Harry G. Par	rros, Communic	ation Oriented Networks, Wiley, ISBN: 0470021632, 2005		
3. G. Agrwal, F York 2014	iber Optic Comr	nunication Systems, John Wiley and Sons, 3rd Edition, New		
4. C. Siva Ram	Moorthy and M	ohan Gurusamy, WDM Ontical Networks: Concept Design		
and Algorithms	s. Prentice Hall of	of India. 1st Edition, 2002.		
	,			

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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	ch unit consists of TWO questions of 20 Marks each. Answe				
2	Tests - T1 & T2	40	110	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			



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		SEMESTER: II	1		
Course Code	: 22IM21T		CIE Marks	:	100
Credits L-T-P	: 3-0-0	RESEARCH METHODOLOGY	SEE Marks	1:	100
Hours	: 42L	Common Course to all M.Tech Programs	SEE Duration	18 :	3 Hrs
Facul	ty Coordinator:	Dr. Rajeswara Rao K V S			I.
	5	UNIT - I			8 Hrs
Research Probl	em: Problem So	olving – General Problem Solving, Logical A	oproach, Soft Sys	sten	h Approach,
Creative Approx	ach, Group Pro	blem Solving Techniques for Idea Generation	on. Formulation	of R	esearch
Problems – App	proaches to Res	earch Problem, Exploration for Problem Ide	ntification, Hypo	othe	sis
Generation and	l Formulation o	of the problem.			
		UNIT - II			9 Hrs
Research Desig	gn: Experimenta	al Design – Principles of Experiment, Labor	atory Experimen	t, Ez	xperimental
Design, Quasi	Experimental D	esign, Action. Research, Validity and Relia	bility of Experime	ent a	and Quasi
Experiments. E	Ex Post Facto Re	esearch - Exploratory Research, Historical	Research, Descri	iptiv	e Research,
Field Studies, S	Survey Research	h, Qualitative Research Methods.			
		UNIT - III			8 Hrs
Research Desig	gn for Data Acqu	uisition: Measurement Design – Primary typ	pes of Measurem	ent	scales,
Validity and Re	liability Measu	rement, Sample Design – Non-Probability S	ampling, Probab	ility	^r Sampling.
Data Collection	Procedures – S	Sources of secondary data, Primary data co	llection methods	, Va	lidity and
Reliability of da	ata collection pr	cocedures.	~ \		
	1.5	UNIT - IV	1		9 Hrs
Data Analysis:	Exploratory Da	ta Analysis, Statistical Estimation, Hypothe	esis Testing, Para	ame	etric Tests,
Non-Parametric	c Tests, Multipl	<mark>e Reg</mark> ression, Factor Analysis, Clus <mark>ter An</mark> al	ysis		-
	1 mil	UNIT - V	0		8 Hrs
Research Propo	osal: Purpose, T	ypes, Development of Proposal, Evaluation	of Research Prop	posa	al.
Report Writing:	Pre-writing co	nsideration, Format of Reporting, Briefing,	Best practices fo	r Jo	ournal writing.
Course Outcom	mes:				
After going th	rough this cou	rse the student will be able to:			
CO1	Recognize the	e principles and concepts of res <mark>earch typ</mark> es	, data types and	ana	lysis
	: procedures.				
CO2	Apply approp : principles.	priate method for data collection and analyz	e the data using	stat	tistical
CO3	Express researcher	arch output in a structured report as per th	ne technical and	ethi	ical
	: standards.	Claure V/			
CO4	: Develop a res	search design for the given engineering and	management pr	oble	em context.
Reference Boo	oks:				
1. Krishnaswar	ni, K.N., Sivakı	amar, A. I. and Mathirajan, M., Managemer	nt Research Meth	iodo	ology,
Integration of F	Principles, Meth	ods and Techniques, 17th Impression, Pea	rson India Educa	atior	n Services
Pvt. Ltd, 2018.	ISBN: 978-81-	7758-563-6			
2. William M. K	K. Trochim, Jan	nes P. Donnelly, The Research Methods Kno	wledge Base, 3r	d Ec	dition, Atomic
Dog Publishing	, 2006, ISBN: 9	978-1592602919			
3. Kothari C.R.	, Research Met	hodology Methods and Techniques, 4th Edi	tion, New Age In	tern	national
Publishers, 201	19, ISBN: 978-9	93-86649-22-5.			
4. Levin, R.I. an 2017, ISBN-13	nd Rubin, D.S., - 978-8184957	Statistics for Management, 8th Edition, Pe 495.	arson Education	ı: Ne	ew Delhi,

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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	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	1					
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: Questio <mark>n 9 or 10</mark>	20			
				Total Marks	100			

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			SEMESTER: II	_,	
Course Code	:	22MCS22TL	Advanced Communication Systems-2	CIE Marks	: 100
Credits L-T-P		3-0-1	(Theory & Practice)	SEE Marks	: 100
Hours		$\frac{3}{42L} + 28P$	(Professional Core - 4)	SEE Durations	\cdot 3 Hrs
Facu	11+1	Coordinator:	Dr. S. Ravishankar	OBE Durations	. 0 1110
Pacu	iity	coordinator.			Q Hrs
Synthesizers -	DI	I Frequency S	wathesizers fractional PLL synthesizers Direct Dig	ital synthesizers F	`ading -
Large scale sn	n al	1 scale. Statist	ical characterization of multinath channels – Delay	and Doppler spre	ading –
classification o	nai of n	nultinath char	nels scattering function: Rinary signaling over freq	uency non selectiv	ve Ravleigh
fading channel	l. a	nd Frequency	selective fading channel.		re nayleigh
8	,		UNIT - II		9 Hrs
Fading and Div	ver	sity: - Diversit	v techniques for performance improvement with bin	ary signaling over	FNS. Slow
fading channel	ls -	- power combi	ning and Maximal ratio combining; Frequency selec	tive channels – Ra	ke
receivers, Perfo	orn	nance, Tap we	ght Synchronization.		
Channel estimation	ati	on and synch	onization for Single and Multicarrier carrier LTE an	d Wi-Fi	
			UNIT - III	2	8 Hrs
Capacity of wir	rele	ess channel: A	Review of Differential Entropy. Shannon's Theorem	, Capacity of a Lir	lear time
invariant Gaus	ssia	an channel, Ca	apacity of Colored Noise channels. Multicarrier Sign	alling: Single carri	ier vs
Multicarrier, M	Iul	ticarrier Conc	epts, Types of Multicarrier in AWGN channel, OFDM	I, DMT, FBMC	
Implementation	n,	Spectral Char	acteristics, ISI and ICI in Multicarrier, Power and bi	t allocation algorit	hms,
Capacity of Mu	ılti	carrier Chann	el, Peak to Average Power Ratio for Multicarrier, Cha	annel Equalizatior	1 and
Coding Consid	era	ations for Mult	icarrier.		
			UNIT - IV		8 Hrs
MIMO spatial r	mu	ltiplexing and	channel modeling: Multiplexing capability of determ	ninistic MIMO cha	nnels,
Physical model	ling	g of MIMO cha	nnels, Modeling of MIMO fading channels. Concept	of Massive MIMO	with
examples.		12			0.11
MINO como oitr		nd maraltin larrin	UNII - V	ling MIMO shares	
with CSI at rec		r Performan	g architectures. The v-bLAST architecture, Fast lac	annel Slow fadin	MIMO
channel D-BL	AS	T concepts an	d Considerations Receiver architectures – (MLD, MM	ASE ICD and SVI))
Information the	eoi	retic optimality		10L, 10L and 5VL	~],
		<u> </u>	LABORATORY	1	28 Hrs
1. Modulation	an	d Detection, P	ulse Shaping and Matched Filtering		
2. Synchroniza	atic	n: Symbol Tin	ning Recovery in Narrowband channels		
3. Channel Est	tim	ation & Equal	ization		
4. Frame Detec	ctic	on & Frequenc	y Offset Correction		
5. OFDM Modu	ıla	tion & Freque	ncy Domain Equalization		
6. Synchroniza	atic	on in OFDM Sy	stems using Schmidl and Cox Algorithm		
7. Channel Co	din	ıg in OFDM Sy	stems		
8. Generation	of (OFDM Signal	using the 16-point QAM signal constellation.		
9. Performance		t AWGN and R	ayleigh fading channels for different Binary modula	tion schemes- BP	SK, BFSK,
DPSK. 10. Peri	lori	mance improv	ement through Signal diversity on a Frequency non-	-selective channel.	,
11 Error roto		formance of Q	w? MIMO system in a Poyleigh foding AWGN shapp		
Maximum-Like	rei Jih	and Detector	(MID) b) Minimum Mean-Square-Error Detector (MID)	using aj MSF) and c) Minin	011m
Inverse Chann	el 1	Detector (ICD)	(MLD) b) Minimum Mean-Square-Error Detector (Min	wise, and cj winnin	Ium
Course Outcor	me	AS:			
After going thr	ou	gh this course	the student will be able to:		
CO1	$\overline{\left \cdot \right }$	Explain the co	ncepts of multi-channel signaling scheme and sync	hronization for ca	rrier and
		symbol timing	recovery at receiver.		
CO2	1:1	Evaluate the d	legradation in performance of various symbol signal	ing schemes in a	multipath
		fading environ	ment.	5	
CO3	:	Develop & ana	lyze schemes to improve performance in a multipat	h fading environm	ient
		including dive	rsity, maximal ratio combining and RAKE receivers.		

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CO4 : Develop and evaluate the performance of a MIMO scheme to meet specified rate in a given multipath environment.

Reference Books

1. Digital Communications, John G. Proakis, Masoud Salehi, 5th Edition, Pearson Education, ISBN:9789339204792, 2014

2. Fundamentals of Wireless Communication, David Tse, Pramod Viswanath, 1st Edition, Cambridge University Press, ISBN:0521845270, 2005

3. Digital Communications: Fundamentals and Applications, Bernard Sklar, 2nd Edition, Pearson Education, ISBN:9788131720929, 2009

4. Digital Communications Systems, Simon Haykin, 1st Edition, Wiley, ISBN:8126542314, 2014

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	Each unit consist <mark>s of TWO q</mark> uestions of 16 Marks each. Answer FIV					
2	Tests - T1 & T2	30	Questi	full questions selecting ONE from each unit (1 to 5). Question 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				
	Total Marks	100	5&6	Unit-3: Question 5 or 6	16				
			7 & 8	Unit-4: Question 7 or 8	16				
NO SEE for Laboratory				Unit-5: Question 9 or 10	16				
				Laboratory Component (Compulsory)	20				
				Total Marks	10				

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		SEMESTER: II							
Course Code	: 22MCS23T		С	IE Marks	: 100				
Credits L-T-P	: 3-0-0	Smart Antennas and Algorithm	IS S	EE Marks	: 100				
Hours	: 42L	Professional Core - 5	S	EE Durations	: 3 Hrs				
Facu	ltv Coordinator	Dr. Shushrutha K S							
1 404		UNIT - I			9 Hrs				
Array Antenna	Synthesis: Intra	oduction Two-Element Array N-Element I	linear Array	· Uniform Ampl	itude and				
Spacing, N-Ele Method, Fourie Triangular, Cos	ment Linear Arra er Transform Me sine, and Cosine	ay: Directivity, Antenna Synthesis Continu thod, Woodward-Lawson Method, Taylor Li -Squared Amplitude Distributions	ious Sources ine-Source (s, Schelkunoff F Tschebyscheff F	Polynomial Error),				
		UNIT - II			9 Hrs				
Array signal M Weighted Linea vs. Spatially W Models, Narroy design.	odelling: Frequer ar Arrays, Beam hite Noise. Char vband Time-dom	ncy-wavenumber Response, Beam Patterns Pattern Parameters, Array Steering, Array acterization of Space-time Processes: Intro ain Snapshot Models, Orthogonal Expansi	s, Uniform L Performance oduction, Fre ions, AI for r	inear Arrays, U e: Directivity Ar equency-domain non regular arra	niformly ray Gain 1 Snapshot 1y antenna				
		UNIT - III			8 Hrs				
"Beamformers	Optimum Beam	Formers: Minimum Variance Distortionless	Response (I	MVDR) Beamfor	mers,				
Minimum Powe Generalized Sid Adaptive Beam Behaviour, Par Inversion (SMI)	er Distortionless de lobe Canceller formers: Estima cametric Spatial (): Recursive Leas	Response (MPDR) Beamformer,Optimum I rs. tion of Spatial Spectral Matrices -Sample S Spectral Matrix Estimation, Singular Value t Squares (RLS): Least Squares Formulatio	LCMV and L Spectral Mat e Decomposi on, Recursiv	CMP Beamform rices: Asymptot tion Sample Ma e Implementatio	iers, ic atrix on LMS				
Beam forming	Algorithms"			1					
	10	UNIT - IV			8 Hrs				
Direction of Ar less Response Eigen structur	rival Algorithms: Estimator, Linea e Methods, MUS	Spectral Estimation Methods, Bartlett Me r Prediction Method, Maximum Entropy M IC Algorithm, Minimum Norm Method, ES	ethod, Minim Iethod, Maxi PRIT Methoo	um Variance D mum Likelihood 1, Weighted Sub	istortion d Method, ospace				
		UNIT - V	-		8 Hrs				
Beam Forming Beam Former, Matrix, Modifie Characteristics Radiating Elem	Fourier Transfor ed Butler BFN for s, Active Array Bl nent Design Cons	Itiple-Beam Arrays: Introduction, BFN Usi rm and Excitation Coefficients, FFT Algorit r Nonuniform Taper, Digital Beam Former, lock Diagrams, Aperture Design of Array, N sideration.	ing Power Di hm, FFT and Digital Phas Number of E	uders, Butler M d Butler Matrix, se Shifter, Syste lements and Ele	latrix , Hybrid em ement Size,				
Course Outco	mes:	0	/						
After going three	ough this course	the student will be able to:	/						
CO1	: Apply the con- process for a s	cept of spatial spectrum of a planar array a spatially distributed statistical signal being	antenna to ι g received by	understand the the antenna.	estimation				
CO2	CO2 : Analyse appropriate complex weighting technique for array elements that provide desirable spatial response and beam pattern.								
CO3	CO3 : Analyse the spatially sampled spectrum by an array and verify the performance of known spatial estimation algorithms.								
CO4	: Evaluate and performance r	develop an array with spatial estimation al equirement including resolution and SNR.	lgorithms th	at meet a speci	fied spatial				
Reference Boo	oks								
1. Optimum Ar John Wiley & S	ray Processing: Sons, ISBN: 9788	Part IV of Detection, Estimation, and Modu 3126538478, 2002	ulation Theo	ry, Harry L. Vai	n Trees,				
2. Antenna The 978812652422	eory: Analysis ar 28, 2009	d Design, Constantine A. Balanis, 3rd Edi	ition, John V	Viley & Sons, IS	BN:				
3. Phased Arra Bhattacharwa	y Antennas: Floo Wiley-Interscie	uet Analysis, Synthesis, BFNs and Active nce: 1st edition, ISBN: 0471727571, 2006	Array System	ms, Arun K.					
4. Array Signal	Processing Cor	cepts and Techniques Don H. Johnson F	Dan E. Duge	on. Prentice Ha	ll Signal				
Drococcing Sogilar	ies ISBN: 01304	85136, 1993	- In D. Duge	,	~-5.1.01				

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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	ch unit consists of TWO questions of 20 Marks each. Answe			
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		



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Technologia Dresenity, S	i. eng	pia (
		1		SEMESTER: II				
Course Code	:	22MCS2C1T	Developmen	nt of Modem SoCs for W	Vireless,	CIE Marks	:	100
Credits L-T-P	:	3-0-0	Wirel	ine and IOT application	ns	SEE Marks	:	100
Hours	:	42 L	Electi	ve C (Professional Electiv	e)	SEE Durations	:	3 Hrs
Facu	ilt	y Coordinator:	Dr. S Ravishanl	kar			-	1
		•	1	UNIT - I				9 Hrs
Algorithms for	Si	ingle carrier co	nmunications a	nd Multicarrier Commur	nication mo	odems, Algorithms	f	or MIMO
Applications, c	<u>, , , , , , , , , , , , , , , , , , , </u>	ligit carrier Cha		INIT - II	ulai stallua	1115		9 Hrs
DSL standards hardware and assignment in	s f fii Z	or Transreceive rmware, DSL s ynq board	r, Synchronizat: andards for Tes	ion, Channel estimation, ting, Simulation in Matla	, Mapping s ab and C of	standards to Mode specific modules	em ai	SoC nd
			U	NIT - III				8 Hrs
hardware and assignment in LTE standards		rmware, 802.11 ynq board, IEE or Transreceive	standards for 7 E 802.15.4 stan U r, Synchronizati	Section, Channel estimation dard NIT - IV on,Channel estimation, Simula	Protocol St	acks, Mapping sta	les 	8 Hrs dards to
modules and a	ISS	signment in Zy	nq board			that and C of spec		
		1.9	τ	JNIT - V	57			8 Hrs
Mobility management IOT Application Course Outco After going thr CO1	ge ns m ou :	ement in netwo s es: agh this course Explain the co	the student will ncepts of synch	be able to:	nd in-servi	ce monitoring in r	L,	tworks, WiFi and
CO2	:	LTE. Associate the	standards sectio	ons to Training, Initializa	tion and sh	now time with in-s	er	vice
CO3	:	Recognize typ	cal SoC platform orithms with tas	ns in terms of their hard sk scheduling.	ware and s	oftware capabilitie	es	to
CO4	:	Develop runti typical SoCs.	ne code to evalu	ate performance of a tra	ining, Initia	alization and show	vti	me on the
Defenses	_ 1		U.Pr.		/			
				ATION OFOTOD "A		4 - 1 ¹ 1 1 ¹		
transceivers 2	(A	DMMUNICATIC ADSL2) G.992.3	, April 2009.	ATION SECTOR, "Asym	metric digi	tal subscriber line	2	
2. IEEE Standa Local and Metr (MAC) and Phy	ar co	d for Informati politan Area Ne ical Layer (PHY	on Technology T tworks— Specifi Specifications,	elecommunications and ic Requirements Part 11: IEEE Std 802.11 TM -2020	Information : Wireless I)	n Exchange betwe AN Medium Acces	eer ss	n Systems Control
3. European Te and reception	el (3	ecommunicatio GPP TS 38.104	ns Standards In version 16.4.0	stitute (ETSI), " 5G; NR;I Release 16)", July 2020	Base Statio	n (BS) radio trans	m	ission

4. ADSL: Standards, Implementation, and Architecture, by Charles K. Summers

CRC Press, CRC Press LLC, ISBN: 084939595x Pub Date: 06/21/99

5. System Architecture Documents (for two cases TI and Centillium)
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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	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			
	1		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 V Educational Institutions **RV College of Engineering** Approace by AICTE. New Delivi Amonous Industries Affiliated Technological Drivensity, Selegisi SEMESTER: II : 22MDC2C1T Course Code **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 Coordinator: Dr. Mahesh A UNIT - I 9 Hrs Introduction: Radio frequency and Microwave circuit applications, component basics, Transmission Lines, Microstrip line, Formulation and properties of S-parameters. Applications of Smith chart Impedance Matching networks: Goal of impedance matching, Components for matching, Design of Matching Networks - Matching network design using Lumped elements, Design of Matching Networks using Distributed Elements - Transmission lines, Microstrip lines. Wideband & Narrowband Matching circuit design. Case Studies on IC device matching, Antenna Matching UNIT - II 9 Hrs Couplers and Power dividers - Basic properties, Types, Wilkinson Powerdivider- equal and unequal types, 90° Hybrids couplers, Directional Couplers, Circulators/Isolators. RF Filters: Basic filter configurations, Important Concepts on Filter Realizations, Filter Implementation, Lumped Filter Design, Distributed Filter Design, Microstrip line Filters, Hairpin, Edge-Coupled Filter. UNIT - III 8 Hrs Active RF Components: RF diodes -Schottky diode, PIN diode, Varactor diode, Bipolarjunction transistor - RF field effect transistors, metal oxide semiconductor transistors, High electron mobility transistors, (construction, functionality, frequency response), Microwave Amplifier-I: Amplifier classes of operation and biasing networks, characteristic of amplifiers, Amplifier power relations, stability considerations, and constant gain Circles and Noise figure circles UNIT - IV 8 Hrs Microwave Amplifier-II: Broadband amplifiers, High power amplifiers, Multistage amplifiers, Low noise amplifiers. Oscillators: Basic oscillator models - Feedback oscillator, Negative Resistance oscillator, oscillator phase noise, feedback oscillator design, design steps, High frequency oscillator configuration-Dielectric Resonator oscillators, and Voltage controlled oscillator. Introduction to Frequency synthesizer. UNIT - V 8 Hrs Mixers: Basic consideration of Mixers- basic concepts, frequency domain considerations, single ended mixer design, Balanced (single & Double) mixers, Integrated active mixers and image reject mixer. Control Circuits: Switch, Phase Shifters, Attenuators RF Front-end / Subsytem Design Fundamental Concepts & Performance Parameters / Measurements Case Study- RF transceiver Design (T/R-Module) **Course Outcomes:** After going through this course the student will be able to: CO1 : Review the concepts of RF components and circuits, smith charts, RF subsystems. CO2: Analyze the performance parameters of RF passive components. CO3 : Design RF active circuits for given specifications. CO4 : Evaluate the Performance of RF passive and active circuits through simulation tools. **Reference Books** 1. RF circuit design, theory and applications, Reinhold Ludwig, Pavel Bretchko, 2nd Edition, Pearson Asia Education, ISBN: 9788131762189, 2011 2. Mathew M. Radmanesh, "Radio Frequency and Microwave Electronics", Pearson Education Asia, ISBN : 9780130279583.2001 3. Microwave Engineering, D. Pozar, John Wiley & Sons, 4th edition, New York.: ISBN: 8126541903, 2013 4. Microwave Transistor Amplifiers: Analysis and Design, Guillermo Gonzalez, Pearson; 2nd edition, ISBN:0132543354,1996

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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	110	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		



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Drevensty, Be	lagsd	SEMESTER. II		
Course Code	· 22MVE2C3T	SEMESTER. II	CIF. Marks	· 100
Credite L T P	\cdot 22101 V E2CO1	Robotics and Industrial Automation	SFF Morks	. 100
Hours	· 401	Flective C (Professional Flective)	SEE Marks	\cdot 3 Hrs
Facu	1ty Coordinator:	Dr. Abbay Deshande	SEE Durations	. 5 1115
Facu				Q Hrs
"Introduction:	Automation and	Robotics Historical Development Definitions Ba	asic Structure of Rol	ots Robot
Anatomy, Com Robot Performa Subassemblies Kinematics of F	plete Classificati ance, Basic Robo Robot Manipulat	on of Robots, Fundamentals about Robot Techno ot Configurations and their Relative Merits and De or: Introduction, General Mathematical Prelimina	logy, Factors related emerits, the Wrist & uries on Vectors& Ma	to use Gripper atrices,
Direct Kinemat	Rotation matrix	Juneary Based Direct Killematics problem, Co-ordi	nate and vector tran	isionmation
		IINIT - II		9 Hrs
"Trajectory Play	ning: _ Introdu	ction Trajectory Internolators Basic Structure of	TrajectoryInternola	tors Cubic
Joint Trajector Motion Trajector GeneralizedRoh Equations of m	ies. General Dest pries) Dynamics potic Coordinates lotion."	ign Consideration on Trajectories:- 4-3-4 & 3-5-3 of Robotic Manipulators: Introduction,. Prelimina s, Jacobian for a Two link Manipulator, Euler Equ	Trajectories. (SLE: A ry Definitions, uations, TheLagrang	Admissible ian
		UNIT - III		8 Hrs
Robotics, Mach Application of I Applications: C Robot Intelliger (SLE: Goals of J	ine Vision Syste Machine Vision S Objectives, Auton nce and Task Pla AI Research, AI	m, Description, Sensing, Digitizing, Image Proces System, Robotic Assembly Sensors and Intelligent nation in Manufacturing, Robot Application in Inc nning, Modern Robots, Future Application and C Fechniques)	sing and Analysis and Sensors. Industrial lustry, Task Program Challenges and Case	nd aming, Studies.
	02	UNIT - IV	D. S.	8 Hrs
Modeling and c manipulators. software. Robo	control: Kinemati Overview of PLC t Manipulator Co	ic modeling of multi-link flexible robots, Dynamic Hardware, numeric data handling, system addre ontrol Using PLC with Position Based and Image I	s and control of flex ssing, and program Based Algorithm. Ca	ible link ning se Study.
		UNIT - V		8 Hrs
"Programmable VLSI-DSP proc Signal Processi	e Digital Signal P essor, applicatio ng etc. "	rocessor Introduction, Evaluation and important n of VLSI-DSP processor in the field of Wireless C	features of program communication, Mul	mable timedia
Course Outee	m.o.s.			
After going thr	nes.	the student will be able to:		
CO1	· Analyze the p	rocess Modeling hierarchies theoretical and empi	rical models	
CO2	: Apply differen models.	t Feedback & feed forward control techniques for	theoretical and emp	irical
CO3	: Comprehend t preparation of	he Decoupling controller, Instrumentation for pro	ocess monitoring and	d
CO4	: Develop Statis control, PC ba	tical process control, supervisory control, direct on sed automation.	digital control, distri	buted
Reference Boo	oks			
1. Fu, Lee and edition, ISBN: 9	Gonzalez , "Robo 978-0071004213	otics, control vision and intelligence". McGraw Hil 3.	ll International, 200'	7,2nd
2. John J. Crai 978-02015436	g, "Introduction 12	to Robotics"- Addison Wesley Publishing, 2010, 3	3rd edition, ISBN:	
3. Ghosal A, "F 978-01956739	undamental con 13	cepts and Analysis", Oxford University Press2008	3, 2nd edition, ISBN	:
4. Sebastian Th	nrun, "Probabilis	tic Robotics", The MIT Press, 2005, 2nd edition, l	ISBN:978-02622016	29

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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									
ADVANCED 5G									
Course Code	:	22MCS2C4T	CIE	:	100Marks				
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 of 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 G	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.							
Unit – II	07 Hrs						
5G Fundamentals Use cases of 5G: Use cases of 5G as per standards, ex	ample 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.	c 1 170						
Network Interfaces: Xn interface, F1 interface, E1 interface, NG inter	rface and X2						
interface.							
Protocol stack: Protocol Stacks, User Plane and Control Plane.	07.11						
Unit -III DDC states: DDC Idle_DDC Composted and DDC Inactive	07 Hrs						
RRC states: RRC Idle, RRC Connected and RRC Inactive.	Management						
Call Management in NR & 5G Signalling: Call Management; Registration	Management,						
Connection Management, Access Control.							
SG Signalling; Signalling Radio Bearers, PDU Sessions, QOS	Deem Trues						
MIMO & Beam: Introduction to MIMO and Beam forming, ABF, DBF.	Beam Types						
Analog, digital and hybrid beamforming.	07 11						
Unit –IV							
5G Beamforming Antenna: Active Antenna, Passive Antenna, polarisation	is, what is an						
Antenna, Antenna arrays. Power Splitter fundamentals, Antenna Bas	ics – Dipole,						
Antenna arrays	- 1 1 1						
5G Beamforming L1 Concepts : 55/PBCH based Beamforming Cod	lebook based						
Beamforming SKS based Beamforming Eigenmode Beamforming	ming Doom						
Staaring Dynamic Deemforming Deem Switching Dynamic Beamforming	ming – Beam						
Deemforming Dilat Signala	ig vs. Analog						
	07 11						
UIIIT-V EC Deemforming Measing MINO SH MINO and MIL MINO. Special	UI HIS						
Spatial Multiplaying up Doomforming Creating a Doom Namer Doom	Substial Multiplexing Department of the New New Partial Multiplexing						
Steering Maggive MIMO Antonnoo MIMO in a Handaat Multiple Devel	is and Beam						
I Steering massive mimo Antennas, mimo in a Handset, multiple Panel A	nemia. 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	tcomes: 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

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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.

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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	:	22BT2D01T		CIE Marks	: 100
Credits L-T-P	:	3-0-0	BIOINSPIRED ENGINEERING	SEE Marks	: 100
Hours	:	42L	Elective D (Global Elective)	SEE Durations	: 3 Hr
Facı	ılt	y Coordinator:	Dr Nagashree Rao and Dr Ashwani Sharma		<u> </u>
		<u> </u>	UNIT - I		8 Hrs
Introduction t	o]	Bio-inspired Er	ngineering: Macromolecules, Stem cells; types and applications. Syn	thetic Biology; E	Bottom-up'
and 'top-down	ι' ε	engineering app	proaches. Synthetic/ artificial life. Biological Clock, Genetic Algorith	ms.	_
			UNIT - II		9 Hrs
Principles of b Bio-steel, Bio- biomaterials, 1	io co Mi	inspired mater mposites, mul- crofluidics in b	ials: Biological and synthetic materials, Self-assembly, hierarchy an ti-functional biological materials. Thermal Properties. Antireflection iology, Invasive and non-invasive thermal detection inspired by skir	d evolution. Bioj and photo-therr 1	polymers, nal
			UNIT - III		9 Hrs
Lessons from Self-cleaning a reducing swim tiles, Morpho flights/ aerody	Na ma 1 s bu yn	ature:Bioinspire aterials, Gecko suits, Kingfishe atterfly- Structu amics, Mosqui	ed Materials and mechanism: Firefly-Bioluminescence, Cockleburs - - Gecko tape, Whale fins - Turbine blades, Box Fish / Bone - Bionic r beak - Bullet train, Coral - Calera cement, Forest floor / Ecosyster aral color, Namib beetle- Water collecting, Termite mound passive co to inspired micro needle.	-Velcro, Lotus le c car, Shark skin n functioning - l poling, Birds/Ins	af - 1 - Friction Flooring sects-
			UNIT - IV		8 Hrs
Biomedical In: Respiratory- a artificial liver	sp rti an	iration-Concep ificial lungs. Ex d pancreas. To	t and applications: Organ system- Circulatory- artificial blood, artific accretory- Artificial kidney and skin. Artificial Support and replacement tal joint replacements- artificial limbs. Visual prosthesis -artificial e	icial heart, pacer ent of human org eye/ bionic eye.	naker. 3ans:
			UNIT - V		8 Hrs
Neural Networ Course Outco	rki me	ng and bio-rob	otics.		
After going the	rol	agh this course	e the student will be able to:		
<u> </u>	:	Elucidate the	concepts and phenomenon of natural processes		
CO2	:	Apply the basi	c principles for design and development of bioinspired structures		
CO3	:	Analyse and a	ppend the concept of bio-mimetics for diverse applications		
CO4	:	Designing tech	nnical solutions by utilization of bio-inspiration modules.		
Reference Bo 1. D. Floreance Press, 2008, I	ol a SE	ts: nd C. Mattiuss 3N: 978026206	i, Bio-Inspired Artificial Intelligence: Theories, Methods and Techno 2718	logies, 1st editio	n, MIT
2. Guang Yan 2018, ISBN: 9	g, 78	Lin Xiao, and I 3-1-119-39033	Callepak Lamboni, Bioinspired Materials Science and Engineering. 1	st edition, John	Wiley,
3. M.A. Meyer University Pre	s a ss	and P.Y. Chen. , 2014, ISBN 9	Biological Materials, Bioinspired Materials, and Biomaterials, 1st ed 78-1-107-01045.	dition, Cambridg	çe
4. Tao Deng. I	Bic	oinspired Engir	neering of Thermal Materials, 1st edtion, Wiley-VCH Press, 2018. ISI	BN: 978-3-527-3	3834-4.
Scheme of Co	n	tinuous Interr	nal Evaluation (CIE): 20 + 40 + 40 = 100		
QUIZZES: Qui 10 Marks. The TESTS: Stude Levels: Remen will be evaluat	izz e s ent nb	tes will be cond um of two quiz s will be evalu- ering, Understa l for 50 Marks	ucted in online/offline mode. Two quizzes will be conducted & Each zes will be the Final Quiz marks. ated in test, descriptive questions with different complexity levels (R anding, Applying, Analyzing, Evaluating, and Creating). Two tests w	a Quiz will be eva evised Bloom's 7 ill be conducted	aluated for l'axonomy . Each test
EXPERIENTI Case study-ba	AL ISC	LEARNING: Sed teaching least	students will be evaluated for their creativity and practical implement rning and Program specific requirements (15), Video based tration (25) adding upto 40 marks.	ntation of the pro	oblem.

	Rub	ric for (CIE & S	SEE Theory courses			
	RUBRIC for CIE	1	RUBRIC for SEE				
SLNo	Content	Marks	Q. No	Contents	Marks		
1	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	LEALTH INFORMATICS CIE Mark	s	: 100
Credits L-T-P	: 3-0-0	SEE Mar	ks	: 100
Hours	: 42L	Elective D (Global Elective) SEE Dur	ations	: 3 Hrs
Fac	ulty Coordinator:	Dr A H Manjunatha Reddy		
		UNIT - I		8 Hrs
Introduction,	Healthcare data,	information and knowledge: Data types, data conversion, clinical data warehous	buse, d	ata
analytics, cha	allenges, role of in	formatics in analytics, future trends		
		UNIT - II		8 Hrs
Electronic he	alth records: Intro	oduction, scope for the e health records, challenges, examples, logical steps to	selecti	ing and
implementing	g EHR			
		UNIT - III		8 Hrs
Data standar	ds and medical co	oding: Introduction, medical content standards, termonology standards, trans	port st	andards,
medical codir	ng and reimburser	ment, future trends,		
		UNIT - IV		9 Hrs
Healthcare E	nterprise: Overvie	w of Health Informatics: Introduction, Key players in HI, organizations involve	d, barı	riers,
programs, org	ganizations and c	areer, HI Resoruces		
		UNIT - V		9 Hrs
Health Inform	nation privacy and	d security: Introduction, basic security principles, authentication and identity	manag	gement,
data security	in the cloud and	client/server management		
		A De Carlos		
Course Outco	omes:			
After going th	rough this course	e the student will be able to:		
	Understand th	he basic principles of Health informatics		
CO2	: Data capture f	to data transformation and to analysis		
CO3	Creation of E	health records, identify the challenges		
CO4	: Improvise the	significant factors as per the spatio-temporal requirements		
Reference Be	ooks:			
1. Robert E. I	Hoyt Ann K. Yoshi	ihas <mark>hi, Hea</mark> lth Informatics, Practical guide for <mark>Healthc</mark> are and Information Teo	hnolog	У
Professionals	, 6th edition, Info	rmatics Education, 2014, ISBN: 978-0-9887529-2-4		
2. Kathryn J.	Hannah Marion	J. Ball, Health Informatics, Springer Series edition, Springer, 2005, ISBN: 1-8	5233-8	\$26-1
3. William R	Hersh, Health Info	ormatics, a Practical guide, 8th edition. 2022, ISBN 978-1-387-85475-2		
4. Pentti Nien	ninen. Medical inf	form <mark>atics and</mark> data analysis 1st edition, MDPI AG, 2021, ISBN-13: 978-3036	500980)
Scheme of C	ontinuous Interi	nal Evaluation (CIE): 20 + 40 + 40 = 100		
QUIZZES: Qu	uzzes will be cond	lucted i <mark>n online/o</mark> ffline mode. Two quizz <mark>es will be</mark> conducted & Each Quiz will	be eva	luated for
10 Marks. Th	e sum of two quiz	zzes will b <mark>e the Final</mark> Quiz marks.		
TESTS: Stud	ents will be evalu	ated in test, descriptive questions with different complexity levels (Revised Blo	om's T	axonomy
Levels: Reme	mbering, Underst	anding, Applying, Analyzing, Evaluating, and Creating). Two tests will be cond	lucted.	Each test
will be evalua	ited 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			
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	: 22CS2D03T	DUSINESS ANALYTICS	CIE Marks	: 100
Credits L-T-P	: 3-0-0	BUSINESS ANALYTICS	SEE Marks	: 100
Hours	: 42L	Elective D (Global Elective)	SEE Duration	s : 3 Hrs
Facu	ulty Coordinator:	Dr. Azra Nasreen and Dr. Badarinath K		
		UNIT - I		9 Hrs
Overview of B	usiness analytics	s, Scope of Business analytics, Business Analytics Process, Relation	ship of Busines	s Analytics
Process and o	rganization, com	petitive advantages of Business Analytics. Statistical Tools: Statistic	al Notation, De	escriptive
Statistical me	thods, Review of	probability distribution and data modelling.		
		UNIT - II	<u> </u>	9 Hrs
Trendiness an	d Regression An	alysis Modelling Relationships and Trends in Data, simple Linear Re	egression. Impo	rtant
Resources, Bu	asiness Analytics	Personnel, Data and models for Business analytics, problem solvin	g, Visualizing a	.nd
Exploring Dat	a, Business Ana	ivites reenhology.		Q Uma
Organization	Stratation of Div	UNII - III	Information D	
Outsourcing	Ensuring Data C	ulative Measuring contribution of Business analytics. Managing Ch	anges Descript	nicy,
Analytics. Pre	dictive Analytics.	Predicative Modelling. Predictive analytics analysis.	angeo. Descript	100
	j	UNIT - IV		8 Hrs
Forecasting T	echniques Qualit	ative and Judgmental Forecasting, Statistical Forecasting Models, F	orecasting Mod	lels for
Stationary Tir	ne Series, Foreca	sting Models for Time Series with a Linear Trend, Forecasting Time	Series with Sea	asonality,
Regression Fo	recasting with C	asual Variables, Selecting Appropriate Forecasting Models.		-
		UNIT - V		8 Hrs
Decision Anal	ysis Formulating	Decision Problems, Decision Strategies with and without Outcome,	Probabilities, I	Decision
Trees, The Va	lue of Information	n, Utility and Decision Making.		
After going t	hrough this cou : Apply the con-	rse the student will be able to:		
CO2	: Analyse, mode	el and solve decision problems in different settings		
CO3	: Interpret resu	lts/solutions and identify appropriate courses of action for a given b	ousiness scenar	rio
CO4	: Demonstrate	skills like investigation, effective communication, working in team/I	ndividual and f	ollowing
	ethical practic	es by implementing solutions to decision making problems		8
	1			
Reference Bo	oks:			
1. Business a	nalytics Principle	es, Concepts, and Applications FT Press Analytics, Marc J. Schniede	rjans, Dara G.	
Schniederjans	s, Christopher M.	. Stark <mark>ey, 1st Edi</mark> tion, 2014, ISBN-13: 9 <mark>78-013398</mark> 9403, ISBN-10: 0	133989402	
2. The Value of	of Business Analy	ytics: Ide <mark>ntifying the</mark> Path to Profitabilit <mark>y, Evan S</mark> tubs , John Wiley 8	۵ Sons,	
DOI:10.1002	2/978111898388	1,1st Edition 2014, ISBN:978111898388		
3. Business A	nalytics, James 1	Evans, Pearsons Education 2nd Edition, ISBN-13: 978-0321997821	ISBN-	
10: 03219978	<u>524</u>			
4. Predictive E	ausiness Analytic	the contract of the contract o	ind	
Lawrence Mar	sel, wiley, ist Et	IIII0II, 2013, ISBN: 978-1-118-17530-9.		
Scheme of C	ntinuous Inter	nal Evaluation (CIE): $20 + 40 + 40 = 100$		
OUIZZES: OII	izzes will be cond	fucted in online/offline mode. Two quizzes will be conducted & Each	n Ouiz will he e	valuated for
10 Marks. The	e sum of two aui	zzes will be the Final Quiz marks.		
TESTS: Stude	ents will be evalu	ated in test, descriptive questions with different complexity levels (R	evised Bloom's	Taxonomv
Levels: Remer	nbering, Underst	anding, Applying, Analyzing, Evaluating, and Creating). Two tests w	vill be conducte	d. Each tes
will be evalua	ted for 50 Marks	, adding upto 100 marks. Final test marks will be reduced to 40 Ma	rks.	
EXPERIENTI	AL LEARNING: S	Students will be evaluated for their creativity and practical implement	ntation of the p	roblem.

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			
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		





L	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	1
preventive steps/procedure, de	escribe salient points of factories act 1948 for health and safety, wa	ash rooms, drinkir	ıg water
layouts, light, cleanliness, fire,	guarding, pressure vessels, etc, Safety color codes. Fire prevention	n and fire fighting,	
equipment and methods.			
	UNIT - II 	. 1	09Hrs
Uselth begande workplace and	y: Introduction, Health, Occupational health: definition, interaction	1 Detween work an	a nealth,
and promotion Activities in the	Shohiy and sustainable development, work as a factor in health pr	omotion. Health p	and
unions Communities Occupa	tional health professionals. Potential health hazards: Air contamin	ants Chemical ha	anu zarde
Biological hazards, Physical ha	azards, Ergonomic hazards, Psychosocial factors, Evaluation of hea	of the hazards: Expo	sure
measurement techniques. Inte	rpretation of findings recommended exposure limits. Controlling h	azards: Engineerin	g
controls, Work practice control	ls, Administrative controls. Occupational diseases: Definition, Cha	racteristics of occu	pational
diseases, Prevention of occupa	tional diseases.		-
	UNIT - III		09Hrs
Hazardous Materials character	ristics and effects on health: Introduction, Chemical Agents, Organ	ic Liquids, Gases,	Metals
and Metallic Compounds, Part	iculates and Fibers, Alkalies and Oxidizers, General Manufacturin	g Materials, Chemi	ical
Substitutes, Allergens, Carcino	ogens, Mutagens, Reproductive Hazards, Sensitizers and Teratogen	s, Recommended	Chemical
Exposure Limits. Physical Age	nts, Noise and Vibration, Temperature and Pressure, Carcinogenic	ity, Mutagenicity a	nd
Teratogenicity. Ergonomic Stre	esses: Stress-Related Health Incidents, Eyestrain, Repetitive Motior	i, Lower Back Pair	i, Video
Display Terminals.			00 11
Ween and Connecton and their	UNII - IV	habricanta tropas a	US HIS
applications Lubrication meth	ands general sketch working and applications i Screw down great	se cun ii Pressure	nu e grease
gun, iji, Splash lubrication, iv.	Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication	on, vii, Ring lubric	ation.
Definition, principle and factor	s affecting the corrosion. Types of corrosion, corrosion prevention	methods.	
	UNIT - V		08 Hrs
Periodic and preventive mainte	enance: Periodic inspection-concept and need, degreasing, cleaning	and repairing sch	emes,
overhauling of mechanical com	pon <mark>ents, ove</mark> r hauling of electrical motor, co <mark>mmon tro</mark> ubles and re	emedies of electric	motor,
repair complexities and its use	e, def <mark>inition, nee</mark> d, steps and advantages of p <mark>reventive</mark> maintenance	e. Steps/procedure	for
periodic and preventive mainte	enance of: I. Machine tools, ii. Pumps, iii. Air compressors, iv. Dies	el generating (DG)	sets,
Program and schedule of preve	entive maintenance of mechanical and electrical equipment, advan	tages of preventive	
maintenance. Repair cycle con	cept and importance.		
Course Outcomes:	rea the student will be able to		
CO1: Exploin the In	dustrial and Occupational health and safety and its importance		
CO2: Demonstrate t	the exposure of different materials, occupational environment to w	hich the employee	can
expose in the	industries.	men the employee	can
CO3 : Characterize t	he different type materials, with respect to safety and health hazar	ds of it.	
CO4 : Analyze the di	fferent processes with regards to safety and health and the mainte	nance required in	the
industries to a	avoid accidents.	1	
Reference Books:			
1.Maintenance Engineering Ha	andbook, Higgins & Morrow, SBN 10: 0070432015 / ISBN 13: 9780	0070432017, Publ	ished by
McGraw-Hill Education. Da Int	formation Services.		-
2. H. P. Garg, Maintenance En	gineering Principles, Practices & Management, 2009,S. Chand and	Company, New D	elhi,
ISBN:9788121926447			
3.Fundamental Principles of O	ccupational Health and Safety, Benjamin O. ALLI, Second edition,	2008 International	Labour
Office – Geneva: ILO, ISBN 978			
	3-92-2-120454-1		



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	h 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	1 & 2	Unit-1: Question 1 or 2	20			
	Total Marks	100	3&4	Unit-2: Question 3 or 4	20			
	10	1119	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			



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to Velocity Technolog	artiyo Koti			
Lessenary.	oeagae	SEMESTED, II		
Course Code	· 22CV2D05T	SEMESTER. II	CIF Morks	1.00
Crodite L T P	· 22CV2D031	INTELLIGENT TRANSPORTATION SYSTEMS	SEE Morteo	. 100
	. 3-0-0	Elective D (Clobal Elective)	SEE Marks	. 100
Hours	• 42L		SEE Durations	s : 3 Hrs
Faculty Coord	linator:	Dr.Sunil S		0.77
.			1 1	8 Hrs
Introduction: Fundamentals	-Historical Backs s of Traffic Flow a and control princ	ground, Definition, Future prospectus, ITS training and educationa and Control- Traffic flow elements, Traffic flow models, Shock waves iples. Ramp metering, Traffic simulation	l needs. s in Traffic strear	ms, Traffic
8	F	UNIT - II		9 Hrs
ITS User servi	ces-User services	s bundles. Travel and Traffic management. Public Transportation O	perations, Electr	ronic
Payment, Con Information M Architecture,	nmercial Vehicles Ianagement, Mai Need of ITS arch	Operations, Emergency Management, Advanced Vehicle Control and ntenance and construction Management. ITS Architecture-Regional tecture, concept of Operations, National ITS Architecture, Architect	nd safety system l and Project ITS ture developmen	t tool
		UNIT - III		9 Hrs
Technology Bu Information, V and incident r Multimodal Tu	uilding Blocks for Various detection management syst raveller Informati	r ITS-Introduction, Data acquisition, Communication Tools, Data A , identification and collection methods for ITS. ITS Applications and tems, Advanced arterial traffic control systems, Advanced Public Tra on systems	nalysis, and Trav 1 their benefits-F ansportation Sys	veller Freeway stems,
		UNIT - IV		8 Hrs
ITS Planning-	Transportation p	lanning and ITS, Planning and the National ITS Architecture, Planr	ning for ITS, Inte	grating ITS
into Transpor	tation Planning,	relevant case studies. ITS Standards-Standard development proces	s, National ITS a	rchitecture
and standards testing	s, ITS standards	application areas, National Transportation Communications for ITS	S Protocol, Stand	ards
	1.	UNIT - V		8 Hrs
ITS Evaluation	n – Project select:	ion at th <mark>e planning level, Deployment Trackin<mark>g, Im</mark>pact Assessment</mark>	, Benefits by ITS	3
components, l	Evaluation Guide	elines, Challenges and Opportunities. ITS for Law Enforcement: Intr	coduction, Enhar	nce and
support the er	nforcement traffic	c rule <mark>s and regulations, ITS Funding options and ITS</mark> case studies		
Course Outco	omes: brough this cour	rea the student will be able to:		
	· Identify and a	northe student will be able to.		
		pply 115 applications at different levels		
<u> </u>	· Illustrate IIS			
003	Examine the s	lignificance of ITS for various levels		
C04	Compose the	mportance of ITS in implimentions		
Reference Bo	ooks:			
1. Pradip Kun ISBN-978938	har Sarkar and A 7472068	mit Kumar Jain, "Intelligent Transport Systems", PHI Learning Priv	rate Limited, Dell	hi,2018,
2. Choudury l March 2003);	M A and Sadek A ISBN-10: 15805	, "Fundamental <mark>s of Intelli</mark> gent Transportation Systems Planning" A 31601	rtech House pub	lishers (31
3. Bob Willian	ns, "Intelligent tr	ansportation systems standards", Artech House, London, 2008. ISE	3N-13: 978-1-59	693-291-3
4. Asier Perall Technologies a	os, Unai Hernan and Applications	dez-Jayo, Enrique Onieva, Ignacio Julio García Zuazola "Intelligent "Wiley Publishing ©2015, ISBN:1118894782 9781118894781	Transport Syste	ms:
	**			
Scheme of Co	ontinuous Inter	nal Evaluation (CIE): 20 + 40 + 40 = 100		
QUIZZES: Qu	izzes will be cond	lucted in online/offline mode. Two quizzes will be conducted & Eac	h Quiz will be ev	aluated for
10 Marks. The	e sum of two quiz	zzes will be the Final Quiz marks.		
TESTS: Stude	ents will be evalu	ated in test, descriptive questions with different complexity levels (I	Revised Bloom's '	Taxonomy
Levels: Remer	nbering, Underst	anding, Applying, Analyzing, Evaluating, and Creating). Two tests v	will be conducted	l. Each test
will be evalua	ted for 50 Marks	adding upto 100 marks. Final test marks will be reduced to 40 Ma	arks.	
EXPERIENTI	AL LEARNING: S	Students will be evaluated for their creativity and practical impleme	ntation of the pr	oblem.
Case study-ba	ased teaching lea	rning and Program specific requirements (15), Video based	-	
seminar/pres	entation/demons	stration (25) adding upto 40 marks.		
Scheme of Se	emester End Exa	amination (SEE) for 100 marks: The question paper will have FIV	E questions with	internal
<u>choic</u> e from ea	ach unit. Each qu	uestion will carry 20 marks. Student will have to answer one full qu	lestion from each	n unit.

Rubric for CIE & SEE Theory courses							
	RUBRIC for CIE			RUBRIC for SEE	1		
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		





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Rubric for CIE & 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		





	SEMESTER: II		
Course Code : 22EC2D07T	EVOLUTION OF WIDELESS TECHNOLOGIES	CIE Marks	: 100
Credits L-T-P : 3-0-0	EVOLUTION OF WIRELESS TECHNOLOGIES	SEE Marks	: 100
Hours : 42L	Elective D (Global Elective)	SEE Durations	: 3 Hrs
Faculty Coordinator:	Dr. Mahesh A		-
	UNIT - I		9 Hrs
Introduction to cellular system	s: Overview of Cellular Systems and evolution 2G/3G/4G/5G,	Cellular Concepts –	Frequency
reuse, Co			
channel and Adjacent channel	Interference, C/I, Handoff, Blocking, Erlang Capacity, Bluetoot	h, WiFi, WWAN and	PAN.
	UNIT - II		9 Hrs
Fundamentals of wireless com	munication: Wireless Channel, Wireless propagation, Link budg	et, Free-space path	loss, Noise
figure of receiver, Multipath fac	ding, Shadowing, Fading margin, Shadowing margin, Wireless (Channel Capacity, O	FDM
and LTE, Large Scale Propagat	ion effects and Channel Models		
			8 Hrs
Fundamentals of 5G architectu	are: Difference between 4G and 5G, 5G Architecture, Planning o	it 5G Network, Quali	ty of
Service, Radio	its SIM in EC Francesifications Standardization Terminal St		
Network, Requirements, Secur	ity, SIM in 5G Era, Specifications, Standardization, Terminal St	ates	0.11
mmWowe and Visible Light Cor	UNIT - IV	actions Frequency	o nrs
propagation characteristics ch	annel models, applications and challenges in 50	cations, Frequency	banus,
propagation characteristics, ch			0 Uma
Future Concretions: Future Co	onarationa/where is the 6C2) Health Considerations Identifiers	Interfaces Koy Do	rivetion
Location Based Services Mass	ive Internet of Things, Measurements, Network Functions, Virtu	alization	Ilvation,
Network Slicing Open Source	User Equipment, Vehicle-to-Vehicle communications (V2V) Vi	rtual Reality	
(VR/AR/XR) Case study- Bhay	rath Stack	Itual Reality	
(Treffind) Edde ordag Dia			
Course Outcomes:			
After going through this cour	rse th <mark>e stud</mark> ent will be able to:		
CO1 : Demonstrate t	heir understanding on functioning of wireless communication s	system and evolutior	ı of
different wirele	ess communication systems and standards	5	
CO2 : Compare diffe:	rent technologies used for wireless communication systems.		
CO3 : Demonstrate a	an ability explain recent techniques for Wireless Communication	n systems	
CO4 : Update the lat	est trends in wireless communications		
Reference Books:			
1. Theodore S. Rappaport, "Win	reless Communications: Principles and Practice", Pearson, 2nd	Edition.	
2. Aditya K Jagannatham, "Pri	nciples of Modern Wireless Communications", McGraw Hill, 201	17	
3. Robin Chataut, Robert Akl,	"Massive MIMO Systems for 5G and beyond Networks—Overvie	w, Recent Trends, C	hallenges,
and Future Research Direction	" Sensors, May 2020	, , ,	0 /
4. A. N. Uwaechia and N. M. M	ahyuddin, A Comprehensive Survey on Millimeter Wave, Comm	unications for	
Fifth-Generation Wireless Netw	vorks: Feasibility and Challenges, in IEEE, Access, vol. 8, pp. 62	2367-62414, 2020	
Scheme of Continuous Intern	nal Evaluation (CIE): 20 + 40 + 40 = 100		
QUIZZES: Quizzes will be cond	lucted in online/offline mode. Two quizzes will be conducted &	Each Quiz will be ev	aluated 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			
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	: 22ET2D08T	TRACKING AND NAMICATION SYSTEMS	IE Marks	: 100
Credits L-T-P	: 3-0-0	IRACKING AND NAVIGATION SISTEMS	EE Marks	: 100
Hours	: 42L	Elective D (Global Elective) S	EE Durations	: 3 Hrs
Faculty Coord	inator:	Prof. Shambulinga .M, Dr. B. Roja Reddy		
		UNIT - I		9 Hrs
An Introductio	on to Radar: Basi	c Radar, The simple form of the Radar Equation, Radar Block Diagram	n, Radar Frequ	encies,
Application of of Detection an	radar, Types of l nd False alarm, l	Radars. Detection of signals in Noise, Receiver Noise and the Signal-to introduction to Doppler, MTI, UWB Radars	Noise Ratio, Pr	robability
		UNIT - II		8 Hrs
Terrestrial Net	work based posi	tioning and navigation: General Issues of wireless positions location, F	rundamentals,	
positioning in	cellular network	s, positioning in WLANs, Positioning in Wireless sensor networks.		
		UNIT - III		8 Hrs
Satellite-based	l navigation syst	ems: Global Navigation satellite systems (GNSS), GNSS receivers.		
		UNIT - IV		9 Hrs
LiDAR: Introdu Flash LiDAR v Basic compon	uction to LiDAR, ersus Scanning ents and physica	context and conceptual discussion of LiDAR, Types of LiDARS, LiDAR LiDAR, Monostatic versus Bistatic LiDAR, Major Devices in a LiDAR, L Il principles of LiDAR, LiDAR accuracy and data formats.	S Detection mo DAR remote s	odes, ensing,
		UNIT - V		8 Hrs
SONAR: Under	rwater acoustics	, applications, comparison with radar, submarine detection and warfa	re, overcoming	the
and detection	index, transmiss	the acoustic signal: Introduct signal in	lion, detection	contrast
Course Outer	moor	201 (A)		
After going th	mes. rough this cou	rse the student will be able to:		
CO1	· Understand th	be concepts of Radar LiDAR Sonar terrestrial and satellite based nav	igation system	
CO2	· Apply the cond	cents of radars LiDAR Sonar cellular networks WLAN sensor netwo	rks and satellit	es in
002	determining th	the user position and navigation.	nio una satomi	
CO3	: Analyze the di	fferent parameters of satellite and terrestrial networks for navigation s	systems.	
CO4	: Evaluate the F	Radar, LiDAR, Sonar systems and satellite and terrestrial network base	ed navigation a	nd
	tracking syste	ms	0	
Reference Bo	oks:			
1. M. L Skolni	k,Introduction to	RADAR Systems, 3rd edition, 2017, TATA Mcgraw-Hill, ISBN: 978-007	0445338	
2. Mark A Rich	nards, James A S	Scheer, William A Holam, Principles of Modern Radar Basic Principles,	2010, 1st	
edition,SciTec	h Publishing Inc	, ISB <mark>N:978-18</mark> 91121524 .		
3. Davide dard	lari, Emanuela F	alletti, Marco Luise, Satellite and Terrestrial Radio Positioning techniq	jues- A signal p	processing
perspective, 1s	st Edition, 2012,	Elsevier Academic Press, ISBN: 978-0-12-382084-6.		
4. Paul McMai	namon,LiDAR Te	chnologies and Systems, SPIE press, 2019.		
5. Pinliang Do	ng and Qi Chen,	LiDAR Remote Sensing and Applications, CRC Press, 2018, ISBN: 978	-1-4822-4301-	.7
6. Jean-Paul M	Marage, Yvon Mo	ri, Sonar and Underwater Acoustics, Wiley, 2013, ISBN: 97811186006	558	
Scheme of Co	ntinuous Interi	nal Evaluation (CIE): 20 + 40 + 40 = 100		
QUIZZES: Qui	zzes will be cond	lucted in online/offline mode. Two quizzes will be conducted & Each Q	uiz will be eva	luated for
10 Marks. The	e 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				
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	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	:	22IM2D09T		CIE Marks	:	100
Credits L-T-P	:	3-0-0	PROJECT MANAGEMENT	SEE Marks	:	100
Hours	:	42L	Elective D (Global Elective)	SEE Durations	:	3 Hrs
Facı	ılt	y Coordinator:	Dr. Vikram N Bahadurdesai			
		<u> </u>	UNIT - I			8 Hrs
Introduction	Ρ	roject Planning	, Need of Project Planning, Project Life Cycle, Roles, Responsibility a	and Team Work,	Pr	oject
Planning Proc	es	s, Work Break	lown Structure (WBS), Introduction to Agile Methodology.			0
			UNIT - II			8 Hrs
Capital Budg	eti	i ng : Capital Inv	estments: Importance and Difficulties, phases of capital budgeting,	levels of decisio	n r	naking,
facets of proje	ct	analysis, feasi	pility study – a schematic diagram, objectives of capital budgeting			
			UNIT - III			9 Hrs
Project Costi	ng	: Cost of Project	t, Means of Finance, Cost of Production, Working Capital Requirem	ent and its Fina	nc	ing,
Profitability P	oj	ections, Projec	ed Cash Flow Statement, Projected Balance Sheet, Multi-year Proje	ctions, Financia	1	
Modeling, Soc	ial	Cost Benefit A	nalysis		<u> </u>	
			UNIT - IV			8 Hrs
Tools & Tech	ni	ques of Projec	t Management: Bar (GANTT) chart, bar chart for combined activitie	es, logic diagram	s a	ınd
networks, Pro	jeo	et evaluation ar	nd review Techniques (PERT) Critical Path Method (CPM), Computer	ized project man	iag	ement
			UNIT - V			9 Hrs
Course Outco	qu m	es, performanc	e measurement.	leuuning, use of		
After going t	ır	ough this cour	se th <mark>e stud</mark> ent will be able to:			
C01	:	Explain projec	t planning activities that accurately forecast project costs, timelines	, and quality.		
CO2	:	Evaluate the b	udget and cost analysis of project feasibility.			
CO3	:	Analyze the co	ncepts, tools and techniques for managing projects.			
CO4	:	Illustrate proje	ct management practices to meet the needs of Domain specific stak	eholders from m	ıul	tiple
		sectors of the	economy (i.e. consulting, government, arts, media, and charity organ	nizations).		
Reference Bo	oł	KS:				
1. Prasanna C	ha	andra, Project I	Planning Analysis Selection Financing Implementation & amp; Review	w, Tata		
McGraw Hill H	'u	blication, 8th E	dition, 2010, ISBN 0-07-007793-2.			
2. Project Mar	iaį	ion 0012 ISD	e, A Guide to the Project Management Body of Knowledge (PMBOK			
Guidej, Stil Ed	<u>111</u>	1011, 2013, 18D	N. 976-1-955569-07-9	ling		
John Wiley &	h	in: Sons Inc 1	1th Edition 2013 ISBN 978-1-118-02227-6	iiiig,		
4 Rory Burke	F	Project Manage	ment – Planning and Controlling Techniques, John Wiley & amp: So	ns 4th		
Edition. 2004	Ì	SBN: 9812-53-	121-1			
,			X//TITITY //			
Scheme of Co	n	tinuous Interr	al Evaluation (CIE): 20 + 40 + 40 = 100			
QUIZZES: Qu	izz	es will be cond	ucted in online/offline mode. Two quizzes will be conducted & Each	Quiz will be eva	alu	ated for
10 Marks. The	e s	um of two quiz	zes will be the Final Quiz marks.			
TESTS. Stude	nt	s will be evalue	ated in test descriptive questions with different complexity levels (R	evised Bloom's T	l'av	onomy

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	1			
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				
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			



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raionadr.	beager	OFWEGGED. H		
0		SEMESTER: II		1.00
Course Code	: 22IS2D101	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	1: 3 Hrs
Faci	alty Coordinator:	: Prof.Smitha G R		1
		UNIT - I		8 Hrs
Advanced Dat	abase Models, S	ystems, and Applications : Enhanced Data Models: Introduction to	Active, Temporal	, Spatial,
Multimedia, a	nd Deductive Da	atabases . Distributed Database Concepts : Distributed Database C	Concepts, Data	
Fragmentation	n, Replication, ai	nd Allocation Techniques for Distributed Database Design, Overvie	w of Concurrency	Control
and Recovery	in Distributed D	atabases		0.77
T . 1 . . .			1.1.1.1.77	8 Hrs
Introduction t	o Information Re	etrieval and web Search : Information Retrieval (IR) Concepts Retri	eval Models, Type	S OI
Queries in IR	Systems, Text P	reprocessing, inverted indexing, Evaluation Measures of Search F	celevance, web Sea	arch and
Analysis, Tren	ids in informatio	in Retrieval .		0.11
	· • • • •		· · · · · · ·	8 Hrs
Information S	ystems, Organiza	ations and Strategy: Organizations and information systems, How	information system	ms impact
organization a	ind business firm	ns, Using information systems to gain competitive advantage, man	agement issues, E	thical and
information of	n monnation S	stems: Understanding ethical and Social issues related to information	ation Systems, Ett	nes in an
iniormation se	Delety, The mora		innig.	O Har
		UNII - IV		9 HIS
Achieving Ope	tional Exceller	nce and Customer Intimacy: Enterprise systems, Supply chain ma	nagement(SCM) sy	ystems,
E commorco o	utonship manage	E commerce business and technology. The mobile digital platform	markets Digital G	oous:
E-commerce a	F commerce wet	site A Case study on FPP		lillierce,
Dunung and I	E-commerce wet			0 11=0
Monoging Kng	wiledge:			9 1115
The knowledge	e management l	andscane Enterprise wide knowledge management system Knowl	edge work system	9
Intelligent tecl	hniques Enhand	cing Decision Making: Decision making and information systems. I	Rusiness intelliger	s, ace in the
enterprise Bu	isiness intelligen	ace constituencies. Building Information Systems: Systems as plan	ned organizationa	l change
Overview of sy	stems developm	ent	neu organizationa	i ellange,
Course Outco	omes:			
After going th	hrough this cou	rse the student will be able to:		
CO1	: Understand th	he different models for Infromation Retrieval.		
CO2	: Appricieate th	technology of Information Retrieval and Web Search		
CO3	· To understan	d the basic principles and working of information technology		
C04	: Describe the t	rale of information technology and information systems in husines	<u> </u>	
Deference Be		tole of information teenhology and information systems in busiles		
1 Konnoth C	UKS:	no D. Loudon, Monogoment Information System Managing the Dig	ital Firm Doorgon	
T. Kenneth C.	th Global adition	a 2016 ISPN:0781202004007	ital Film, Pearson	
2 Fundament	als of Database	Systems, Remore Elmosri, Shamkant P. Novatha, 7th Edition, 2014	6 Dublished by De	oroon
2. Fulluament	ISBN 10.01330	70770	5, Fublished by Fe	ai son,
3 James A O	'Brien George	M. Marakas: Management Information Systems, Clobal McGraw Hi	11 10th Edition 2	011 ISBN:
978-0072823	110	m. Marakas. Management information systems, Globar McGraw In	II, 10111 Euritio11, 2	011, ISBN.
4 Database M	lanagement Syst	tems Raghu Ramakrishnan and Johannes Gebrke 3rd Edition 20	003 McGraw-Hill	ISBN
97800712315	10	tenns, Ragnu Ramakrishnan and obhannes Genrike, Sid Dutton, 20	job, mediaw iiii,	IODIN.
57000712010	10			
Scheme of Co	ntinuous Inter	ral Evaluation (CIE): 20 + 40 + 40 = 100		
OIIIZZES: Out	jzzes will be con	ducted in online (offline mode. Two quizzes will be conducted & Fa	ch Quiz will be ev	aluated for
10 Marks The	e sum of two qui	zzes will be the Final Ouiz marks		aluateu 101
TESTS Stude	nts will be evolution	azes will be user rillial Quiz marks.	(Revised Bloom's "	Faxonomy
Levels Remen	nhering Undered	tanding Annlying Analyzing Evaluating and Creating) Two tests	will be conducted	Each test
will be evaluat	ted for 50 Marks	adding unto 100 marks Final test marks will be reduced to 40 M	larks	. Lati tot
EXPERIENTI		Students will be evaluated for their creativity and practical implem	entation of the pro	oblem
Case study-ba	sed teaching lea	arning and Program specific requirements (15) Video based	entation of the pro-	
seminar/prese	entation/demon	stration (25) adding up to 40 marks.		
0.1		= 1 + 1 + 1 + 1 + 1 + 1 + 1 + 1 + 1 + 1		• . 1

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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 F			
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		



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Technological Dresenthy, Sellagisel			
	SEMESTER: II	<u> </u>	-
Course Code : 22IS2D11T	MANAGEMENT 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
Faculty Coordinator:			8 Ure
Overview: Introduction:	UNIT - I		0 1115
Professional Software Develop activities, Coping with Change Agile Software Development: In scaling agile methods. Informa Perspectives on information sy	ment, Software Engineering Ethics, Case studies. Software Proc e, Process improvement. The Rational Unified Process. Computer introduction to agile methods, Agile development techniques, Agi ation Systems in Global Business Today: The role of information systems. Contemporary approaches to information systems	esses: Models, Process r Aided Software Engin le project managemen systems in business t	s neering. .t and today,
	UNIT - II		9 Hrs
Requirements Engineering and Software Requirements: Funct and Change. System Modeling architecture. Information Syst systems impact organization a	d System Modeling: tional and Non-functional requirements. Requirements Elicitation : Context models, Interaction models, Structural models, Behav ems, Organizations and Strategy: Organizations and information and business firms, Using information systems to gain competiti	on, Specification, Valid ioural models, Model on systems, How inform ve advantage, manage	ation driven nation ement
issues			O IIma
Development and Testing:	UN11 - 111	-	אין חוג
Design and implementation: C development. Software Testing Securing Information Systems framework for security and co	Object oriented design using UML, Design patterns, Implementat g: Development testing, Test-driven development, Release testing : System vulnerability and abuse, Business value of security an ntrol, Technology and tools for protecting information resources	ion issues, Open-sour g, User testing. d control, Establishing . A case study on cybe	rce g ercrime.
	UNIT - IV	5	8 Hrs
dependable systems: Dependa dependability, A15 Availability Markets Digital Goods: E-com Software Management: Project Management: Risk Mar	and reliability, reliability requirements, Reliability measuremer merce and the internet, E-commerce-business and technology, A UNIT - V nagement, Managing People, Teamwork, Project Planning: Softw	, formal methods and its E-commerce: Digita <u>A Case study on ERP.</u> vare Pricing, Plan drive	al 8 Hrs en
development, Project Scheduli Systems: Systems as planned	ng, Agile planning, Estimation Techniques, COCOMO cost mode organizational change, Overview of systems development.	ling. Building Informa	ation
Course Outcomes:			
After going through this cou	rse the student will be able to:		
CO2: Develop the la	nd apply the fundamental concepts of software engineering for i	nformation systems.	
CO3: Interpret and	recommend the use information technology to solve business n	rohlems	
CO4 : Apply a frame	work and process for aligning organization's IT objectives with t	ousiness strategy.	
Reference Books:		0	
1. Kenneth C. Laudon and Jar Education, 14th Global edition	ne P. Laudon: Management Information System, Managing the I n, 2016, ISBN:9781292094007.	Digital Firm, Pearson	
2. Ian Sommerville,— Software 9788131762165	Engineering, 9th Edition, Pearson Education, 2013, ISBN:		
3. W.S. Jawadekar: Manageme	ent Information Systems, Tata McGraw Hill, 2006, ISBN: 97800	70616349.	
4. James A. O' Brien, George I 10th Edition, 2011, ISBN: 978	M. Marakas: Management Information Systems, Global McGraw 8-0072823110	Hill,	
Scheme of Continuous Inter	nal Evaluation (CIE): $20 \pm 40 \pm 40 = 100$		
OUIZZES: Ouizzes will be cond	ducted in online/offline mode. Two guizzes will be conducted &	Each Ouiz will be eval	uated for
10 Marks. The sum of two qui	zzes will be the Final Quiz marks.		
TESTS: Students will be evalu	ated in test, descriptive questions with different complexity leve	ls (Revised Bloom's Ta	xonomy
Levels: Remembering, Underst	tanding, Applying, Analyzing, Evaluating, and Creating). Two tes	sts will be conducted. I	Each test
EXPERIENTIAL LEADNING	, adding upto 100 marks. Final test marks will be reduced to 40	1 Marks. ementation of the prob	lem
Case study-based teaching lea	rning and Program specific requirements (15). Video based	mentation of the prob	<i>n</i> cm.
seminar/presentation/demons	stration (25) adding upto 40 marks.		
Scheme of Semester End Ex	amination (SEE) for 100 marks: The question paper will have	FIVE questions with in	iternal
choice from each unit. Each q	uestion will carry 20 marks. Student will have to answer one ful	l question from each u	ınit.
	Rubric for CIE & SEE Theory courses		

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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 F			
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 Marks	100		



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Addisornes Keltudor Al	Approact by AICTE. New Deliv		
Technological Dresenity, Be	ye Lingani		
		SEMESTER: II	<u>-</u>
Course Code	: 22MAT2D12T		CIE Marks : 100
Credits L-T-P	: 3-0-0	STATISTICAL AND OPTIMIZATION METHODS	SEE Marks : 100
Hours	: 42L	Elective D (Global Elective)	SEE Durations : 3 Hrs
Faculty Coordi	nator:	Dr. PRAKASH R	
U U		UNIT - I	9 Hrs
Random Vector Probability mod and random ve Expected value (MGF), MGF of	ors: dels of N random ectors, Functions es of sums, Proba the sum of inde	n variables, Vector notation, Marginal probability functions, Indep of random vectors, Expected value vector and Correlation matrix ability density function of the sum of two random variables, Mom pendent random variables, Characteristic function and Probabili	pendence of random variables x, Gaussian random vectors, lent Generating Functions ty generating function.
		UNIT - II	8 Hrs
Estimation: Po and sufficiency likelihood, Bay	oint estimation, 7, Variance of a p esian estimation	Estimator and estimate, Criteria for good estimates - unbiasedne point estimator, Methods of point estimation - Method of moment a of parameters.	ss, consistency, efficiency s and Method of maximum
		UNIT - III	9 Hrs
Null and altern regions and po and two-sided samples (F, Ch	active hypothesis wer, Standard N confidence inter i – square, Z, t –	s, Procedure for statistical testing, Type I and Type II errors: level ormal null distribution (Z-test), Z-tests for means and proportion vals, P-value, Inference about variances, Special tests of significa- test).	of significance, Rejection is, Duality: two-sided tests nce for large and small
		UNIT - IV	8 Hrs
Defuzzificatiuo Artificial Neura variants, Loss	n, Knowledge ba ll Networks: Intr functions in arti	ise, Decision making logic, Membership functions, Rule base. oduction - Neuron model, Multilayer perceptions - Back propagat ficial neural networks, Stochastic gradient descent method.	ion algorithm and its
		UNIT - V	8 Hrs
Data mining, H data, Statistica Kernel functior	lierarchy Cluster I nature of Big of Is and Nonlinear	s: ring, k-Means Clustering, Distance Metric, Data mining for Big da lata, Support Vector Machines, Statistical Learning Theory, Linea r Support Vector Machines.	ata, Characteristics of Big ar Support Vector Machine,
Course Outcou	mes		
After going th	rough this cour	se the student will be able to:	
CO1	: Illustrate the f optimization a	undamental concepts of statistics, random variables, estimation, nd machine learning algorithms.	inferential statistics, fuzzy
CO2	Derive the solution statistics, fuzz	ation by <mark>applying the acquired knowledge of ran</mark> dom variables, es y optimization and machine learning algorithms to the problems	timation, inferential of engineering applications.
CO3	Evaluate the s world problem	olution of the problems using appropriate statistical and probabils arising in many practical situations.	lity techniques to the real
C04	optimization g	ained to engage in life – long learning.	ition, tests of hypothesis and
1 Dow D. Votes	Derrid L Card	man "Drohability and Stachastic Drassass" and Edition An Ind	ion Adoptotion Wilcor 0001
I. Roy D. Yates ISBN: 9789354	s, David J. Good 243455.	man, Provability and Stochastic Processes", 3rd Edition, An Indi	an Adaptation, wiley, 2021,
2. Douglas C. M & Sons, 2019,	Montgomery and ISBN: 97811195	George C. Runger, "Applied Statistics and Probability for Engine 570615.	ers", 7th Edition, John Wiley
3. Trevor Hasti Prediction", 2n	e Robert Tibshir d Edition, Sprin	ani Jerome Friedman, "The Elements of Statistical Learning - Da ger, 2009 (Reprint 2017), ISBN-10: 0387848576, ISBN-13: 97803	ta Mining, Inference, and 387848570.
4. Michael Bar 2014, ISBN- 13	on, "Probability : 3: 978-1-4822-1	and Statistics for Computer Scientists", 2nd Edition, CRC Press, 410-9.	
5. Shai Shalev- Cambridge Uni	Shwartz and Sh versity Press, 20	ai Ben-David "Understanding Machine Learning: From Theory to 014, ISBN: 978-1-107-05713-5.	Algorithms", 1st 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 u	Each unit consists of TWO questions of 20 Marks each. Answ				
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	1119	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			





		SEMESTER: II		
Course Code	: 22ME2D13T	INDUSTRY 4 0	CIE Marks	: 100
Credits L-T-P	: 3-0-0	INDUSTRI 4.0	SEE Marks	: 100
Hours	: 42L	Elective D (Global Elective)	SEE Durations	: 3 Hrs
Facu	ulty Coordinator:	Dr. Gopalakrishna H D		
		UNIT - I		8 Hrs
Fundamentals Introduction, (PSS) Industry Transformatic (Reference Arc Industry 4.0 a Introduction, 4.0 (Implicatio The Concept of Communicatio	s of Industry 4.0 Industry 4.0, RA y 4.0 across the S on of Railways, Lo chitecture Model across the Sectors Transportation 4 ons) of the IIoT: Moder on Protocols, TCF	MI 4.0 (Reference Architecture Model Industry 4.0), Servitization, Pr Sectors Introduction, Transportation 4.0: Multimodal Transportation ogistics 4.0 (Implications), Fundamentals of Industry 4.0, Introducti Industry 4.0), Servitization, Product Service-System (PSS) s .0: Multimodal Transportation Systems, Rail 4.0, Digital Transform UNIT - II rn Communication Protocols, Wireless Communication Technologies P/IP, API: A Technical Perspective, Middleware Architecture. UNIT - III	oduct Service-Sy Systems, Rail 4 on, Industry 4.0 ation of Railways	/stem 4.0, Digital , RAMI 4.0 s, Logistics 8 Hrs vork 8 Hrs
Data Analytic Conditioning, Internet of Th Standards, Se Advances in R	s in Manufacturin Smart Remote M ings and New Va courity and Privac Robotics in the Er	ng: Introduction, Power Consumption in manufacturing, Anomaly E fachinery Maintenance Systems with Komatsu, Quality Prediction in lue Proposition, Introduction, Internet of Things Examples, IoTs Val cy Concerns. a of Industry 4.0, Introduction, Recent Technological Components of	Detection in Air 1 Steel Manufact ue Creation Barr of Robots, Advan	uring. riers: .ced
Sensor Techn	ologies, Artificial	Intelligence, Internet of Robotic Things, Cloud Robotics.		
	6 · · · · · · · · · · · · · · · · · · ·	UNIT - IV	<u> </u>	9 Hrs
lithography, 3 Net Shaping, 4 Advances in V Commercial S	DP, Fused Depos Advantages of Ad 'irtual Factory Re oftware.	sition Modeling, Selective Laser Sintering, Laminated Object Manufa ditive Manufacturing, Disadvantages of Additive Manufacturing. esearch and Applications, The State of Art, The Virtual Factory Software	cturing, Laser E vare , Limitation	ngineered s of the
		UNIT - V		9 Hrs
Augmented Re systems, Tech Internet of Th (IoT), Visualiza in Internet of Smart Factori A Roadmap: I Develop New I	eality: Definitions inical issues and ings (IoT), Interne ing the Internet of Things, Enablers es: Introduction, Digital Transform Business Models.	a and application of AR, VR, MR, Limitations of AR, VR, Hardware de 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 Softw a Rationalization re of Internet of 7 , Key Technologie The way forward. ase Operational 1	are Fhings es Involved Efficiency,
Course Outco	omes:			
After going t	hrough this cou	rse the student will be able to:		
CO1	: Understand th individuals	ne opportunities, challenges brought about by Industry 4.0 for bene	fits of organizatio	ons and
CO2	: Analyze the eff	fectiveness of Smart Factories, Smart cities, Smart products and Sn	nart services	
CO3	: Apply the Indu	astrial 4.0 concepts in a manufacturing plant to improve productivit	ty and profits	
CO4	: Evaluate the e	ffectiveness of Cloud Computing in a networked economy		
Reference Bo	oks:			
1. Alasdair Gi	lchrist, Industry	4.0 The Industrial Internet Of Things, Apress Publisher, ISBN-13 (p	bk): 978-1-4842	-2046-7
2. Alp Ustund 978-3-319-57	ag, Emre Cevikca 869-9.	an, Industry 4.0: Managing The Digital Transformation, Springer, 20)18 ISBN	
3.Ovidiu Vern worlds, Rivers	nesan and Peer F Publishers, 201	riess, Designing the industry - Internet of things connecting the phy 6 ISBN 978-87-93379-81-7	/sical, digital and	1 virtual
4.Christoph J	an Bartodziej, Th inger Gabler, 201	e concept Industry 4.0- An Empirical Analysis of Technologies and 7 ISBN 978-3-6581-6502-4	Applications in I	Production



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				
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. Answe				
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	149	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			



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camera de co	resident.	1						
				SEMEST	TER: II			
Course Code	: 2	22MCS24L	Simulation and	Charact	torization of PF Dovisor	CIE Mark	s	: 50
Credits L-T-P	: 1	-0-1	Simulation and	Charac	terization of Kr Devices	SEE Marl	۸S	: 50
Hours	: 1	4L + 28P	(Codi	ng / Sk	ill Laboratory)	SEE Dura	ations	: 3 Hrs
Facu	ilty	Coordinator:	Dr. Mahesh A					
			Co	ntent				28 Hrs
1. Design and	Sim	ulation of RF	Passive circuits u	sing AW	/R			
2. Design and	Sim	ulation of RF	Active circuits usi	ing AWI	र			
3. Design and	sim	ulation of RF	transceiver system	n using	AWR 4. Design and Simula	ation of Di	pole An	tenna an
Horn Antenna	usi	ng HFSS 5. D	esign and Simulat	ion of N	Iultiband Microstrip Patch	Antenna	for Mob	ile
Applications u	sing	g HFSS 6. Des	sign and Simulatio	n of Ph	ased Array Antenna for Be	am steerin	ig Applie	cations
using HFSS 7.	Me	asurement of	Radiation Pattern	in Lab	Environment and in Anech	ioic Cham	ber 8.	
Measurement	of S	-parameters,	VSWR, power mea	isureme	ents of Microwave Passive of	component	ts using	Vector
Network Analy	zer	and Spectrur	n Analyzer 9. Meas	suremen	nt of S-parameters, VSWR,	power me	asurem	ents and
noise figure of $f = T / D$	M1C	crowave Active	e components usin	g Vecto	r Network Analyzer and Sp	ectrum Ai	nalyzer	10. Desig
of a 1/R modu	lle u	Ising AWR/H	FSS	10.00				
0			- ciks	10	12 0			
Course Outco	mes	S:	the student will b	a abla t	02.			
Alter going thr	oug	In this course	the student will b		D:			
		keview the con	ncepts of RF comp	onents :	, circuits and RF subsyster	ns ·		
	: L	Design and ev	aluate antenna pe	rtormar	ice according to practical r	equiremen	its	
CO3	: C	Characterize t	he Antenna and R	F syster	n using measurement setu	ips		
CO4	- : E	Evaluate the p	performance of Ant	ennas a	and Passive devices using S	Simulation	tools	
		100						
Scheme of Co	ntii	nuous Intern	al Evaluation (CI	E- Labo	ratory) : Only LAB Course	e 30 + 10 ·	+ 10 = 5	0. The
Laboratory ses	sion	n is held ever	y week as per the t	imetabl	e and the performance of t	the studen	t is eval	uated in
every session.	The	average of m	arks over number	of expe	riments conducted over the	e weeks is	conside	ered for 3
Marks i.e (Lab	Rep	bort, Observa	tion & Analysis). T	he stud	ents are encouraged to imp	plement ac	ditiona]
innovative exp	erin	nents in the la	ad (10 marks). At t	ne end	of the semester a test is co	nauctea i	or IU M	arks (Lab
Schome of Sc		tor End Evo	mination (SEE L	horato	(main LAB Course 40	+ 10 - 50	Studor	to will be
evaluated for V	mes Mrite	e-up Evperin	nental Setup Eve	aborato	Conduction with Results	+ 10 - 30.	Discus	its will be
40 Marks and	Vive	a will be cond	lucted for 10 Mark	s addin	g to 50 Marks	analysis a	5 Discus	510115 101
To marko ana	• 1 • 0		Only LAB		s with 50 Marks			
12		DI	IDDIC FOR CIF		PLIPPICE	ND OFF		
		RODRIC FOR CIE			ROBRIC I	OK BLL	Masler	
SI	.No	0	ontent	MARKS	Content		Marks	
P	1	Write Up, Set Results, Anal	up, Conduction ysis & Discussions	30	1. Write Up, Setup, Conduction 40		40	
	2	Innovative Ex Design & Imp	periment/Concept lementation	10	2. Results, Analysis & Discussions			
	3	Laboratory In	ternal	10	Viva Voce		10	
			Total Marks	50	T	otal Marks	50	



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					
Faculty Coordinator: Dr. C.Bindu Ashwini									
		UNIT - I		4 Hrs					
Communicatio	on Skills: Basic	s of Communication, Personal Skills &	; Presentation Sl	cills –					
Introduction, A	Application, Sir	nulation, Attitudinal Development, Self Co	nfidence, SWOC	analysis.					
Resume Writing: Understanding the basic essentials for a resume, Resume writing tips Guidelines									
for better pres	entation of fact	s. Theory and Applications.							
		UNIT - II		8 Hrs					
Quantitative A	ptitude and Da	ata Analysis: Number Systems, Math Vocal	oulary, fraction d	ecimals, digit					
places etc. Sin	nple equations	– Linear equations, Elimination Method, S	ubstitution meth	od,					
Inequalities. R	leasoning – a. V	Verbal - Blood Relation, Sense of Direction,	Arithmetic & amp	p; Alphabet.					
b. Non- Verbal reasoning - Visual Sequence, Visual analogy and classification. Analytical Reasoning -									
Single & amp; Multiple comparisons, Linear Sequencing.									
Logical Aptitude, - Syllogism, Venn-diagram method, Three statement syllogism, Deductive and									
inductive reasoning. Introduction to puzzle and games organizing information, parts of an argument,									
Common Haws	common flaws, arguments and assumptions.								
Verbal Analogies/Aptitude – introduction to different question types – analogies, Grammar review,									
Comprehensio	n Problem Sol	ving	building building e	cic. Reading					
			7.0	6 Ura					
Interview Strill	a: Ouestions of	led some how to handle them. Body lan	minge in interview	U nis					
Etiquette Conversational and Professional Dress and in interview Professional attire and Crooming									
Behavioral and technical interviews. Mock interviews - Mock interviews with different Danels. Practice									
on Stress Interviews, Technical Interviews, and General HR interviews									
		UNIT - IV		5 Hrs					
Interpersonal	and Manageria	Skills: Optimal co-existence, cultural sen	sitivity, gender se	ensitivity:					
capability and	canability and maturity model, decision making ability and analysis for brain storming. Group								
discussion(Ass	sertiveness) and	l presentation skills;	8,	T					
, ,	í.	UNIT - V		5 Hrs					
Motivation: Se	lf-motivation, g	roup motivation, Behavioral Management,	Inspirational and	d motivational					
speech with co	speech with conclusion. (Examples to be cited). Leadership Skills: Ethics and Integrity. Goal Setting								
leadership abi	lity.			Ċ,					
Course Outco	mes:								
After going th	rough this co	urse the student will be able to:							
CO1	: Develop profe	essional skill to suit the industry requireme	ent.						
CO2	CO2 : Analyze problems using quantitative and reasoning skills								
CO3 : Develop leadership and inter personal working skills.									
CO4 : Demonstrate verbal communication skills with appropriate body language.									
Reference Books:									
1. The 7 Habits of Highly Effective People, Stephen R Covey Free Press 2004 Edition									
ISBN: 0743272455									
2. How to win friends and influence people, Dale Carnegie General Press, 1st Edition, 2016,									
ISBN: 9789380914787									
3. Crucial Conversation: Tools for Talking When Stakes are High, Kerry Patterson, Joseph									
Grenny, Ron M	Grenny, Ron Mcmillan 2012 Edition, McGraw-Hill Publication ISBN: 9780071772204								
4. Ethnus, Aptimithra: Best Aptitude Book ,2014 Edition, Tata McGraw Hill ISBN: 9781259058738									


Phase *	Activity					
Ι	Test 1 is conducted after the completion of 9 hours of training programme (3 Classes). Question paper will have two parts. Part A will be Quiz for 10 Marks and					
	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	emester End Examination: SEE is conducted for 50 Marks for a duration of 2 hours.					



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Tearrockoptal Drésentry, Beilegnel							
SEMESTER: III							
Course Code : 22MCS31T Error Control Coding for Wireless CIE Marks	: 100						
Credits L-T-P : 3-1-0 Communication SEE Marks	: 100						
Hours: 42L + 28TProfessional Core - 6SEE Durations	: 3 Hrs						
Faculty Coordinator: Dr. Usharani K R							
UNIT - I	9 Hrs						
Introduction to algebra: Groups, Fields, binary field arithmetic, Construction of Galois Field GF (2m)	and its						
properties, Computation using Galois filed GF (2m) arithmetic, Vectors and Matrices.	-						
UNIT - II	9 Hrs						
"BCH codes: Binary primitive BCH codes, Decoding procedures, Implementation of Galois field							
arithmetic, Implementation of error correction.							
Non-binary BCH codes: Primitive BCH codes over GF(q), Reed -Solomon codes, decoding of non-bina	ry BCH and						
IIII III							
"Majority Logic decodable codes: One -step majority logic decoding. Class of One-step majority	0 1115						
logic decodable codes. One -step majority logic decoding, class of One-step majority							
Convolution codes: Encoding of convolutional codes. Transfer Function of convolution codes.							
Structural properties, Distance properties, Viterbi search decoding algorithm – soft decision and							
hard decision based, ZJ Stack Sequential decoding algorithm, Probability of error in convolution							
decoding for hard and soft decision cases. Punctured and Tail biting Convolution codes."							
UNIT - IV	8 Hrs						
"Concatenated Codes: Single level Concatenated Codes, Multilevel Concatenated Codes							
(Formulation only), Soft decision Multistage Decoding (Formulation only).							
Tur for an example PCBC and one PCCC, Performance							
Analysis Formulation and one example only.							
Codes Decoding of LDPC Codes – Majority Logic Bit Flipping "							
UNIT - V	8 Hrs						
Polar Codes: Primary Concepts and Practical Decoding Algorithms-successive cancellation (SC) list a	nd fast SC						
Course Outcomes:							
After going through this course the student will be able to:							
CO1 : Explain the principles and theory of Linear Algebra, and apply the same for BCH Co	odes in						
Communication systems.							
CO2 : Perform a decoding procedure for Majority logic decodable and Convolution codes							
CO3 : Test and evaluate the Convolution Codes schemes for performance.							
CO4 : Construct and Decode Concatenated codes and polar codesto perform close to Shar	non Limit						
in a data Transmission system.							
Reference Books							
1. Error control coding, Shu Lin and Daniel J. Costello. Jr, Pearson, 2nd edition, 2011, ISBN							
978-81-317-3440-7							
2. Introduction to Error control coding, Salvatore Gravano, Oxford university press, , ISBN:01992367	78X , 2007						
3. Theory and practice of error control codes, Blahut. R. E. Addison Wesley,							
13DIN: U2U11U1U23, 1984	016 0004						
4. County meory A first course, Camproge university press, SAN ling, chaoping xing, ISBN: 0521821	910, 2004						
o. Foral couces are released in induces mansaed on papers and Journal papers.							

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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. Answ	er FIVE	
2	Tests - T1 & T2	40	110	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	



		S	EMESTER : III			
		Next Gen	eration Wireles	s LANs		
Course Code	:	22MCS3E1T		CIE Marks	:	100
Credit L:T:P	:	3:1:0		SEE Marks	:	100
Hours	:	42L+28T		SEE Duration	:	3 Hrs
Faculty Coor	diı	nator: Dr. P N Jayant	hi			
			• •			0.77
		U	nit – I			8Hrs
Physical laye History of II MIMO/SDM to PHY interope 11a packet s channel- subo encoding and Robust perfo Receive diver- codes encoding process, Effect	er EED bas era tru car pe orn sity g	E 802.11, Orthogon ics, 802.11n propaga bility with 11a/g leg icture review, Mixed rier design, spectral p rformance improvement hance y, Spatial expansion, re code rate, LDPC code	al frequency di tion model, Ante gacy OFDM devi format high thr nask, channel d ent. Space-time bloc ding gain.	ivision multiplex nna correlation, l ces roughput packet esign, mixed form k coding, Low de	ing Dopp stru nat p ensit	background, bler model. cture.40 MHz breamble, data y parity check
		<u>U</u>	nit – II			8 Hrs
exchange, H acknowledger	ido ner	len node problem, nt, HT-immediate bloo U II	Enhanced dis <u>ck acknowledgen</u> nit – I	stributed chann nent.	el a	access, Block
MAC through	ιpυ	it enhancements			(T)	
Throughput v	vit.	hout MAC changes,	MAC throughpu	t enhancements,	Th	oughput with
Advanced ch	y c an	nel access technique				
Point coordina	atio	on function and its lin	itations, HCCA a	and its limitations	s, Re	verse direction
protocol fram	e e	xchange and recovery	, PSMP recovery	and resource all	ocati	on.
		U	nit –			9 Hrs
Intonononahil	:4-	1\ and accuration ac				
Station and operation (PC with 802.11g burst protection protection. MAC frame fo General frame	B: O) or on or	SS capabilities, Con basic operation, Prot 802.11a stations pre , Greenfield format p nats prmat, Format of indiv	trolling station ection with 802. sent, Protection rotection, RTS/G	behavior, Phas 11b stations pres for OBSS legacy CTS protection ar s, Data frames ar	ed o sent, stat nd C nd M	coexistence Protection ions, RIFS CTS-to-Self- anagement
FTame neids.		TT	nit - V			Q Hre
Transmit bea Singular valu Unequal MCS Improved per Sounding PF Comparison b Introduction t	mf le for: DU petv co I	forming decomposition, Trans Receiver design, Chan mance with transmit Js, Implicit feedbac ween implicit and exp EEE 802.11ac and as	smit beamformin nel sounding, Cl beamforming, k beamforming, licit , Fast link a c Technologies.	ng with SVD, Eig hannel state infor Degradations, Ma , Explicit feedba daptation.	genv rmat AC c ack	alue analysis, ion feedback , onsiderations, beamforming,

After going through this course the student will be able to:

CO1: Illustrate the fundamental concepts of IEEE 802.11a packet structure, propagation model, Doppler model, preamble format and robust performance.

CO2: Evaluate management functions, distributed channel access techniques and data/ack frame exchange Fragmentation for Duplicate detection.

CO3: Analyze MAC throughput performance and efficiency enhancements techniques and check the interoperability.

CO4: Develop and evaluate the transmit beam forming with SVD for different real world scenarios.

Re	ference Books
1	Next Generation Wireless LANs: Throughput, Robustness, and Reliability in 802.11n, Eldad Perahia and Robert Stacey, 1st Edition, 2008, Cambridge University Press, ISBN:9781107016767
2.	Next-Generation Wireless Networks Meet Advanced Machine Learning Applications, Ioan-Sorin Comşa and Ramona Trestian ,1st edition, 2019,IGI Global Publisher, ISBN: 1522574581.
3	Digital Communications Paperback, John G. Proakis and Masoud Salehi, 5th edition, 2014, McGraw Hill Education, ISBN: 9789339204792
4	Transmit Beamforming in Modern Wireless Communications: From Theory to Practice in LTE and WiFi Hardcover, Joonsuk Kim , Pengfei Xia , Yang Tang , 1st edition, 2018, Wiley–Blackwell ISBN:978-1118939475.

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.

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	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	

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Dresenity, Se	Regist			
		SEMESTER: III		
Course Code	: 22MCS3E2T		CIE Marks	: 100
Credits L-T-P	: 3-1-0	Cyber Security	SEE Marks	: 100
Hours	: 42L +28T	Elective E (Professional Elective)	SEE Durations	: 3 Hrs
Facu	lty Coordinator	Dr. Kiran V		
Tucu				9 Hrs
"Security Attac	ks (Interruption	Interception Modification and Fabrication) Securi	ty Services (Confid	entiality
Authentication	Integrity Non-1	repudiation, access Control and Availability) and Me	chanisms A mode	el for
Internetwork se	ecurity Internet	Standards and RFCs. Buffer overflow & format strip	ng vulnerabilities	TCP
session hijacki	ng. ARP attacks.	route table modification. UDP hijacking, and man-	in-the-middle atta	cks "
J	8,	UNIT - II		9 Hrs
"Conventional	Encryption Princ	iples. Conventional encryption algorithms, cipher h	lock modes of ope	ration.
location of enci	votion devices.	xev distribution Approaches of Message Authentica	tion. Secure Hash	Functions
and HMAC. "	5 F, -			
		UNIT - III		8 Hrs
"Public key cry	ptography princi	ples, public key cryptography algorithms, digital sig	gnatures, digital Co	ertificates.
Certificate Aut	nority and key m	anagement Kerberos, X.509 Directory Authentication	on Service. "	
		UNIT - IV		8 Hrs
Email privacy:	Pretty Good Priv	acy (PGP) and S/MIME IP Security Overview IP Sec	urity	
Architecture A	uthentication H	eader Encapsulating Security Payload Combining	Security Association	ons and
Key Manageme	nt Basic concer	ts of SNMP_SNMPv1 Community facility and SNM	Pv3 Intruders Vin	ises and
related threats.				
- olatoa dil oato	125	UNIT - V		8 Hrs
Firewall Design	principles True	sted Systems Intrusion Detection Systems Getting	Started with Block	chain:
Blockchain ver	sus distributed l	edger technology versus		circuiri.
distributed dat	abases - Compa	ring the technologies with examples - Public versus	private	
versus permiss	ioned Blockchai	n - Comparing usage scenarios - Privacy in Blockch	ain -Getting Starte	ed with
Blockchain: Blo	ockchain versus	distributed ledger technology versus		
distributed dat	abases - Compa	ring the technologies with examples - Public versus	private	
versus permiss	ioned Blockchai	n - Comparing usage scenarios - Privacy in Blockch	ain. Security for V	LSI and
FPGA.				
Course Outcon	mes:			
After going thro	ough this course	the student will be able to:		
CO1	: Gain a comple	te knowledge on types of security attacks, services	and mechanisms.	
CO2	: Understand th	e implementation of Internetwork security model a	nd its standards a	nd
	vulnerabilities			
CO3	: Demonstrate (he Conventional Encryption Principles and the Pub	olic key Cryptograp	hy
	principles		5 51 6 1	5
CO4	: Build a model	of Firewall and test the security issues		
		5		
Reference Boo	oks			
1 Network Sec	urity Essentials	(Applications and Standards) William Stallings 6th	h edition Pearson	Education
ISBN: 9789352	2866601 2018	(Applications and Standards), winiam Stannigs, St	i cuition, i carson	Duucation,
2 Network Sec	urity - Private C	mmunication in a Public World CharlienKaufman	Radia Perlman	
and Mike Speci	iner Pearson / PI	II ISBN: 9789332578210 2016	, nauta i cimian	
3 Practical Ari	tifical Intelligenc	e and Blockchain, Ganesh Presed Kumble, First Fo	lition Packt	
Publishing I td	ISBN·18388222	291 2020	initiati, i ackt	
4 Cryptograph	v and networlz S	ecurity Third edition Stallings PHI/Pearson ISBN	1.0780330585005	2017
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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. 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		
	1		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 Astractive Mathematics
te Verviewan Technickogio Dresening, Br	iyû Kagist								
		SEMESTER: III							
Course Code	: 22MCS3E3T	Madarn Padar Sustama	CIE Marks :	100					
Credits L-T-P	: 3-1-0	modern Radar Systems	Elective E (Professional Elective) SEE Marks : 10 SEE Marks : 3						
Hours	: 42L + 28T	Elective E (Professional Elective)	SEE Durations :	3 Hrs					
Facu	lty Coordinator:	Dr. Nethravathi K A							
		UNIT - I		9 Hrs					
Introduction, F	Radar Basics, Ra	dar Equation including its search and track f	forms, Displays, Receivers	,					
	Addar Antennas		illas	Q Hre					
Radar Cross S	ection_ Monostat	ic and Bistatic Statistical Models for Noise a	nd Target RCS Constant	9 ms False					
Alarm Rate De	tectors Target cl	assification using AI	nu Target (CS, Constant)	aise					
marin Rate De	teetois, raiger ei	UNIT - III		8 Hrs					
General Chara	cteristics of Clut	ter and Clutter Modelling Clutter Reduction	Techniques of Doppler and	1 MTI					
		UNIT - IV		8 Hrs					
Radar Measure	ements. Pulse co	mpression, Radar Tracking, Radar Detection	and Target Classification	••					
Displaced-Pha	se-Center Anteni	ha Space-time adaptive processing.		2					
1		UNIT - V		8 Hrs					
Course Outco After going thr	mes:	the student will be able to:	2						
C01	: Able to carry of	out research and development of the RADAR	systems design.						
CO2	: To enable the	students to demonstrate on Statistical Model	ls for Noise and Target RC	S.					
CO3	: To develop the processing fur	e knowledge in RADAR depending on the approximation the approximation of the second seco	lication and involvement o	f signal					
CO4	: To enable the of signal proce	students on matched filtering, detection and essing through rigorous analysis of RADAR st	estimation, statistical app ub-systems.	oroaches					
Reference Boo	oks		<u>a</u> /						
1. Principles O June, 2010, Pt	f Modern Radar: 1blisher, Institut	Basic Principles by Mark A Richards, James ion of Engineering and Technology, 2010 ; IS	A Scheer, William A Holm BN, 1891121529, 978189	30th 1121524.					
2. Introduction	to Radar Syster	ns-Merill I Skolnik, Third Edition, 2001, MCG	raw-Hill ISBN 13: 978007	2909807					
3. Radar Princ	iples,Peyton Z Pe	ebles, First Edition, 2007, Wiley India, ISBN 13	3: 9788126515271						
4. Radar Princ ISBN:1397881	iples, Technology 31713839	,Byron Edde, First Edition,2012,Pearson Edu	ucation Limited,						
5. Radar Princ	iples,Peyton Z Pe	ebles,First Edition,2007,Wiley India, ISBN 13	3: 9788126515271						

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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 & SEE Theory courses

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	RUBRIC for CIE			RUBRIC for SEE		
SLNo	Content	Marks	Q. No	Contents	Merks	
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	
			58:6	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	



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SEMESTER III

Course Code : 22MCS32N		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.



te Vezkovan Toolmotoglo University, S	oyie d elegad			
		SEMESTER III		
Course Code	: 22MCS33P		CIE Marks	: 50
Credits L-T-P	: 0 - 0 - 6	MINOR PROJECT	SEE Marks	: 50
Hours/Week	: 12		SEE Durations	: 3 Hrs
1. Each projec 2. Each studer program of stu 3. Allocation of 4. The minor p 5. The implement	t group will co nt / group has idy after intens f the guides pr project would b entation of the ollege.	nsist of maximum of two students. to select a contemporary topic that will use the tasive literature survey. eferably in accordance with the expertise of the face performed in-house. project must be preferably carried out using the	echnical knowled; aculty. resources availat	ge of their ole in the
Course Outco	mes: After co	mpleting the course, the students will be able	to	
COT: Concepti	lanze, design a	and implement solutions for specific problems.		

CO2: Communicate the solutions through presentations and technical reports.

CO3: Apply resource managements skills for projects.

CO4: Synthesize self-learning, team work and ethics.

Scheme of Continuous Internal Examination

Evaluation shall be carried out in three reviews. The evaluation committee shall consist of Guide, Professor and Associate Professor/Assistant Professor.

Phase *	Activity	Weightage		
Ι	Approval of the selected topic, formulation of Problem Statement and Objectives with Synopsis submission	20 %		
II	Mid-term seminar to review the progress of the work with documentation	40 %		
III	Oral presentation, demonstration and submission of project report	40 %		
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* 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%

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			SEMESTER IV					
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Course Code	:	22MCS41P		CIE Marks	:	100
Credits L-T-P	:	0 - 0 - 18	MAJOR PROJECT	SEE Marks	:	100
Hours/Week	:	36		SEE Durations	:	3 Hrs

Guidelines:

1. Major Project is to be carried out for a duration of 18 weeks

2. Students must adhere to the Project Presentation Schedule, report to their guide on a weekly basis and get their Project diary signed by their guide 4. Students must execute the Major Project individually and not in teams.

5. It is mandatory for the students to present/publish their project work in National/International Conferences or Journals

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 soft bound and in Ivory color for PG circuit Programs and Light Blue for Non-Circuit Programs

Course Outcomes: After completing the course, the students will be able to

CO1: Conceptualize, Design and Implement solutions for specific problems.

CO2: Communicate the solutions through presentations and technical reports.

CO3: Apply project and resource managements skills, professional ethics and societal concerns

CO4: Synthesize self-learning, sustainable solutions and demonstrate life-long learning

Scheme of Continuous Internal Examination

Evaluation shall be carried out in three reviews. The evaluation committee shall consist of Guide, Professor, Associate Professor/Assistant Professor.

Phase *	Activity		
Ι	Selection of Project Title, Formulation of Problem Statement and Objectives	20 %	
II	II Design, Implementation and Testing 40 %		
т	Experimental Result & Analysis, Conclusions and Future Scope of Work,		
11	Report Writing and Paper Publication	40 %	
* Phase wise mubrics to be prepared by the respective departments			

* Phase wise rubrics to be prepared by the respective departments

Scheme for Semester End Evaluation (SEE):

Major Project SEE evaluation shall be conducted in two stages. This is initiated after fulfilment of submission of Project Report and CIE marks.

Stage-1 Report Evaluation: Evaluation of Project Report shall be done by the Guide and an External examiner.

Stage-2 Project Viva-voce: Major Project Viva-voce examination is conducted after receipt of evaluation 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			



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Curriculum Design Process



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Process For Course Outcome Attainment





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Program Outcome Attainment Process



Innovative Clubs of RVCE

1	Ashwa Racing	Ashwa Mobility Foundation (AMF) is a student R&D platform that designs and fabricates Formula theme race curs 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	Jataya	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.
*	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.
n	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



REPORT OF

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

