



RV Educational Institutions®
RV College of Engineering®

Autonomous
Institution Affiliated
to Visvesvaraya
Technological
University, Belagavi

Approved by AICTE,
New Delhi

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Scheme and Syllabus of I – IV semester
(Autonomous System of 2022 Scheme)

Master of Technology (M. Tech.)
in

COMPUTER SCIENCE AND ENGINEERING
(MCE)

DEPARTMENT OF
COMPUTER SCIENCE
AND ENGINEERING

Academic Year 2022-23

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

VISION

To achieve leadership in the field of Computer Science and Engineering by strengthening fundamentals and facilitating interdisciplinary sustainable research to meet the ever-growing needs of the society.

MISSION

1. To evolve continually as a centre of excellence in quality education in computers and allied fields.
2. To develop state-of-the-art infrastructure and create environment capable for interdisciplinary research and skill enhancement
3. To collaborate with industries and institutions at national and international levels to enhance research in emerging areas.
4. To develop professionals having social concern to become leaders in top-notch industries and/or become entrepreneurs with good ethics.

PROGRAMME OUTCOMES (PO)

M. Tech in **Computer Science and Engineering** graduates will be able to:

- PO1: Independently carry out research and development work to solve practical problems related to Computer Science and Engineering domain.
- PO2: Write and present a substantial technical report/document.
- PO3: Demonstrate a degree of mastery over the area of Computer Science and Engineering program.
- PO4: Acquire knowledge to evaluate, analyse complex problems by applying principles of Mathematics, Computer Science and Engineering with a global perspective.
- PO5: Explore, select, learn and model applications through use of state-of-art tools.
- PO6: Recognize opportunities and contribute synergistically towards solving engineering problems effectively, individually and in teams, to accomplish a common goal and exhibit professional ethics, competence and to engage in lifelong learning.

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M.Tech in Computer Science & Engineering: MCE

I SEMESTER M.Tech

Sl. No.	Course Code	Course Title	Credit Allocation				BoS	Category	CIE Duration (H)	Max Marks CIE	SEE Duration (H)	Max Marks SEE
			L	T/SDA	P	Total						
1	22MAT11BT	Linear Algebra, Probability and Queuing Theory	3	1	0	4	MA	Theory	1.5	100	3	100
2	22MCE12TL	Advanced Data Structures and Algorithms	3	0	1	4	CS	Theory+Lab	1.5	100	3	100
3	22MCE13T	Advances in Data Base Management & Mining	3	1	0	4	CS	Theory	1.5	100	3	100
4	22MCE14L	Computing & Analytics Lab	1	0	1	2	CS	Lab	1.5	50	3	50
5	22XXX1AXT	Elective A (Professional Elective)	3	0	0	3	CS	Theory	1.5	100	3	100
6	22XXX1BXT	Elective B (Professional Elective)	3	0	0	3	CS	Theory	1.5	100	3	100

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

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Code	Elective A (Professional Elective)	Code	Elective B (Professional Elective)
22MCE1A1T	Artificial Intelligence & Machine Learning	22MCN1B1T	Social Network Analysis
22MCN1A2T	Blockchain Technologies	22MCN1B2T	Distributed & Cloud Computing
22MIT1A3T	Mobile Application Development	22MCN1B3T	Software Defined Networks
22MCE1A4T	Computer Vision	22MCE1B4T	Computer Network Technologies

II SEMESTER M.Tech

Sl. No.	Course Code	Course Title	Credit Allocation				BoS	Category	CIE Duration (H)	Max Marks CIE	SEE Duration (H)	Max Marks SEE
			L	T/SDA	P	Total						
1	22IM21T	Research Methodology	3	0	0	3	IM	Theory	1.5	100	3	100
2	22MCE22TL	Advances in Operating System	3	0	1	4	CS	Theory+Lab	1.5	100	3	100
3	22MCE23T	Deep Learning	3	0	0	3	CS	Theory	1.5	100	3	100
4	22XXX2CXT	Elective C (Professional Elective)	3	0	0	3	CS	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	22MCE24L	Web Application Development Lab	1	0	1	2	CS	Lab	1.5	50	3	50
7	22HSS25T	Professional Skills Development-I	2	0	0	2	HSS	Theory*	1.5	50	2	50

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Code	Elective C (Professional Elective)
22MSE2C1T	Robotic Process Automation
22MCE2C2T	Embedded Systems
22MCE2C3T	Natural Language Processing
22MCN2C4T	Internet of Things and Edge Computing

Elective D (Global Elective)			
22BT2D01T	Bioinspired Engineering	22ET2D08T	Tracking and Navigation Systems
22BT2D02T	Health Informatics	22IM2D09T	Project Management
22CS2D03T	Business Analytics	22IS2D10T	Database and Information Systems
22CV2D04T	Industrial and Occupational Health and Safety	22IS2D11T	Management Information Systems
22CV2D05T	Intelligent Transportation Systems	22MAT2D12T	Statistical and Optimization Methods
22EC2D06T	Electronic System Design	22ME2D13T	Industry 4.0
22EC2D07T	Evolution of Wireless Technologies		

III SEMESTER M.Tech

Sl. No.	Course Code	Course Title	Credit Allocation				BoS	Category	CIE Duration (H)	Max Marks CIE	SEE Duration (H)	Max Marks SEE
			L	T/SDA	P	Total						
1	22MCE31T	High Performance Computing Architectures	3	1	0	4	CS	Theory	1.5	100	3	100
2	22XXX3EXT	Elective E (Professional Elective)	3	1	0	4	CS	Theory	1.5	100	3	100
3	22MCE32N	Internship	0	0	6	6	CS	Internship	1.5	50	3	50
4	22MCE33P	Minor Project	0	0	6	6	CS	Project	1.5	50	3	50

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Code	Elective E (Professional Elective)
22MIT3E1T	Augmented Reality and Virtual Reality
22MCE3E2T	Cyber Security
22MCE3E3T	Software Product Development (DevOps)
22MCE3E4T	Intelligent Systems

IV SEMESTER M.Tech

Sl. No.	Course Code	Course Title	Credit Allocation				BoS	Category	CIE Duration (H)	Max Marks CIE	SEE Duration (H)	Max Marks SEE
			L	T/SDA	P	Total						
1	22MCE41P	Major Project	0	0	18	18	CS	Project	1.5	100	3	100
2	22HSS42	Professional Skills Development-II	2	0	0	2	HSS	NPTEL	--	50	ONLINE	50

Student need to submit the certificate for the evaluation of Course code 22HSS42

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SEMESTER: I				
Course Code	: 22MAT11BT	LINEAR ALGEBRA, PROBABILITY AND QUEUEING THEORY	CIE Marks	: 100
Credits L-T-P	: 3 - 1 - 0		SEE Marks	: 100
Hours	: 42L+28T		<i>Common Course (MCE, MCN)</i>	
Faculty Coordinator:		Dr. C Nandeeshkumar		
UNIT - I				09 Hrs
Matrices and Vector spaces: Geometry of system of linear equations, vector spaces and subspaces, linear independence, basis and dimension, four fundamental subspaces, change of basis. Rank-nullity theorem (without proof), linear transformations, representation of transformations by matrices.				
UNIT - II				09 Hrs
Orthogonality and least square approximations: Inner product, orthogonal vectors, orthogonal projections, orthogonal bases, Fourier expansion. Eigen subspaces, Gram-Schmidt orthogonalization process. QR factorisation, least square problems, application to linear models (least square lines and least square fitting of other curves).				
UNIT - III				08 Hrs
Symmetric and Quadratic forms: Quadratic forms, constrained optimization, symmetric forms, diagonalization, singular value decomposition, mean and covariance matrix, principal component analysis.				
UNIT - IV				08 Hrs
Multiple Random variables: Joint probability mass functions and probability density functions, marginal density function, conditioning of random variables, statistical independence, correlation and covariance functions, covariance and correlation matrices, transformation of random variables, Markov and Chebyshev inequalities, Gaussian distribution-Multivariate normal density and its properties.				
UNIT - V				08 Hrs
Queueing Theory: Symbolic Representation of a Queueing Model, Poisson Queue system, Little Law, Types of Stochastic Processes, Birth-Death Process, The M/M/1 Queueing System, The M/M/s Queueing System, The M/M/s Queueing with Finite buffers.				
Course Outcomes: After going through this course the student will be able to:				
CO1	:	Illustrate the fundamental concepts of vector spaces, orthogonality, joint probability distributions and queueing theory arising in various fields engineering.		
CO2	:	Derive the solution by applying the acquired knowledge and skills of linear algebra/probability/optimization techniques to solve problems of probability distributions, linear algebra and queueing theory.		
CO3	:	Evaluate the solution of the problems using appropriate linear algebra, statistical and optimization techniques to the real world problems arising in many practical situations.		
CO4	:	Compile the overall knowledge of multivariate probability distributions, linear algebra and optimization methods gained to engage in life – long learning.		
Reference Books:				
1. Alberto Leon-Garcia, “Probability, Statistics, and Random Processes for Electrical Engineering”, Pearson Prentice Hall, 3rd Edition, 2008, ISBN: 978-0-13-147122-1.				
2. Edgar G. Goodaire “Linear Algebra: Pure & Applied Kindle Edition”, World Scientific, 1st Edition, 2013, ISBN-13: 978-9814508360.				
3. Gilbert Strang, “Linear Algebra and its Applications”, Cengage Learning, 4th Edition, 2006, ISBN: 97809802327.				
4. Hwei P. Hsu, Schaum’s Outline of Theory and Problems of Probability, Random Variables, and Random Processes, McGraw Hill Education, 2017, ISBN-10: 978-0070589506.				
5. T. Veerarajan, Probability, Statistics and Random Processes, Tata McGraw Hill Education Private Limited, 3rd Edition, 2008, ISBN: 978-0-07-066925-3.				

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 & SEE Theory courses

RUBRIC for CIE			RUBRIC for SEE		
SLNo	Content	Marks	Q. No	Contents	Marks
1	Quizzes - Q1 & Q2	20	Each unit consists of TWO questions of 20 Marks each. Answer FIVE 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: I				
Course Code	: 22MCE12TL	Advanced Data Structures and Algorithms	CIE Marks	: 100
Credits L-T-P	: 3-0-1	(Theory & Practice)	SEE Marks	: 100
Hours	: 42L + 28P	(Professional Core - 1)	SEE Durations	: 3 Hrs
Faculty Coordinator: Dr. Rajashree Shettar and Prof. Girish Rao Salanke				
UNIT - I				9 Hrs
Algorithmic Complexity Measures Methods for expressing and comparing complexity of algorithms: worst and average cases, lower bounds, and asymptotic analysis. Abstract Data Type (ADT) Specification and Design techniques, Elementary ADTs: Lists, Trees, Stacks, Queues, and Dynamic Sets. Sorting in Linear Time Lower bounds for sorting, Radix sort and Bucket sort				
UNIT - II				9 Hrs
Graph Algorithms Graphs representations, Graph traversal-Breadth First Search, Depth First Search with applications, Topological Sort, Dijkstra's algorithms, Bellman-Ford Algorithm, Shortest paths in a DAG, Minimum Spanning Trees: Prim's and Kruskal's Algorithms with applications. Maximum Flow Flow networks, Ford Fulkerson method, Max Flow Min Cut theorem.				
UNIT - III				8 Hrs
Advanced Data structures Structure of Fibonacci heaps, Mergeable-heap operations, Decreasing a key and deleting a node. Randomized Algorithms Las Vegas-Randomized Quicksort, Monte Carlo Algorithms-Miller-Rabin Primality Test				
UNIT - IV				8 Hrs
Advanced Data structures Internet algorithms: Tries-Insert, Search operations and Delete operations. Hashing Techniques: Dictionaries, Introduction to hash tables, Hash functions. Resolving collisions - Chaining, Open addressing - Linear Probing, Quadratic Probing, Double Hashing and Perfect Hashing.				
UNIT - V				8 Hrs
Exact String Matching Algorithms: Naïve algorithm, Rabin-Karp algorithm, Knuth-Morris-Pratt algorithm. Approximate String Matching Algorithms: Levenshtein Edit distance				
LABORATORY				28 Hrs
Laboratory Programs could be executed using C/C++/Java/Python or any equivalent programming language. Solve case studies by applying relevant algorithms and calculate complexity. For example: 1. Real world applications of Advanced Data Structures 2. Applications of Graph Algorithm 3. Applications of Maximum Flow algorithm 4. String Matching algorithms Sample Experiment: Analyze how and why applying two phase Radix Sort to an array is able to produce a sorted array. Begin by stating any conditions that must be satisfied for it to work well. Library has its books organized primarily according to 20 categories represented by the two digit codes 01, 02, 03, ... 20, and secondarily according to the first two letters of the first author's surname Aa, Ab, ..., Az, Ba, ..., Zz. Use Radix Sort to sort the set of books with keys: [09 Ce, 09 Fa, 16 Mo, 16 Fa, 07 Ce, 13 Fa, 09 Mo, 07 Ba, 13 Ca]. Show the state of the book list and what is being done at each stage.				
Course Outcomes: After going through this course the student will be able to:				
CO1	:	Analyze the efficiency of programs based on time complexity.		
CO2	:	Critically think and apply appropriate design paradigm and algorithm for a specific problem.		
CO3	:	Apply knowledge of computing and mathematics to algorithm design		
CO4	:	Design, implement and evaluate algorithms to solve real world problems		
Reference Books				
1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, "Introduction to Algorithms", The MIT Press, 3rd Edition, 2009, ISBN: 978-0262033848				
2. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C++", Addison-Wesley, 4th Edition, 2014, ISBN: 978-0132847377				

3. Jon Kleinberg, "Algorithm Design", Pearson Education India, 1st Edition, 2013, ISBN: 978-9332518643
4. Yashavant Kanetkar, "Data Structures Through C++", BPB Publications, 4th Edition, 2022, ISBN: 978-9355511898

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 for CIE & SEE for Integrated Theory courses with Laboratory

RUBRIC of CIE			RUBRIC of SEE		
SLNo	Content	Marks	Q. No	Contents	Marks
1	Quizzes - Q1 & Q2	10	Each unit consists of TWO questions of 16 Marks each. Answer FIVE full questions selecting ONE from each unit (1 to 5). Question No. 11 is compulsory (Laboratory component) for 20 Marks.		
2	Tests - T1 & T2	30			
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
NO SEE for Laboratory			7 & 8	Unit-4: Question 7 or 8	16
			9 & 10	Unit-5: Question 9 or 10	16
			11	Laboratory Component (Compulsory)	20
				Total Marks	100

SEMESTER: I				
Course Code	: 22MCE13T	ADVANCES IN DATA BASE MANAGEMENT & MINING (Professional Core - 1)	CIE Marks	: 100
Credits L-T-P	: 3- 1 - 0		SEE Marks	: 100
Hours	: 42L+28T		SEE Durations	: 3 Hrs
Faculty Coordinator:		Dr. Shobha G and Prof. Manas M N		
UNIT - I				9 Hrs
Overview of DBMS – Database design – Query processing. Data modelling – ER – EER –Object Oriented Databases – Object Relational Databases, Document oriented Databases – Background of NoSQL – XMLdocument – Structure of XML Data – XML Document Schema – Querying and Transformation – API – Storage of XML Data – XML Applications.				
UNIT - II				9 Hrs
Object and Object-Relational Databases: Overview of OOP; Complex objects; Identity, structure etc. Object model of ODMG, Object definition Language ODL; Object Query Language OQL; Conceptual design of Object database. Overview of object relational features of SQL; Object-relational features of Oracle; Implementation and related issues for extended type systems; syntax and demo examples, The nested relational model. Overview of C++ language binding;				
UNIT - III				8 Hrs
Distributed Databases & Parallel Databases: – Data Distribution – Distributed Transactions, Parallel Databases – Performance measure – Parallel operations for relational operations, Information Integration – Federated Database – Data Warehouses – Mediators – Schema matching methods.				
UNIT - IV				8 Hrs
Data Warehousing, Decision Support and Data Mining: Introduction to decision support; OLAP, multidimensional model; Window queries in SQL; Finding answers quickly; Implementation techniques for OLAP; Data Warehousing; Views and Decision support, View materialization, Maintaining materialized views. Introduction to Data Mining; Counting co-occurrences; Mining for rules; Tree-structured rules; ROC and CMC Curves; Clustering; Similarity search over sequences; Incremental mining and data streams; Additional data mining tasks.				
UNIT - V				8 Hrs
Enhanced Data Models for Some Advanced Applications: Active database concepts and triggers; Temporal, Spatial, and Deductive Databases – Basic concepts. More Recent Applications: Mobile databases; Multimedia databases; Geographical Information Systems; Genome data management.				
Course Outcomes: After going through this course the student will be able to:				
CO1	:	Analyze the concepts of object oriented, parallel, distributed, NoSQL databases for different applications.		
CO2	:	Design data warehouse for different data bases and apply mining techniques to discover knowledge from the databases.		
CO3	:	Design and apply SQL and triggers for different database models		
CO4	:	Create different database models and query the database models according to the real time requirements.		
Reference Books				
1. Silberschatz, Korth and Sudarshan, “Database Concepts”, Sixth Edition, Tata McGraw Hill, 2010.				
2. Hector Garcia-Molina, Jeff Ullman, and Jennifer Widom, “Database Systems: The Complete Book”, Pearson, 2011.				
3. Jiawei Han and MichelineKamber, Data Mining Conceptsand Techniques , Morgan, KaufnamPublishers, 3rd Edition,2011, ISBN: 9780123814791				
4. Elmasri and Navathe, Fundamentals of Database Systems, Pearson Education, 5th edition, 2013, ISBN 0-321-36957-24.				

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 & SEE Theory courses

RUBRIC for CIE			RUBRIC for SEE		
SLNo	Content	Marks	Q. No	Contents	Marks
1	Quizzes - Q1 & Q2	20	Each unit consists of TWO questions of 20 Marks each. Answer FIVE 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: I				
Course Code	: 22MCE14L	COMPUTING & ANALYTICS LAB (Coding / Skill Laboratory)	CIE Marks	: 50
Credits L-T-P	: 1- 0 - 1		SEE Marks	: 50
Hours	: 14L + 28P		SEE Durations	: 3 Hrs
Faculty Coordinator:		Dr. Shanta Rangaswamy and Dr. Vinay Hegde		
Content				28 Hrs
<p>The purpose of the Computing and Analytics Lab is to educate students in all aspects of large and distributed information systems (e.g. system development, testing, maintenance, data integration, networking, and application development) and, thus prepare them for highly emerging technologies in fast-growing IT industries such as Big Data computing, Health-care informatics, Data integration and Data analytics. The research in the lab mainly focuses on next-generation data management and mining issues on Big Data with special attention to heterogeneous information networks and social computing</p> <p>The lab focusses on data analytics using open-source tools.</p> <p>Indicative potential application areas:</p> <ol style="list-style-type: none">1. Healthcare Data Analytics2. Agriculture Data Analytics3. Financial Data Analytics4. Smart city and Transportation				
Course Outcomes:				
After going through this course the student will be able to:				
CO1	:	Apply and develop data driven solutions for improving healthcare operations and Agriculture sector		
CO2	:	Identify and describe the different types of Data		
CO3	:	Analyze to design behavioural technologies (at the individual as well as at community level based on social networks of individuals) for preventive care		
CO4	:	Examine practice case-based learning and keeping students updated with world-class cases for learning management practices		
Reference Books				
1. Gorden S.Linoff, Data Analysis using SQL and Excel,2nd Edition, 2015, ISBN-13:978-1119021438 ,Wiley publisher				
2. Anand Rajaraman and Jeffrey David Ullman, Mining of Massive Datasets, 2nd Edition, 2015, Cambridge University Press				
3. Nina Zumel and John Mount, Practical data science with R, Manning Publications, March 2014, ISBN 9781617291562				
4. Web links and Video Lectures (e-Resources): https://www.w3schools.com/datascience https://data-flair.training/blogs/data-science-tutorials-home				
Scheme of Continuous Internal Evaluation (CIE- Laboratory) : Only LAB Course 30 + 10 + 10 = 50. The Laboratory session is held every week as per the timetable and the performance of the student is evaluated in every session. The average of marks over number of experiments conducted over the weeks is considered for 30 Marks i.e (Lab Report, Observation & Analysis). The students are encouraged to implement additional innovative experiments in the lab (10 marks). At the end of the semester a test is conducted for 10 Marks (Lab Test). This adds to 50 Marks.				
Scheme of Semester End Examination (SEE- Laboratory) : Only LAB Course 40 + 10 =50. Students will be evaluated for Write-up, Experimental Setup, Experiment Conduction with Results, Analysis & Discussions for 40 Marks and Viva will be conducted for 10 Marks adding to 50 Marks.				



Only LAB Courses with 50 Marks

	RUBRIC FOR CIE			RUBRIC FOR SEE	
	Sl.No	Content	Marks	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	
	3	Laboratory Internal	10	Viva Voce	10
		Total Marks	50	Total Marks	50



SEMESTER: I				
Course Code	: 22MCE1A1T	ARTIFICIAL INTELLIGENCE & MACHINE LEARNING	CIE Marks	: 100
Credits L-T-P	: 3- 0 - 0		SEE Marks	: 100
Hours	: 42L		SEE Durations	: 3 Hrs
Faculty Coordinator:		Dr. Shanta Rangaswamy and Dr. Soumya A		
UNIT - I				9 Hrs
Introduction: Intelligent agents, searching: Basics of AI, Intelligent Agents: Agents and environment; Rationality; the nature of environments; the structure of agents. Problem-solving: Problem-solving agents; Searching for solution; Uninformed search strategies; Informed search strategies, Heuristic Functions				
UNIT - II				9 Hrs
Adversarial search, constraint satisfaction problems, logical agents: Games, Optimal decision in games, Alpha-Beta Pruning, Defining Constraint satisfaction problems; Backtracking search for CSPs; Knowledge-based agents Probabilistic reasoning: Representing knowledge in an uncertain domain; Semantics of Bayesian Networks; Efficient representation of conditional distributions; Exact inference in Bayesian Networks; Approximate inference in Bayesian Networks				
UNIT - III				8 Hrs
Introduction, Concept Learning and Decision Trees Learning Problems – Designing Learning systems, Perspectives and Issues – Concept Learning –Version Spaces and Candidate Elimination Algorithm – Inductive bias – Decision Tree learning– Representation – Algorithm – Heuristic Space Search.				
UNIT - IV				8 Hrs
Bayesian And Computational Learning Bayes Theorem – Concept Learning – Maximum Likelihood – Minimum Description Length Principle – Bayes Optimal Classifier – Gibbs Algorithm – Naïve Bayes Classifier – Bayesian Belief Network – EM Algorithm – Probably Learning – Sample Complexity for Finite and Infinite Hypothesis Spaces – Mistake Bound Model				
UNIT - V				8 Hrs
Instant Based Learning K- Nearest Neighbor Learning, Locally Weighted Regression, Radial Basis Functions, Case-Based Reasoning Reinforcement Learning: The Learning Task, Q-Learning, Temporal Difference Learning				
Course Outcomes: After going through this course the student will be able to:				
CO1	:	Explore the fundamentals of Artificial intelligence technology and Machine learning algorithms		
CO2	:	Apply the working of various searching algorithms, games, pruning, inferencing, etc. with suitable examples.		
CO3	:	Analyze and determine appropriate algorithms and techniques for AI and ML applications.		
CO4	:	Evaluate AI and ML based solutions for classical problems.		
Reference Books				
1 AI – A Modern Approach, Stuart Russel, Peter Norvig, 3rd Edition, 2010, Pearson, ISBN-13: 978-0136042594.				
2. Tom M. Mitchell, “Machine Learning”, McGraw-Hill Education, July 2017, McGraw Hill Education, 1st Edition, ISBN-10 1259096955, ISBN-13 978-1259096952				
3. Pang-Ning Tan, Michael Steinbach, Vipin Kumar: Introduction to Data Mining, Pearson Education, 2007, ISBN 9788131714720				
4. T. Hastie, R. Tibshirani, J. H. Friedman, “The Elements of Statistical Learning”, Springer; 1st edition, 2001				

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 & SEE Theory courses

RUBRIC for CIE			RUBRIC for SEE		
SLNo	Content	Marks	Q. No	Contents	Marks
1	Quizzes - Q1 & Q2	20	Each unit consists of TWO questions of 20 Marks each. Answer FIVE 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: I					
Course Code	: 22MCN1B2T	DISTRIBUTED AND CLOUD COMPUTING	CIE Marks	:	100
Credits L-T-P	: 3- 0 - 0		SEE Marks	:	100
Hours	: 42L			SEE Durations	:
Faculty Coordinator:		Dr. Sharvani G S and Prof. Jyoti Shetty			
UNIT - I					9 Hrs
Distributed System Models & Enabling technology: Scalable computing over the internet, Technologies for network-based system, System models for distributed & cloud, Software environments for distributed & Cloud, performance security and energy efficiency					
UNIT - II					9 Hrs
Introduction to Cloud Computing: Cloud Computing in a Nutshell, System Model for Distributed and Cloud Computing, Roots of Cloud Computing, Grid and Cloud, Layers and Types of Clouds, Desired Features of a Cloud, Basic Principles, of Cloud Computing, Challenges and Risks, Service Models					
UNIT - III					8 Hrs
Service Oriented Architecture for Distributed Computing: Services & SOA, Message Oriented Middleware, Workflow in SOA. Cloud Programming & Software Environments: Features of Cloud & Grid, Parallel & Distributed programming paradigms, Programming support of Google Cloud, Amazon AWS & Azure.					
UNIT - IV					8 Hrs
Virtual Machines and Virtualization of Cluster and Data Centres Levels of Virtualization, Virtualization structures/Tools and Mechanism, Virtualization of CPU, Memory and I/O Devices, Virtual Clusters and Resources Management, Virtualization Data-Centre Automation, Virtual Machine Migration Services, VM Provisioning and Migration in Action					
UNIT - V					8 Hrs
DESIGNING DISTRIBUTED SYSTEMS: GOOGLE CASE STUDY: Introducing the case study: Google Overall architecture and design philosophy Underlying communication paradigms, Data storage and coordination services Distributed computation services					
Course Outcomes: After going through this course the student will be able to:					
CO1	:	Apply the distributed and cloud computing concepts to solve problems in computing domain.			
CO2	:	Analyse various architectures, work flow models and algorithms used to implement cloud and distributed systems.			
CO3	:	Design solutions using modern tools to solve applicable problems in cloud and distributed systems.			
CO4	:	Demonstrate effective communication , report writing and usage of modern tools for implementing cloud and distributed systems applications			
Reference Books					
1. Kai Hwang, Geoffrey C. Fox, Jack J. Dongarra, "Distributed and Cloud Computing from parallel processing to the internet of things", Elsevier, 1st Edition, ISBN: 9780123858801-1, 2013					
2. Rajkumar Buyya, James Broberg and Andrzej M. Goscinski, "Cloud Computing: principles and paradigms (Wiley Series on Parallel and Distributed Computing), Wiley Publishing (c) 201, 1st edition, ISBN:978-0470887998, 2013					
3. George Coulouris, Jean Dollimore, Tim Kindberg, Gordon Blair, DISTRIBUTED SYSTEMS Concepts and Design, Fifth Edition, Addison- Wesley, ISBN:978-0132143011, 2012					
4. Cloud Computing Theory and Practice, Dan Marinescu, ISBN: 9780323852777 eBook ISBN: 9780323910477, 3rd Edition 2022					

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 & SEE Theory courses

RUBRIC for CIE			RUBRIC for SEE		
SLNo	Content	Marks	Q. No	Contents	Marks
1	Quizzes - Q1 & Q2	20	Each unit consists of TWO questions of 20 Marks each. Answer FIVE 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	: 22IM21T	RESEARCH METHODOLOGY	CIE Marks	: 100
Credits L-T-P	: 3-0-0		SEE Marks	: 100
Hours	: 42L		SEE Durations	: 3 Hrs
Faculty Coordinator:		Dr. Rajeswara Rao K V S		
UNIT - I				8 Hrs
Research Problem: Problem Solving – General Problem Solving, Logical Approach, Soft System Approach, Creative Approach, Group Problem Solving Techniques for Idea Generation. Formulation of Research Problems – Approaches to Research Problem, Exploration for Problem Identification, Hypothesis Generation and Formulation of the problem.				
UNIT - II				9 Hrs
Research Design: Experimental Design – Principles of Experiment, Laboratory Experiment, Experimental Design, Quasi Experimental Design, Action. Research, Validity and Reliability of Experiment and Quasi Experiments. Ex Post Facto Research – Exploratory Research, Historical Research, Descriptive Research, Field Studies, Survey Research, Qualitative Research Methods.				
UNIT - III				8 Hrs
Research Design for Data Acquisition: Measurement Design – Primary types of Measurement scales, Validity and Reliability Measurement, Sample Design – Non-Probability Sampling, Probability Sampling. Data Collection Procedures – Sources of secondary data, Primary data collection methods, Validity and Reliability of data collection procedures.				
UNIT - IV				9 Hrs
Data Analysis: Exploratory Data Analysis, Statistical Estimation, Hypothesis Testing, Parametric Tests, Non-Parametric Tests, Multiple Regression, Factor Analysis, Cluster Analysis				
UNIT - V				8 Hrs
Research Proposal: Purpose, Types, Development of Proposal, Evaluation of Research Proposal. Report Writing: Pre-writing consideration, Format of Reporting, Briefing, Best practices for Journal writing.				
Course Outcomes:				
After going through this course the student will be able to:				
CO1	:	Recognize the principles and concepts of research types, data types and analysis procedures.		
CO2	:	Apply appropriate method for data collection and analyze the data using statistical principles.		
CO3	:	Express research output in a structured report as per the technical and ethical standards.		
CO4	:	Develop a research design for the given engineering and management problem context.		
Reference Books:				
1. Krishnaswami, K.N., Sivakumar, A. I. and Mathirajan, M., Management Research Methodology, Integration of Principles, Methods and Techniques, 17th Impression, Pearson India Education Services Pvt. Ltd, 2018. ISBN: 978-81-7758-563-6				
2. William M. K. Trochim, James P. Donnelly, The Research Methods Knowledge Base, 3rd Edition, Atomic Dog Publishing, 2006, ISBN: 978-1592602919				
3. Kothari C.R., Research Methodology Methods and Techniques, 4th Edition, New Age International Publishers, 2019, ISBN: 978-93-86649-22-5.				
4. Levin, R.I. and Rubin, D.S., Statistics for Management, 8th Edition, Pearson Education: New Delhi, 2017, ISBN-13- 978-8184957495.				

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 & SEE Theory courses

RUBRIC for CIE			RUBRIC for SEE		
Sl.No	Content	Marks	Q. No	Contents	Marks
1	Quizzes - Q1 & Q2	20	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	: 22MCE22TL	ADVANCES IN OPERATING SYSTEM	CIE Marks	: 100
Credits L-T-P	: 3-0-1	(Theory & Practice)	SEE Marks	: 100
Hours	: 42L + 28P	(Professional Core - 3)	SEE Durations	: 3 Hrs
Faculty Coordinator: Dr. Azra Nasreen and Dr. Deepamala N				
UNIT - I				9 Hrs
Introduction to Operating Systems Virtualizing the CPU, Virtualizing Memory, Concurrency, Persistence, Design Goals. Virtualization The Abstraction: The Process , Process API , Process Creation, Process States, Data Structures, Process API: The fork() System Call, Adding wait() System Call ,exec() System Call , Other Parts of the API.				
UNIT - II				9 Hrs
Advanced Multiprocessor Scheduling Background Multiprocessor Architecture, Synchronization, Cache Affinity, Single- Queue Scheduling, Multi-Queue Scheduling, Linux Multiprocessor Schedulers, Real time scheduling, deadline scheduling and rate monotonic scheduling, priority inversion.				
UNIT - III				8 Hrs
Threads API Thread Creation, Thread Completion, Locks, Condition Variables. Locks The Basic Idea, Pthread Locks, Building A Lock, Evaluating Locks, Controlling Interrupts, Test And Set, Building A Working Spin Lock, Evaluating Spin Locks, Compare-And-Swap ,Load-Linked and Store-Conditional, Fetch-And-Add, Using Queues, Different OS, Different Support ,Two-Phase Locks Lock-based Concurrent Data Structures Concurrent Counters, Concurrent Linked Lists, Concurrent Queues, Concurrent Hash Table				
UNIT - IV				8 Hrs
Processes in Linux: Processes, Lightweight Processes, and Threads, Process Descriptor, Process Switch, Creating Processes, Destroying Processes. Process Scheduling: Scheduling Policy, The Scheduling Algorithm, Data Structures Used by the Scheduler.				
UNIT - V				8 Hrs
System Calls: POSIX APIs and System Calls, . Parameter Passing, Kernel Wrapper Routines. Kernel Synchronization: How the Kernel Services Requests, Synchronization Primitives, Synchronizing Accesses to Kernel Data Structures, Examples of Race Condition Prevention				
LABORATORY				28 Hrs
PART-A 1. Develop an application using process control APIs to demonstrate virtualization of CPU and Virtualization of memory 2. Implement a multithreaded application using Pthread Library to perform I/O operations 3. Implement the code for context switching in xv6. 4. Simulate a Multilevel Feedback Queue scheduler and analyse the performance using different scheduling metrics. 5. Implement a lottery scheduler with random seeds. 6. Implement Lock With Queues, Test-and-set, Yield, and Wakeup. 7. Demonstrate the use of linux based Futex Locks. 8. Build a concurrent hashtable using concurrent lists. 9. Write a C program that takes one or more file/directory names as command line input and reports following information A)File Type B)Number Of Links C)Time of last Acces D) Read,write and execute permission 10. Write a kernel program and print "Hello World" using insmod, rmmod, lsmod etc.				
Open Ended Experiments The students are expected to implement a mini project using operating system concepts and APIs/system calls learned in the theory. The primary emphasis of the experiment is to understand and gain knowledge of operating system concepts so as to apply these concepts in implementing solutions to real world problems.				
Course Outcomes: After going through this course the student will be able to:				
CO1	:	Explore the recent development of Operating Systems and understanding the new techniques that advance the start-of-the-art of Operating Systems		
CO2	:	Analyze critical components of OS with hands-on experience with the scientific methods to develop specific system on an operating system.		

CO3 :	Design multi-processes and multithreading schemes for concurrent systems
CO4 :	Demonstrate process concurrency, file systems, protection and data integrity mechanisms for applications running on different operating systems.

Reference Books

1. Remzi H, Andrea C, "Operating Systems Three Easy Pieces", ARPACI-DUSSEAU publishers, 1st Edition, 2014, 978-1985086593
2. William Stallings, "Operating Systems: Internals and Design Principles", Pearson Education, 7th edition, 2014, ISBN 13: 978-0-13-230998-1.
3. Gary Nutt, Nabendu Chaki, Sarmistha Neogy, "Operating Systems", Pearson Education, 3rd Edition, 2012, ISBN 0201773449.
4. Mukesh Singhal, Niranjana G Shivarathri, "Advanced concepts in operating systems", Tata Mcgraw Hill Education Pvt. Ltd, 2011, ISBN : 9780070472686.

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 for CIE & SEE for Integrated Theory courses with Laboratory

RUBRIC of CIE			RUBRIC of SEE		
SLNo	Content	Marks	Q. No	Contents	Marks
1	Quizzes - Q1 & Q2	10	Each unit consists of TWO questions of 16 Marks each. Answer FIVE full questions selecting ONE from each unit (1 to 5). Question No. 11 is compulsory (Laboratory component) for 20 Marks.		
2	Tests - T1 & T2	30			
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
NO SEE for Laboratory			7 & 8	Unit-4: Question 7 or 8	16
			9 & 10	Unit-5: Question 9 or 10	16
			11	Laboratory Component (Compulsory)	20
			Total Marks		100

SEMESTER: II				
Course Code	: 22MCE23T	Deep Learning	CIE Marks	: 100
Credits L-T-P	: 3- 0 - 0		SEE Marks	: 100
Hours	: 42L		(Professional Core - 4)	SEE Durations
Faculty Coordinator:		Dr. Hemavathy R and Dr. Soumya A		
UNIT - I				9 Hrs
Deep Feedforward Networks: Multilayer Perceptron, Example: Learning XOR, Gradient-Based Learning, Hidden Units, Architecture Design, Back-Propagation Algorithm				
Regularization For Deep Learning: parameter norm penalties, Norm penalties as constrained optimization, Regularization and Under constrained problems, Data Augmentation, Noise Robust, semi supervised, multi task learning, Early stopping.				
UNIT - II				9 Hrs
Convolutional Networks: Convolution Operation, Motivation, Pooling, Convolution and Pooling as an Infinitely Strong Prior, Variants of the basic convolution function, Structured Outputs, Data types, Efficient Convolution Algorithms, Random or Unsupervised features, The Neuroscientific basis for convolutional networks.				
UNIT - III				8 Hrs
Sequence Modeling: Recurrent and Recursive Nets: Unfolding Computational Graphs, Recurrent Neural Networks, Bidirectional RNNs, Encoder-Decoder Sequence-to-Sequence Architectures, Deep Recurrent Networks, Recursive Neural Networks, Echo State Networks, The Long Short-Term Memory and Other Gated RNNs				
UNIT - IV				8 Hrs
Autoencoders: Undercomplete Autoencoders, Regularized Autoencoders, Representational Power, Layer Size and Depth, Stochastic Encoders and Decoders, Denoising Autoencoders, Contractive Auto encoders, Applications of Autoencoders, Variational Autoencoders				
UNIT - V				8 Hrs
Pretrained models and other Architectures: Lenet, AlexNet, VGGNet, Densenet, Resnet, Transfer Learning, Improving Deep Neural Networks- Hyperparameter Tuning, Regularization and Optimization.Data Augmentation techniques.Generative Adversarial Networks, Reinforcement Learning.				
Course Outcomes:				
After going through this course the student will be able to:				
CO1	:	Exploring the concepts of neural network, its applications and various learning models		
CO2	:	Apply the knowledge of neural networks in various deep learning architecture (Convnet, Recurrent and Nets and Auto-encoder models)		
CO3	:	Analyze different deep Network Architectures, learning tasks for various applications		
CO4	:	Evaluate and compare the solutions by various deep learning approaches for a given problem		
Reference Books				
1. Deep Learning (Adaptive Computation and Machine Learning Series), Ian Good Fellow, Yoshua Bengio and Aaron Courville, MIT Press (3 January 2017), ISBN-13: 978-0262035613.				
2. Neural Networks and Learning Machines, Simon S. Haykin, 3rd Edition 2010, PHI Learning, ISBN-9789332586253, 933258625X.				
3. Introduction to Artificial Neural Networks, Gunjan Goswami, S.K. Kataria & Sons; 2012 Edition, ISBN-13: 978-9350142967.				
4. Fundamentals of Deep Learning: Designing Next-Generation Machine Intelligence Algorithms, Nikhil Buduma, by O'Reilly Publications, 2016 Edition, ISBN-13: 978-1491925614.				

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 & SEE Theory courses

RUBRIC for CIE			RUBRIC for SEE		
SLNo	Content	Marks	Q. No	Contents	Marks
1	Quizzes - Q1 & Q2	20	Each unit consists of TWO questions of 20 Marks each. Answer FIVE 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	: 22MSE2C1T	Robotic Process Automation	CIE Marks	: 100
Credits L-T-P	: 3- 0 - 0		SEE Marks	: 100
Hours	: 42L		<i>Elective C (Professional Elective)</i>	SEE Durations
Faculty Coordinator:		Dr. G S Mamatha and Dr. B K Srinivas		
UNIT - I				9 Hrs
What is Robotic Process Automation? Scope and Techniques of automation: what should be automated? What can be automated? Techniques of automation Robotic Process Automation: What can RPA do? Benefits of RPA Components of RPA, RPA platforms. About UiPath. The future of automation. Record and Play: UiPath stack, Downloading and Installing UiPath Studio, Learning UiPath Studio, Task Recorder, Emptying trash in Gmail, Emptying Recycle Bin.				
UNIT - II				9 Hrs
Sequence, Flowchart, and Control Flow: Sequencing the workflow, Activities, Control flow, various types of loops, and decision making, how to use a sequence, how to use a flowchart, step by step example using sequence and control flow. Data Manipulation: Variables and scope, Collections, Arguments-purpose and use, Data table usage with examples, Clipboard management, File operation with step-by-step example. CSV/Excel to data table and vice versa examples.				
UNIT - III				8 Hrs
Taking control of the controls : Finding and attaching windows, Finding the control, Techniques for waiting for a control, Act on controls-mouse and keyboard activities, working with UiExplorer, Handling events, Revisit recorder, Screen scraping, When to use OCR, Types of OCR available, How to use OCR, Avoiding typical failure points. Tame that Application with Plugins and Extensions Terminal plugin: SAP automation, Java Plugin, Citrix automation, Mail plugin, PDF plugin, web integration, Excel and Word plugins, Credential management.				
UNIT - IV				8 Hrs
Handling User Events and Assistant Bots: What are assistant bots? Monitoring system event triggers, Monitoring image and element triggers, Launching an assistant bot on a keyboard event. Exception Handling, Debugging, and Logging Exception handling: Common exceptions and ways to handle them, Logging and taking screenshots, Debugging techniques, Collecting crash dumps, Error reporting.				
UNIT - V				8 Hrs
Managing and Maintaining the Code: Project Organization, Nesting workflows, Reusability of workflows, commenting techniques, State Machine, When to use Flowcharts, State Machines or sequences, Using config files and examples of a config file. Deploying and Maintaining the Bot: Publishing using publish utility, Overview of Orchestration Server, Using Orchestration Server to control bots, Using Orchestration Server to deploy bots.				
Course Outcomes: After going through this course the student will be able to:				
CO1	:	Apply the concept of Robotic Process Automation to automate various applications.		
CO2	:	Analyse the usage of appropriate Robotic Process Automation technique for a given application.		
CO3	:	Design and implement techniques of Robotic Process Automation.		
CO4	:	Evaluate the code for deployment and maintenance.		
Reference Books				
1. Alok Mani Tripathi, Learning Robotic Process Automation, 1st Edition, Packpub.com, 2018, ISBN: 178847094X				
2. Ed Freitas, Robotic Process Automation Succinctly, Succinctly EBook Series, 2020, ISBN: 978-1-64200-199-0				
3. Nividous, Robotic Process Automation, www.nividous.com, 2018				
4. Vaibhav Srivastava, Getting started with RPA using Automation Anywhere, BPB publishers, 2018, ISBN: 9789389898286				

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 & SEE Theory courses

RUBRIC for CIE			RUBRIC for SEE		
SLNo	Content	Marks	Q. No	Contents	Marks
1	Quizzes - Q1 & Q2	20	Each unit consists of TWO questions of 20 Marks each. Answer FIVE 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	: 22MCE2C2T	Embedded Systems	CIE Marks	: 100
Credits L-T-P	: 3- 0 - 0		SEE Marks	: 100
Hours	: 42L	<i>Elective C (Professional Elective)</i>	SEE Durations	: 3 Hrs
Faculty Coordinator:		Dr. Badarinath K and Prof. M S Srividya		
UNIT - I				9 Hrs
Introduction to Embedded Systems: Outline an embedded system, its components and applications, The role of embedded systems in the Internet of Things (IoT) and the context of ubiquitous computing, Identify the challenges of incorporating embedded devices into IoT systems , The benefits of microcontroller-based embedded systems , Identify important trade-offs of embedded systems including cost and performance Overview of ARM and Intel Processor and Controller families: ARM- ARM Processor families, Cortex A, Cortex R and Cortex M. Intel : Overview Of Intel Processors & features				
UNIT - II				9 Hrs
The Arm Cortex-M4 Processor Architecture: Key features of Arm architectures and processors, Features and layout of the Arm Cortex-M4 processor, Sstructure and purpose of specific registers in the Arm Cortex-M4 processor. Introduction to Arm Cortex-M4 Programming: Compare the C and Assembly programming languages, Program-generation flow, including compilation and program images, different data formats and how they are stored in memory, Mixed assembly and C programming. Overview Of IO Interfaces & Peripheral Programming: Digital Input and Output (IO), Analog Input and Output, Interrupts and Low Power Features, Timer and Pulse-width Modulation				
UNIT - III				8 Hrs
Serial Communications: Outline the concept of serial communication and its benefits, Comparison of synchronous and asynchronous serial communication, Popular Embedded System serial communication methods - UART, SPI, and I2C. Real-Time Operating System: Describe what an operating system is, its features, and types of operating systems, Outline features of a real-time operating system (RTOS), concurrency tools such as threads, mutex and semaphores				
UNIT - IV				8 Hrs
Introduction to System-on-Chip Design: Explain why the SoC concept developed, describe scaling and its effect on the cost of chip fabrication, Outline strategies to improve the productivity of IC design engineers, Define the meaning of SoC and list its basic components, Explain the advantages of SoC over system on boards, Explain the limitations of SoC design				
UNIT - V				8 Hrs
Intel FPGAs: Introduction to Intel FPGAs and Intel Quartus Prime Design Software- FPGA design and implementation. Introduction to Timing Analysis - Applying Timing Constraints-Timing Exceptions - False Paths and Multicycle Paths - Achieving timing closure. Intel SoC FPGAs: Introduction to Intel SoC FPGAs - IP design and Platform designer, Embedded System design using Cyclone V and ARM -SoC Design Flow Getting started with the NIOS V Processor,Software development using NIOS V Processor, Debugging the NIOS V Processor using the RISC Free IDE for Intel FPGAs				
Course Outcomes: After going through this course the student will be able to:				
CO1	:	Analyse and explore the impact of Embedded Systems and different processors and controller families.		
CO2	:	Identify and build different Embedded Systems using ALP, embedded C programming using different sub systems like GPIO, Analog, Timers, PWM and Interrupts.		
CO3	:	Apply the concepts of Embedded system serial protocols and RTOS in the embedded systems design		
CO4	:	Development of required FPGAs, SOC's and identify the applications of them in the industry.		
Reference Books				
1. Embedded Systems Fundamentals on Arm Cortex-M based Microcontrollers: A Practical Approach by Alexander G. Dean, FRDM-KL25Z Edition, March 2017, ISBN - 978-1-911531-03-6				

- 2 Embedded Systems- Architecture, Programming and Design, by Raj Kamal, McGraw Hill Education ,3rd Edition, ISBN-13 : 978-9332901490
- 3 System-on-Chip Design with Arm Cortex-M Processors ,Joseph Yiu, August 2019, ISBN – 978-1-911531-18-0
4. White Paper: Cortex-M for Beginners - An overview of the Arm Cortex-M processor family and comparison:
<https://community.arm.com/developer/ip-products/processors/b/processors-ip-blog/posts/white-paper-cortex-m-for-beginners-an-overview-of-the-arm-cortex-m-processor-family-and-comparison>

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 & SEE Theory courses

RUBRIC for CIE			RUBRIC for SEE		
SLNo	Content	Marks	Q. No	Contents	Marks
1	Quizzes - Q1 & Q2	20	Each unit consists of TWO questions of 20 Marks each. Answer FIVE 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	: 22MCE2C3T	Natural Language Processing	CIE Marks	: 100
Credits L-T-P	: 3- 0 - 0		SEE Marks	: 100
Hours	: 42L	<i>Elective C (Professional Elective)</i>	SEE Durations	: 3 Hrs
Faculty Coordinator:		Dr. Rajashree Shettar and Dr. Vinay Hegde		
UNIT - I				9 Hrs
Introduction: Introduction and applications, NLP phases, Difficulty of NLP including ambiguity; Knowledge in Speech and Language Processing, Ambiguity, Models and Algorithms, Language, Thought, and Understanding, The State of the Art. Regular Expressions, Text Normalization, Edit Distance: Regular Expressions, Finite-State Automata, Regular Languages and FSAs, Words & Transducers, Survey of English Morphology, Finite-State Morphological Parsing, Building a Finite-State Lexicon, Finite-State Transducers, FSTs for Morphological Parsing, Transducers and Orthographic Rules, Corpora, Text Normalization.				
UNIT - II				9 Hrs
Language Models: N-Grams, Evaluating Language Models, Sampling sentences from a language model, Generalization and Zeros, Smoothing-Laplace Smoothing, Add-k smoothing. Constituency Grammars: Constituency, Context-Free Grammars, Some Grammar Rules for English, Treebanks, Grammar Equivalence and Normal Form, Lexicalized Grammars. Constituency Parsing: Ambiguity, CKY Parsing: A Dynamic Programming Approach, CKY Parsing: A Dynamic Programming Approach, Evaluating Parsers, Partial Parsing, CCG Parsing.				
UNIT - III				8 Hrs
Dependency Parsing: Dependency Relations, Dependency Formalisms, Dependency Treebanks, Transition-Based Dependency Parsing. Sequence Labelling for Parts of Speech and Named Entities: Part-of-Speech Tagging, Named Entities and Named Entity Tagging, HMM Part-of-Speech Tagging.				
UNIT - IV				8 Hrs
Machine Translation: Language Divergences and Typology, The Encoder-Decoder Model. Co-reference Resolution: Co-reference Phenomena-Linguistic Background, Co-reference Tasks and Datasets, Mention Detection, Architectures for Co-reference Algorithms.				
UNIT - V				8 Hrs
Vector Semantics and Embedding: Lexical Semantics, Vector Semantics, Words and Vectors, Cosine for measuring similarity, TF-IDF: Weighing terms in the vector. Applications: TF-IDF vector models, Word2vec, Visualizing Embedding, and Semantic properties of embedding.				
Course Outcomes: After going through this course the student will be able to:				
CO1	:	Describe the concepts of lexical analysis, morphological analysis, syntax, semantics, discourse & pragmatics of natural language.		
CO2	:	Analyze the syntax, semantics, and pragmatics of a statement written in a Natural Language.		
CO3	:	Extract information from text using Natural Language Processing (NLP) techniques including stemming, n-grams, POS tagging, and parsing.		
CO4	:	Develop solutions for real world natural language problems.		
Reference Books				
1. Daniel Jurafsky and James H Martin, "Speech and Language Processing, An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition", Pearson Education India, 3rd Edition, 2020, ISBN 978-9332518414				
2. Christopher D.Manning and Hinrich Schutze, "Foundations of Statistical Natural Language Processing", MIT Press, 1999, 2nd Edition, ISBN 978-0262133609				
3. Steven Bird, Ewan Klein, Edward Loper, "Natural Language Processing with Python: Analysing Text with the Natural Language Toolkit", O'Reilly Media, 2011, 1st Edition, ISBN: 978-8184047486				
4. James Allen, Natural Language Understanding", Pearson Education, 2nd Edition, 2002, ISBN: 978-8131708958				

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 & SEE Theory courses

RUBRIC for CIE			RUBRIC for SEE		
SLNo	Content	Marks	Q. No	Contents	Marks
1	Quizzes - Q1 & Q2	20	Each unit consists of TWO questions of 20 Marks each. Answer FIVE 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	: 22MCN2C4T	Internet of Things and Edge Computing	CIE Marks	:	100
Credits L-T-P	: 3- 0 - 0		SEE Marks	:	100
Hours	: 42L		<i>Elective C (Professional Elective)</i>	SEE Durations	:
Faculty Coordinator:		Dr. Sharvani G S and Prof. Prapulla S B			
UNIT - I					9 Hrs
Overview of IoT: Overview of Wireless Sensor Networks, Overview of Internet of Things, IoT Conceptual Framework, IoT Architectural View, Technology Behind IoT, Sources of IoT, M2M Communication. Design Principles: IoT/M2M Systems Layers and Design Standardization, Communication Technologies, Data Enrichment, Data Consolidation and Device Management at Gateway Examples of IoT, Ease of Designing and Affordability					
UNIT - II					9 Hrs
Design Principles for Web Connectivity: Introduction, Web Communication Protocols: Constrained Applications Protocol (CoAP), Lightweight Machine-to-Machine Communication; Message Communication Protocols: Message Queue Telemetry Transport (MQTT)					
UNIT - III					8 Hrs
Internet of Things Privacy, Security and Governance- Introduction, Overview of Activity Chain — Governance, Privacy and Security Issues, Contribution From FP7 Project, Security and Privacy Challenge in Data Aggregation for the IoT in Smart Cities-Security, Privacy and Trust in Iot-Data Platforms for Smart Cities, First Steps Towards a Secure Platform, Smartie Approach					
UNIT - IV					8 Hrs
Internet of Things (IoT) and New Computing Paradigms Fog and Edge Computing Completing the Cloud ,Advantages of FEC: SCALE , How FEC Achieves. These Advantages: SCANC 9,Hierarchy of Fog and Edge Computing , Business Models ,Addressing the Challenges in Federating Edge Resources and Networking Challenge.					
UNIT - V					8 Hrs
The Management Challenge ,Integrating IoT + Fog + Cloud ,Management and Orchestration of Network Slices in 5G, Fog, Edge, and Clouds Introduction ,Background ,Network Slicing in 5G , Network Slicing in Software-Defined Clouds ,Network Slicing Management in Edge and Fog					
Course Outcomes: After going through this course the student will be able to:					
CO1	:	Apply and Explore Internet of Things (IoT) with New Computing Paradigms like 5G, Fog, Edge, and Clouds			
CO2	:	Analyze Prototyping and demonstrate resource management concepts in New Computing Paradigms			
CO3	:	Implement optimal technology of Internet of Things and edge computing for different applications			
CO4	:	Design Web Connectivity in IoT and Orchestration of Network Slices in 5G, Fog, Edge, and Cloud			
Reference Books					
1.Raj Kamal, “Internet of Things: Architecture and Design Principles”. TMH Publications,1st Edition, 2017 ISBN: 9789352605224.					
2. Internet of Things: Converging Technologies for Smart Environments and Integrated Ecosystems, Dr. Ovidiu Vermesan, Dr. Peter Friess, River Publishers, 2013, ISBN: 978-87- 92982-73-5(Print) ISBN: 978-87-92982-96-4(E-Book)					
3. Rajkumar Buyya , Satish Narayana Srirama,” Fog and Edge Computing: Principles and Paradigms” ,Wiley series on parallel and distributed computing, 1st Edition, 2019 ISBN: 978-1-119-52498-4.					
4. Vijay Madiseti and Arshdeep Bahga, “Internet of Things (A Hands-on-Approach)”, 1st Edition, 2014 VPT, ISBN: 978-0996025515.					

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 & SEE Theory courses

RUBRIC for CIE			RUBRIC for SEE		
SLNo	Content	Marks	Q. No	Contents	Marks
1	Quizzes - Q1 & Q2	20	Each unit consists of TWO questions of 20 Marks each. Answer FIVE 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	: 22BT2D01T	BIOINSPIRED ENGINEERING	CIE Marks	: 100
Credits L-T-P	: 3-0-0		SEE Marks	: 100
Hours	: 42L		SEE Durations	: 3 Hr
Faculty Coordinator:		Dr Nagashree Rao and Dr Ashwani Sharma		
UNIT - I				8 Hrs
Introduction to Bio-inspired Engineering: Macromolecules, Stem cells; types and applications. Synthetic Biology; Bottom-up' and 'top-down' engineering approaches. Synthetic/ artificial life. Biological Clock, Genetic Algorithms.				
UNIT - II				9 Hrs
Principles of bioinspired materials: Biological and synthetic materials, Self-assembly, hierarchy and evolution. Biopolymers, Bio-steel, Bio-composites, multi-functional biological materials. Thermal Properties. Antireflection and photo-thermal biomaterials, Microfluidics in biology, Invasive and non-invasive thermal detection inspired by skin				
UNIT - III				9 Hrs
Lessons from Nature:Bioinspired Materials and mechanism: Firefly-Bioluminescence, Cocklebur -Velcro, Lotus leaf - Self-cleaning materials, Gecko - Gecko tape, Whale fins - Turbine blades, Box Fish / Bone - Bionic car, Shark skin - Friction reducing swim suits, Kingfisher beak - Bullet train, Coral - Calera cement, Forest floor / Ecosystem functioning - Flooring tiles, Morpho butterfly- Structural color, Namib beetle- Water collecting, Termite mound passive cooling, Birds/Insects- flights/ aerodynamics, Mosquito inspired micro needle.				
UNIT - IV				8 Hrs
Biomedical Inspiration-Concept and applications: Organ system- Circulatory- artificial blood, artificial heart, pacemaker. Respiratory- artificial lungs. Excretory- Artificial kidney and skin. Artificial Support and replacement of human organs: artificial liver and pancreas. Total joint replacements- artificial limbs. Visual prosthesis -artificial eye/ bionic eye.				
UNIT - V				8 Hrs
Biomimetics: Inventions in nature for Human Innovation: Photosynthesis and Photovoltaic cells, Bionic/Artificial leaf. Bio-ink and 3D-Bioprinting. Cellular automata. Biosensors: Artificial tongue and nose. Biomimetic echolocation. Insect foot adaptations for adhesion. Thermal insulation and storage materials. Bees and Honeycomb Structure. Artificial Intelligence, Neural Networking and bio-robotics.				
Course Outcomes: After going through this course the student will be able to:				
CO1	: Elucidate the concepts and phenomenon of natural processes			
CO2	: Apply the basic principles for design and development of bioinspired structures			
CO3	: Analyse and append the concept of bio-mimetics for diverse applications			
CO4	: Designing technical solutions by utilization of bio-inspiration modules.			
Reference Books:				
1. D. Floreano and C. Mattiussi, Bio-Inspired Artificial Intelligence: Theories, Methods and Technologies, 1st edition, MIT Press, 2008, ISBN: 9780262062718				
2. Guang Yang, Lin Xiao, and Lallepak Lamboni. Bioinspired Materials Science and Engineering. 1st edition, John Wiley, 2018, ISBN: 978-1-119-3903362				
3. M.A. Meyers and P.Y. Chen. Biological Materials, Bioinspired Materials, and Biomaterials, 1st edition, Cambridge University Press, 2014, ISBN 978-1-107-01045.				
4. Tao Deng. Bioinspired Engineering of Thermal Materials, 1st edition, Wiley-VCH Press, 2018. ISBN: 978-3-527-33834-4.				
Scheme of Continuous Internal Evaluation (CIE): 20 + 40 + 40 = 100				
QUIZZES: Quizzes will be conducted in online/offline mode. Two quizzes will be conducted & Each Quiz will be evaluated for 10 Marks. The sum of two quizzes will be the Final Quiz marks.				
TESTS: Students will be evaluated in test, descriptive questions with different complexity levels (Revised Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating). Two tests will be conducted. Each test will be evaluated for 50 Marks, adding upto 100 marks. Final test marks will be reduced to 40 Marks.				
EXPERIENTIAL LEARNING: Students will be evaluated for their creativity and practical implementation of the problem. Case study-based teaching learning and Program specific requirements (15), Video based seminar/presentation/demonstration (25) adding upto 40 marks.				
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

RUBRIC for CIE			RUBRIC for SEE		
SL.No	Content	Marks	Q. No	Contents	Marks
1	Quizzes - Q1 & Q2	20	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	: 22BT2D02T	HEALTH INFORMATICS	CIE Marks	: 100
Credits L-T-P	: 3-0-0		SEE Marks	: 100
Hours	: 42L		SEE Durations	: 3 Hrs
Faculty Coordinator:		Dr A H Manjunatha Reddy		
UNIT - I				8 Hrs
Introduction, Healthcare data, information and knowledge: Data types, data conversion, clinical data warehouse, data analytics, challenges, role of informatics in analytics, future trends				
UNIT - II				8 Hrs
Electronic health records: Introduction, scope for the e health records, challenges, examples, logical steps to selecting and implementing EHR				
UNIT - III				8 Hrs
Data standards and medical coding: Introduction, medical content standards, terminology standards, transport standards, medical coding and reimbursement, future trends,				
UNIT - IV				9 Hrs
Healthcare Enterprise: Overview of Health Informatics: Introduction, Key players in HI, organizations involved, barriers, programs, organizations and career, HI Resources				
UNIT - V				9 Hrs
Health Information privacy and security: Introduction, basic security principles, authentication and identity management, data security in the cloud and client/server management				
Course Outcomes:				
After going through this course the student will be able to:				
CO1	: Understand the basic principles of Health informatics			
CO2	: Data capture 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 Books:				
1. Robert E. Hoyt Ann K. Yoshihashi, Health Informatics, Practical guide for Healthcare and Information Technology Professionals, 6th edition, Informatics Education, 2014, ISBN: 978-0-9887529-2-4				
2. Kathryn J. Hannah Marion J. Ball, Health Informatics, Springer Series edition, Springer, 2005, ISBN: 1-85233-826-1				
3. William R Hersh, Health Informatics, a Practical guide, 8th edition. 2022, ISBN 978-1-387-85475-2				
4. Pentti Nieminen. Medical informatics and data analysis 1st edition, MDPI AG, 2021, ISBN-13 : 978-3036500980				
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 & SEE Theory courses

RUBRIC for CIE			RUBRIC for SEE		
SL.No	Content	Marks	Q. No	Contents	Marks
1	Quizzes - Q1 & Q2	20	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	: 22CS2D03T	BUSINESS ANALYTICS <i>Elective D (Global Elective)</i>	CIE Marks	: 100
Credits L-T-P	: 3-0-0		SEE Marks	: 100
Hours	: 42L		SEE Durations	: 3 Hrs
Faculty Coordinator:		Dr. Azra Nasreen and Dr. Badarinath K		
UNIT - I				9 Hrs
Overview of Business analytics, Scope of Business analytics, Business Analytics Process, Relationship of Business Analytics Process and organization, competitive advantages of Business Analytics. Statistical Tools: Statistical Notation, Descriptive Statistical methods, Review of probability distribution and data modelling.				
UNIT - II				9 Hrs
Trendiness and Regression Analysis Modelling Relationships and Trends in Data, simple Linear Regression. Important Resources, Business Analytics Personnel, Data and models for Business analytics, problem solving, Visualizing and Exploring Data, Business Analytics Technology.				
UNIT - III				8 Hrs
Organization Structures of Business analytics Team management, Management Issues, Designing Information Policy, Outsourcing, Ensuring Data Quality, Measuring contribution of Business analytics, Managing Changes. Descriptive Analytics, Predictive Analytics, Predicative Modelling, Predictive analytics analysis.				
UNIT - IV				8 Hrs
Forecasting Techniques Qualitative and Judgmental Forecasting, Statistical Forecasting Models, Forecasting Models for Stationary Time Series, Forecasting Models for Time Series with a Linear Trend, Forecasting Time Series with Seasonality, Regression Forecasting with Casual Variables, Selecting Appropriate Forecasting Models.				
UNIT - V				8 Hrs
Decision Analysis Formulating Decision Problems, Decision Strategies with and without Outcome, Probabilities, Decision Trees, The Value of Information, Utility and Decision Making.				
Course Outcomes:				
After going through this course the student will be able to:				
CO1	:	Apply the concepts and methods of business analytics to solve business problems		
CO2	:	Analyse, model and solve decision problems in different settings		
CO3	:	Interpret results/solutions and identify appropriate courses of action for a given business scenario		
CO4	:	Demonstrate skills like investigation, effective communication, working in team/Individual and following ethical practices by implementing solutions to decision making problems		
Reference Books:				
1. Business analytics Principles, Concepts, and Applications FT Press Analytics, Marc J. Schniederjans, Dara G. Schniederjans, Christopher M. Starkey, 1st Edition, 2014, ISBN-13: 978-0133989403, ISBN-10: 0133989402				
2. The Value of Business Analytics: Identifying the Path to Profitability, Evan Stubbs , John Wiley & Sons, DOI:10.1002/9781118983881,1st Edition 2014, ISBN:978111898388				
3. Business Analytics, James Evans, Pearsons Education 2nd Edition, ISBN-13: 978-0321997821 ISBN-10: 0321997824				
4. Predictive Business Analytics Forward Looking Capabilities to Improve Business, Gary Cokins and Lawrence Maisel, Wiley; 1st Edition, 2013, ISBN: 978-1-118-17556-9 .				
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 & SEE Theory courses

RUBRIC for CIE			RUBRIC for SEE		
SL.No	Content	Marks	Q. No	Contents	Marks
1	Quizzes - Q1 & Q2	20	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	: 22CV2D04T	INDUSTRIAL AND OCCUPATIONAL HEALTH AND SAFETY	CIE Marks	: 100
Credits L-T-P	: 3-0-0		SEE Marks	: 100
Hours	: 42L		SEE Durations	: 3 Hrs
Faculty Coordinator:		Dr.V.AnanthaRam		
UNIT - I				08Hrs
Industrial safety: Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1948 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and fire fighting, equipment and methods.				
UNIT - II				09Hrs
Occupational health and safety: Introduction, Health, Occupational health: definition, Interaction between work and health, Health hazards, workplace, economy and sustainable development, Work as a factor in health promotion. Health protection and promotion Activities in the workplace: National governments, Management, Workers, Workers' representatives and unions, Communities, Occupational health professionals. Potential health hazards: Air contaminants, Chemical hazards, Biological hazards, Physical hazards, Ergonomic hazards, Psychosocial factors, Evaluation of health hazards: Exposure measurement techniques, Interpretation of findings recommended exposure limits. Controlling hazards: Engineering controls, Work practice controls, Administrative controls. Occupational diseases: Definition, Characteristics of occupational diseases, Prevention of occupational diseases.				
UNIT - III				09Hrs
Hazardous Materials characteristics and effects on health: Introduction, Chemical Agents, Organic Liquids, Gases, Metals and Metallic Compounds, Particulates and Fibers, Alkalies and Oxidizers, General Manufacturing Materials, Chemical Substitutes, Allergens, Carcinogens, Mutagens, Reproductive Hazards, Sensitizers and Teratogens, Recommended Chemical Exposure Limits. Physical Agents, Noise and Vibration, Temperature and Pressure, Carcinogenicity, Mutagenicity and Teratogenicity. Ergonomic Stresses: Stress-Related Health Incidents, Eyestrain, Repetitive Motion, Lower Back Pain, Video Display Terminals.				
UNIT - IV				08 Hrs
Wear and Corrosion and their prevention: Wear- types, causes, effects, wear reduction methods, lubricants-types and applications, Lubrication methods, general sketch, working and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vii. Ring lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods.				
UNIT - V				08 Hrs
Periodic and preventive maintenance: Periodic inspection-concept and need, degreasing, cleaning and repairing schemes, overhauling of mechanical components, over hauling of electrical motor, common troubles and remedies of electric motor, repair complexities and its use, definition, need, steps and advantages of preventive maintenance. Steps/procedure for periodic and preventive maintenance of: I. Machine tools, ii. Pumps, iii. Air compressors, iv. Diesel generating (DG) sets, Program and schedule of preventive maintenance of mechanical and electrical equipment, advantages of preventive maintenance. Repair cycle concept and importance.				
Course Outcomes:				
After going through this course the student will be able to:				
CO1	:	Explain the Industrial and Occupational health and safety and its importance.		
CO2	:	Demonstrate the exposure of different materials, occupational environment to which the employee can expose in the industries.		
CO3	:	Characterize the different type materials, with respect to safety and health hazards of it.		
CO4	:	Analyze the different processes with regards to safety and health and the maintenance required in the industries to avoid accidents.		
Reference Books:				
1.Maintenance Engineering Handbook, Higgins & Morrow, SBN 10: 0070432015 / ISBN 13: 9780070432017, Published by McGraw-Hill Education. Da Information Services.				
2. H. P. Garg, Maintenance Engineering Principles, Practices & Management, 2009,S. Chand and Company, New Delhi, ISBN:9788121926447				
3.Fundamental Principles of Occupational Health and Safety, Benjamin O. ALLI, Second edition,2008 International Labour Office – Geneva: ILO, ISBN 978-92-2-120454-1				
4.Foundation Engineering Handbook, 2008, Winterkorn, Hans, Chapman & Hall London. ISBN:8788111925428.				

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 & SEE Theory courses

RUBRIC for CIE			RUBRIC for SEE		
SL.No	Content	Marks	Q. No	Contents	Marks
1	Quizzes - Q1 & Q2	20	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	: 22CV2D05T	INTELLIGENT TRANSPORTATION SYSTEMS	CIE Marks	: 100
Credits L-T-P	: 3-0-0		SEE Marks	: 100
Hours	: 42L		SEE Durations	: 3 Hrs
Faculty Coordinator:		Dr.Sunil S		
UNIT - I				8 Hrs
Introduction: –Historical Background, Definition, Future prospectus, ITS training and educational needs. Fundamentals of Traffic Flow and Control- Traffic flow elements, Traffic flow models, Shock waves in Traffic streams, Traffic signalization and control principles, Ramp metering, Traffic simulation				
UNIT - II				9 Hrs
ITS User services-User services bundles, Travel and Traffic management, Public Transportation Operations, Electronic Payment, Commercial Vehicles Operations, Emergency Management, Advanced Vehicle Control and safety systems, Information Management, Maintenance and construction Management. ITS Architecture-Regional and Project ITS Architecture, Need of ITS architecture, concept of Operations, National ITS Architecture, Architecture development tool				
UNIT - III				9 Hrs
Technology Building Blocks for ITS-Introduction, Data acquisition, Communication Tools, Data Analysis, and Traveller Information. Various detection, identification and collection methods for ITS. ITS Applications and their benefits-Freeway and incident management systems, Advanced arterial traffic control systems, Advanced Public Transportation Systems, Multimodal Traveller Information systems				
UNIT - IV				8 Hrs
ITS Planning-Transportation planning and ITS, Planning and the National ITS Architecture, Planning for ITS, Integrating ITS into Transportation Planning, relevant case studies. ITS Standards-Standard development process, National ITS architecture and standards, ITS standards application areas, National Transportation Communications for ITS Protocol, Standards testing				
UNIT - V				8 Hrs
ITS Evaluation – Project selection at the planning level, Deployment Tracking, Impact Assessment, Benefits by ITS components, Evaluation Guidelines, Challenges and Opportunities. ITS for Law Enforcement: Introduction, Enhance and support the enforcement traffic rules and regulations, ITS Funding options and ITS case studies				
Course Outcomes: After going through this course the student will be able to:				
CO1	: Identify and apply ITS applications at different levels			
CO2	: Illustrate ITS architecture for planning process			
CO3	: Examine the significance of ITS for various levels			
CO4	: Compose the importance of ITS in implimentions			
Reference Books:				
1. Pradip Kumar Sarkar and Amit Kumar Jain, “Intelligent Transport Systems”, PHI Learning Private Limited, Delhi,2018, ISBN-9789387472068				
2. Choudury M A and Sadek A, “Fundamentals of Intelligent Transportation Systems Planning” Artech House publishers (31 March 2003); ISBN-10: 1580531601				
3. Bob Williams, “Intelligent transportation systems standards”, Artech House, London, 2008. ISBN-13: 978-1-59693-291-3				
4. Asier Perallos, Unai Hernandez-Jayo, Enrique Onieva, Ignacio Julio García Zuazola “Intelligent Transport Systems: Technologies and Applications” Wiley Publishing ©2015, ISBN:1118894782 9781118894781				
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 & SEE Theory courses

RUBRIC for CIE			RUBRIC for SEE		
SL.No	Content	Marks	Q. No	Contents	Marks
1	Quizzes - Q1 & Q2	20	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	: 22EC2D06T	ELECTRONIC SYSTEM DESIGN <i>Elective D (Global Elective)</i>	CIE Marks	: 100
Credits L-T-P	: 3-0-0		SEE Marks	: 100
Hours	: 42L		SEE Durations	: 3 Hrs
Faculty Coordinator:		Prof. Ravishankar Holla		
UNIT - I				9 Hrs
Design Process & its Fundamentals: Life Cycle of Electronic Products, Design and Development Process, Guidance for Product Planning, Design and Development, Technical Drawings, Circuit Diagrams, Computer-Aided Design (CAD)				
UNIT - II				9 Hrs
System Architecture and Protection Requirements: Introduction - Terminology, Functions and Structures, Systems Design Architecture, Electronic System Levels, System Protection Experiential Learning: (4 quizzes on the below mentioned topics other than CIE) Reliability Analysis: Introduction, Calculation Principles, Exponential Distribution, Failure of Electronic, Components, Failure of Electronic Systems, Reliability Analysis of Electronic Systems, Recommendations for Improving Reliability of Electronic Systems				
UNIT - III				8 Hrs
Thermal Management and Cooling: Introduction - Terminology, Temperatures and Power Dissipation, Calculation Principles, Heat Transfer, Methods to Increase Heat Transfer, Application Examples in Electronic Systems, Recommendations for Thermal Management of Electronic Systems, Cooling systems, liquid, air and non cooling systems.				
UNIT - IV				8 Hrs
Electromagnetic Compatibility (EMC): Introduction, Coupling Between System Components, Grounding Electronic Systems, Shielding from Fields, Electrostatic Discharge (ESD), Recommendations for EMC-compliant Systems Design				
UNIT - V				8 Hrs
Recycling Requirements and Design for Environmental Compliance: Introduction - Motivation and the Circular Economy, Manufacture, Use, and Disposal of Electronic Systems in the Circular Economy, Product Recycling in the Disposal Process, Material Recycling in the Disposal Process, Design and Development for Disassembly, Material Suitability in Design and Development, Recommendations for Environmentally Compliant Systems				
Course Outcomes: After going through this course the student will be able to:				
CO1	:	Realize the fundamentals of Design, Architecture, thermal management, EMC and Recycling requirements of Electronic System Design		
CO2	:	Analyze the various application wise design requirements in Electronic systems along with the related concepts of implementations, standards and Compliances.		
CO3	:	Use modern open source tools to realize the various concepts of Electronic system design		
CO4	:	Engage in self-study through assignments, simulations, case studies and projects		
Reference Books:				
1. Fundamentals of Electronic Systems Design, Jens Lienig, Hans Brümmer 2017, Springer International Publishing, ISBN 978-3-319-55839-4, DOI:10.1007/978-3-319-55840-0				
2. "Embedded System Design", Marwedel, Peter, Springer Nature, 10.1007/978-3-030-60910-8				
3. "Electromagnetic Compatibility Engineering", Henry W. Ott, WILEY Publication, ISBN: 978-0-470-18930-6				
4. "Handbook of Electronic Systems Design" by Charles A. Harper, McGraw-Hill Inc.,US , 0070266832, 978-0070266834				
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 & SEE Theory courses

RUBRIC for CIE			RUBRIC for SEE		
SL.No	Content	Marks	Q. No	Contents	Marks
1	Quizzes - Q1 & Q2	20	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	: 22EC2D07T	EVOLUTION OF WIRELESS TECHNOLOGIES	CIE Marks	: 100
Credits L-T-P	: 3-0-0		SEE Marks	: 100
Hours	: 42L		SEE Durations	: 3 Hrs
Faculty Coordinator:		Dr. Mahesh A		
UNIT - I				9 Hrs
Introduction to cellular systems: 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, Bluetooth, WiFi, WWAN and PAN.				
UNIT - II				9 Hrs
Fundamentals of wireless communication: Wireless Channel, Wireless propagation, Link budget, Free-space path loss, Noise figure of receiver, Multipath fading, Shadowing, Fading margin, Shadowing margin, Wireless Channel Capacity, OFDM and LTE, Large Scale Propagation effects and Channel Models				
UNIT - III				8 Hrs
Fundamentals of 5G architecture: Difference between 4G and 5G, 5G Architecture, Planning of 5G Network, Quality of Service, Radio Network, Requirements, Security, SIM in 5G Era, Specifications, Standardization, Terminal States				
UNIT - IV				8 Hrs
mmWave and Visible Light Communications: Back ground and concept of mmWave Communications, Frequency bands, propagation characteristics, channel models, applications and challenges in 5G				
UNIT - V				8 Hrs
Future Generations: Future Generations(where is the 6G?), Health Considerations, Identifiers, Interfaces, ,Key Derivation, Location Based Services, Massive Internet of Things, Measurements, Network Functions Virtualization, Network Slicing, Open Source, , User Equipment, Vehicle-to-Vehicle communications (V2V),Virtual Reality (VR/AR/XR). Case study- Bharath Stack				
Course Outcomes:				
After going through this course the student will be able to:				
CO1	:	Demonstrate their understanding on functioning of wireless communication system and evolution of different wireless communication systems and standards		
CO2	:	Compare different technologies used for wireless communication systems.		
CO3	:	Demonstrate an ability explain recent techniques for Wireless Communication systems		
CO4	:	Update the latest trends in wireless communications		
Reference Books:				
1. Theodore S. Rappaport, “Wireless Communications: Principles and Practice”, Pearson, 2nd Edition.				
2. Aditya K Jagannatham, “Principles of Modern Wireless Communications”, McGraw Hill, 2017				
3. Robin Chataut, Robert Akl, “Massive MIMO Systems for 5G and beyond Networks—Overview, Recent Trends, Challenges, and Future Research Direction” Sensors, May 2020				
4. A. N. Uwaechia and N. M. Mahyuddin, A Comprehensive Survey on Millimeter Wave, Communications for Fifth-Generation Wireless Networks: Feasibility and Challenges, in IEEE, Access, vol. 8, pp. 62367-62414, 2020				
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 & SEE Theory courses

RUBRIC for CIE			RUBRIC for SEE		
SL.No	Content	Marks	Q. No	Contents	Marks
1	Quizzes - Q1 & Q2	20	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	: 22ET2D08T	TRACKING AND NAVIGATION SYSTEMS	CIE Marks	: 100
Credits L-T-P	: 3-0-0		SEE Marks	: 100
Hours	: 42L		SEE Durations	: 3 Hrs
Faculty Coordinator:		Prof. Shambulinga .M, Dr. B. Roja Reddy		
UNIT - I				9 Hrs
An Introduction to Radar: Basic Radar, The simple form of the Radar Equation, Radar Block Diagram, Radar Frequencies, Application of radar, Types of Radars. Detection of signals in Noise, Receiver Noise and the Signal-to Noise Ratio, Probability of Detection and False alarm, Introduction to Doppler, MTI, UWB Radars				
UNIT - II				8 Hrs
Terrestrial Network based positioning and navigation: General Issues of wireless positions location, Fundamentals, positioning in cellular networks, positioning in WLANs, Positioning in Wireless sensor networks.				
UNIT - III				8 Hrs
Satellite-based navigation systems: Global Navigation satellite systems (GNSS), GNSS receivers.				
UNIT - IV				9 Hrs
LiDAR: Introduction to LiDAR, context and conceptual discussion of LiDAR, Types of LiDARS, LiDARS Detection modes, Flash LiDAR versus Scanning LiDAR, Monostatic versus Bistatic LiDAR, Major Devices in a LiDAR, LiDAR remote sensing, Basic components and physical principles of LiDAR, LiDAR accuracy and data formats.				
UNIT - V				8 Hrs
SONAR: Underwater acoustics, applications, comparison with radar, submarine detection and warfare, overcoming the effects of the ocean, sonar and information processing. Transmission of the acoustic signal: Introduction, detection contrast and detection index, transmission equation, equation of passive and active sonar.				
Course Outcomes:				
After going through this course the student will be able to:				
CO1	:	Understand the concepts of Radar, LiDAR, Sonar, terrestrial and satellite based navigation system		
CO2	:	Apply the concepts of radars, LiDAR, Sonar, cellular networks, WLAN, sensor networks and satellites in determining the user position and navigation.		
CO3	:	Analyze the different parameters of satellite and terrestrial networks for navigation systems.		
CO4	:	Evaluate the Radar, LiDAR, Sonar systems and satellite and terrestrial network based navigation and tracking systems		
Reference Books:				
1. M. L Skolnik, Introduction to RADAR Systems, 3rd edition, 2017, TATA Mcgraw-Hill, ISBN: 978-0070445338				
2. Mark A Richards, James A Scheer, William A Holam, Principles of Modern Radar Basic Principles, 2010, 1st edition, SciTech Publishing Inc, ISBN: 978-1891121524 .				
3. Davide dardari, Emanuela Falletti, Marco Luise, Satellite and Terrestrial Radio Positioning techniques- A signal processing perspective, 1st Edition, 2012, Elsevier Academic Press, ISBN: 978-0-12-382084-6.				
4. Paul McManamon, LiDAR Technologies and Systems, SPIE press, 2019.				
5. Pinliang Dong and Qi Chen, LiDAR Remote Sensing and Applications, CRC Press, 2018, ISBN: 978-1-4822-4301-7				
6. Jean-Paul Marage, Yvon Mori, Sonar and Underwater Acoustics, Wiley, 2013, ISBN: 9781118600658				
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 & SEE Theory courses

RUBRIC for CIE			RUBRIC for SEE		
SL.No	Content	Marks	Q. No	Contents	Marks
1	Quizzes - Q1 & Q2	20	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	PROJECT MANAGEMENT	CIE Marks	: 100
Credits L-T-P	: 3-0-0		SEE Marks	: 100
Hours	: 42L		SEE Durations	: 3 Hrs
Faculty Coordinator:		Dr. Vikram N Bahadurdesai		
UNIT - I				8 Hrs
Introduction: Project Planning, Need of Project Planning, Project Life Cycle, Roles, Responsibility and Team Work, Project Planning Process, Work Breakdown Structure (WBS), Introduction to Agile Methodology.				
UNIT - II				8 Hrs
Capital Budgeting: Capital Investments: Importance and Difficulties, phases of capital budgeting, levels of decision making, facets of project analysis, feasibility study – a schematic diagram, objectives of capital budgeting				
UNIT - III				9 Hrs
Project Costing: Cost of Project, Means of Finance, Cost of Production, Working Capital Requirement and its Financing, Profitability Projections, Projected Cash Flow Statement, Projected Balance Sheet, Multi-year Projections, Financial Modeling, Social Cost Benefit Analysis				
UNIT - IV				8 Hrs
Tools & Techniques of Project Management: Bar (GANTT) chart, bar chart for combined activities, logic diagrams and networks, Project evaluation and review Techniques (PERT) Critical Path Method (CPM), Computerized project management				
UNIT - V				9 Hrs
Project Management and Certification: An introduction to SEI, CMMI and project management institute USA – importance of the same for the industry and practitioners. PMBOK 6 - Introduction to Agile Methodology, hemes / Epics / Stories, Implementing Agile. Domain Specific Case Studies on Project Management: Case studies covering project planning, scheduling, use of tools & techniques, performance measurement.				
Course Outcomes: After going through this course the student will be able to:				
CO1	:	Explain project planning activities that accurately forecast project costs, timelines, and quality.		
CO2	:	Evaluate the budget and cost analysis of project feasibility.		
CO3	:	Analyze the concepts, tools and techniques for managing projects.		
CO4	:	Illustrate project management practices to meet the needs of Domain specific stakeholders from multiple sectors of the economy (i.e. consulting, government, arts, media, and charity organizations).		
Reference Books:				
1. Prasanna Chandra, Project Planning Analysis Selection Financing Implementation & Review, Tata McGraw Hill Publication, 8th Edition, 2010, ISBN 0-07-007793-2.				
2. Project Management Institute, A Guide to the Project Management Body of Knowledge (PMBOK Guide), 5th Edition, 2013, ISBN: 978-1-935589-67-9				
3. Harold Kerzner, Project Management A System approach to Planning Scheduling & Controlling, John Wiley & Sons Inc., 11th Edition, 2013, ISBN 978-1-118-02227-6.				
4. Rory Burke, Project Management – Planning and Controlling Techniques, John Wiley & Sons, 4th Edition, 2004, ISBN: 9812-53-121-1				
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.				
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

RUBRIC for CIE			RUBRIC for SEE		
SL.No	Content	Marks	Q. No	Contents	Marks
1	Quizzes - Q1 & Q2	20	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	: 22IS2D10T	DATABASE AND INFORMATION SYSTEMS	CIE Marks	: 100
Credits L-T-P	: 3-0-0		SEE Marks	: 100
Hours	: 42L		SEE Durations	: 3 Hrs
Faculty Coordinator:		Prof.Smitha G R		
UNIT - I				8 Hrs
Advanced Database Models, Systems, and Applications : Enhanced Data Models: Introduction to Active, Temporal, Spatial, Multimedia, and Deductive Databases . Distributed Database Concepts : Distributed Database Concepts, Data Fragmentation, Replication, and Allocation Techniques for Distributed Database Design, Overview of Concurrency Control and Recovery in Distributed Databases				
UNIT - II				8 Hrs
Introduction to Information Retrieval and Web Search : Information Retrieval (IR) Concepts Retrieval Models, Types of Queries in IR Systems , Text Preprocessing , Inverted Indexing, Evaluation Measures of Search Relevance ,Web Search and Analysis, Trends in Information Retrieval .				
UNIT - III				8 Hrs
Information Systems, Organizations and Strategy: Organizations and information systems, How information systems impact organization and business firms, Using information systems to gain competitive advantage, management issues, Ethical and Social issues in Information Systems: Understanding ethical and Social issues related to Information Systems, Ethics in an information society, The moral dimensions of information society. A Case study on business planning.				
UNIT - IV				9 Hrs
Achieving Operational Excellence and Customer Intimacy: Enterprise systems, Supply chain management(SCM) systems, Customer relationship management(CRM) systems, Enterprise application. E-commerce: Digital Markets Digital Goods: E-commerce and the internet, E-commerce-business and technology, The mobile digital platform and mobile E-commerce, Building and E-commerce web site. A Case study on ERP.				
UNIT - V				9 Hrs
Managing Knowledge: The knowledge management landscape, Enterprise-wide knowledge management system, Knowledge work systems, Intelligent techniques. Enhancing Decision Making: Decision making and information systems, Business intelligence in the enterprise. Business intelligence constituencies. Building Information Systems: Systems as planned organizational change, Overview of systems development.				
Course Outcomes: After going through this course the student will be able to:				
CO1	: Understand the different models for Infromation Retrieval.			
CO2	: Appricieate the technology of Information Retrieval and Web Search			
CO3	: To understand the basic principles and working of information technology.			
CO4	: Describe the role of information technology and information systems in business.			
Reference Books:				
1. Kenneth C. Laudon and Jane P. Laudon: Management Information System, Managing the Digital Firm, Pearson Education, 14th Global edition, 2016, ISBN:9781292094007.				
2. Fundamentals of Database Systems, Ramez Elmasri, Shamkant B. Navathe, 7th Edition, 2016, Published by Pearson, Copyright © , ISBN-10: 0133970779				
3. James A. O' Brien, George M. Marakas: Management Information Systems, Global McGraw Hill, 10th Edition, 2011, ISBN: 978-0072823110.				
4. Database Management Systems, Raghu Ramakrishnan and Johannes Gehrke, 3rd Edition, 2003, McGraw-Hill, ISBN: 9780071231510				
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 & SEE Theory courses				

RUBRIC for CIE			RUBRIC for SEE		
SL.No	Content	Marks	Q. No	Contents	Marks
1	Quizzes - Q1 & Q2	20	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	: 22IS2D11T	MANAGEMENT INFORMATION SYSTEMS	CIE Marks	: 100
Credits L-T-P	: 3-0-0		SEE Marks	: 100
Hours	: 42L		SEE Durations	: 3 Hrs
Faculty Coordinator:		Prof. Vanishree K		
UNIT - I				8 Hrs
Overview: Introduction: Professional Software Development, Software Engineering Ethics, Case studies. Software Processes: Models, Process activities, Coping with Change, Process improvement. The Rational Unified Process. Computer Aided Software Engineering. Agile Software Development: Introduction to agile methods, Agile development techniques, Agile project management and scaling agile methods. Information Systems in Global Business Today: The role of information systems in business today, Perspectives on information systems, Contemporary approaches to information systems				
UNIT - II				9 Hrs
Requirements Engineering and System Modeling: Software Requirements: Functional and Non-functional requirements. Requirements Elicitation, Specification, Validation and Change. System Modeling: Context models, Interaction models, Structural models, Behavioural models, Model driven architecture. Information Systems, Organizations and Strategy: Organizations and information systems, How information systems impact organization and business firms, Using information systems to gain competitive advantage, management issues				
UNIT - III				9 Hrs
Development and Testing: Design and implementation: Object oriented design using UML, Design patterns, Implementation issues, Open-source development. Software Testing: Development testing, Test-driven development, Release testing, User testing. Securing Information Systems: System vulnerability and abuse, Business value of security and control, Establishing framework for security and control, Technology and tools for protecting information resources. A case study on cybercrime.				
UNIT - IV				8 Hrs
Advanced Software Engineering: Dependable systems: Dependability properties, Sociotechnical systems, dependable processes, formal methods and dependability, A15 Availability and reliability, reliability requirements, Reliability measurements E-commerce: Digital Markets Digital Goods: E-commerce and the internet, E-commerce-business and technology, A Case study on ERP.				
UNIT - V				8 Hrs
Software Management: Project Management: Risk Management, Managing People, Teamwork, Project Planning: Software Pricing, Plan driven development, Project Scheduling, Agile planning, Estimation Techniques, COCOMO cost modeling. Building Information Systems: Systems as planned organizational change, Overview of systems development.				
Course Outcomes: After going through this course the student will be able to:				
CO1	: Understand and apply the fundamental concepts of software engineering for information systems.			
CO2	: Develop the knowledge about software engineering for management of information systems.			
CO3	: Interpret and recommend the use information technology to solve business problems.			
CO4	: Apply a framework and process for aligning organization's IT objectives with business strategy.			
Reference Books:				
1. Kenneth C. Laudon and Jane P. Laudon: Management Information System, Managing the Digital Firm, Pearson Education, 14th Global edition, 2016, ISBN:9781292094007.				
2. Ian Sommerville,— Software Engineering, 9th Edition, Pearson Education, 2013, ISBN: 9788131762165				
3. W.S. Jawadekar: Management Information Systems, Tata McGraw Hill, 2006, ISBN: 9780070616349.				
4. James A. O' Brien, George M. Marakas: Management Information Systems, Global McGraw Hill, 10th Edition, 2011, ISBN: 978-0072823110				
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 & SEE Theory courses				

RUBRIC for CIE			RUBRIC for SEE		
SL.No	Content	Marks	Q. No	Contents	Marks
1	Quizzes - Q1 & Q2	20	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	: 22MAT2D12T	STATISTICAL AND OPTIMIZATION METHODS	CIE Marks	: 100
Credits L-T-P	: 3-0-0		SEE Marks	: 100
Hours	: 42L		SEE Durations	: 3 Hrs
Faculty Coordinator:		Dr. PRAKASH R		
UNIT - I				9 Hrs
Random Vectors: Probability models of N random variables, Vector notation, Marginal probability functions, Independence of random variables and random vectors, Functions of random vectors, Expected value vector and Correlation matrix, Gaussian random vectors Expected values of sums, Probability density function of the sum of two random variables, Moment Generating Functions (MGF), MGF of the sum of independent random variables, Characteristic function and Probability generating function.				
UNIT - II				8 Hrs
Estimation: Point estimation, Estimator and estimate, Criteria for good estimates - unbiasedness, consistency, efficiency and sufficiency, Variance of a point estimator, Methods of point estimation - Method of moments and Method of maximum likelihood, Bayesian estimation of parameters.				
UNIT - III				9 Hrs
Inferential Statistics: Principles of Statistical Inference, Formulation of the problems with examples. Test of hypothesis - Null and alternative hypothesis, Procedure for statistical testing, Type I and Type II errors: level of significance, Rejection regions and power, Standard Normal null distribution (Z-test), Z-tests for means and proportions, Duality: two-sided tests and two-sided confidence intervals, P-value, Inference about variances, Special tests of significance for large and small samples (F, Chi – square, Z, t – test).				
UNIT - IV				8 Hrs
Fuzzy Optimization: Basic concepts of fuzzy sets - Operations on fuzzy sets, Fuzzy relation equations, Fuzzy logic control, Fuzzification, Defuzzification, Knowledge base, Decision making logic, Membership functions, Rule base. Artificial Neural Networks: Introduction - Neuron model, Multilayer perceptions - Back propagation algorithm and its variants, Loss functions in artificial neural networks, Stochastic gradient descent method.				
UNIT - V				8 Hrs
Machine Learning Algorithms: Data mining, Hierarchy Clustering, k-Means Clustering, Distance Metric, Data mining for Big data, Characteristics of Big data, Statistical nature of Big data, Support Vector Machines, Statistical Learning Theory, Linear Support Vector Machine, Kernel functions and Nonlinear Support Vector Machines.				
Course Outcomes: After going through this course the student will be able to:				
CO1	:	Illustrate the fundamental concepts of statistics, random variables, estimation, inferential statistics, fuzzy optimization and machine learning algorithms.		
CO2	:	Derive the solution by applying the acquired knowledge of random variables, estimation, inferential statistics, fuzzy optimization and machine learning algorithms to the problems of engineering applications.		
CO3	:	Evaluate the solution of the problems using appropriate statistical and probability techniques to the real world problems arising in many practical situations.		
CO4	:	Compile the overall knowledge of statistics, probability distributions and estimation, tests of hypothesis and optimization gained to engage in life – long learning.		
Reference Books:				
1. Roy D. Yates, David J. Goodman, “Probability and Stochastic Processes”, 3rd Edition, An Indian Adaptation, Wiley, 2021, ISBN: 9789354243455.				
2. Douglas C. Montgomery and George C. Runger, “Applied Statistics and Probability for Engineers”, 7th Edition, John Wiley & Sons, 2019, ISBN: 9781119570615.				
3. Trevor Hastie Robert Tibshirani Jerome Friedman, “The Elements of Statistical Learning - Data Mining, Inference, and Prediction”, 2nd Edition, Springer, 2009 (Reprint 2017), ISBN-10: 0387848576, ISBN-13: 9780387848570.				
4. Michael Baron, “Probability and Statistics for Computer Scientists”, 2nd Edition, CRC Press, 2014, ISBN- 13: 978-1-4822-1410-9.				
5. Shai Shalev-Shwartz and Shai Ben-David “Understanding Machine Learning: From Theory to Algorithms”, 1st Edition, Cambridge University Press, 2014, ISBN: 978-1-107-05713-5.				

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 & SEE Theory courses

RUBRIC for CIE			RUBRIC for SEE		
SL.No	Content	Marks	Q. No	Contents	Marks
1	Quizzes - Q1 & Q2	20	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	: 22ME2D13T	INDUSTRY 4.0 <i>Elective D (Global Elective)</i>	CIE Marks	: 100
Credits L-T-P	: 3-0-0		SEE Marks	: 100
Hours	: 42L		SEE Durations	: 3 Hrs
Faculty Coordinator:		Dr. Gopalakrishna H D		
UNIT - I				8 Hrs
Fundamentals of Industry 4.0 Introduction, Industry 4.0, RAMI 4.0 (Reference Architecture Model Industry 4.0), Servitization, Product Service-System (PSS) Industry 4.0 across the Sectors Introduction, Transportation 4.0: Multimodal Transportation Systems, Rail 4.0, Digital Transformation of Railways, Logistics 4.0 (Implications), Fundamentals of Industry 4.0, Introduction, Industry 4.0, RAMI 4.0 (Reference Architecture Model Industry 4.0), Servitization, Product Service-System (PSS) Industry 4.0 across the Sectors Introduction, Transportation 4.0: Multimodal Transportation Systems, Rail 4.0, Digital Transformation of Railways, Logistics 4.0 (Implications)				
UNIT - II				8 Hrs
The Concept of the IIoT: Modern Communication Protocols, Wireless Communication Technologies, Proximity Network Communication Protocols, TCP/IP, API: A Technical Perspective, Middleware Architecture.				
UNIT - III				8 Hrs
Data Analytics in Manufacturing: Introduction, Power Consumption in manufacturing, Anomaly Detection in Air Conditioning, Smart Remote Machinery Maintenance Systems with Komatsu, Quality Prediction in Steel Manufacturing. Internet of Things and New Value Proposition, Introduction, Internet of Things Examples, IoTs Value Creation Barriers: Standards, Security and Privacy Concerns. Advances in Robotics in the Era of Industry 4.0, Introduction, Recent Technological Components of Robots, Advanced Sensor Technologies, Artificial Intelligence, Internet of Robotic Things, Cloud Robotics.				
UNIT - IV				9 Hrs
Additive Manufacturing Technologies and Applications: Introduction, Additive Manufacturing (AM) Technologies, Stereo lithography, 3DP, Fused Deposition Modeling, Selective Laser Sintering, Laminated Object Manufacturing, Laser Engineered Net Shaping, Advantages of Additive Manufacturing, Disadvantages of Additive Manufacturing. Advances in Virtual Factory Research and Applications, The State of Art, The Virtual Factory Software , Limitations of the Commercial Software.				
UNIT - V				9 Hrs
Augmented Reality: Definitions and application of AR, VR, MR, Limitations of AR, VR, Hardware devices and Software systems, Technical issues and challenges in AR, Industrial applications, IoT and the Need for Data Rationalization Internet of Things (IoT), Internet of Things Vision, Internet of Things (IoT) Frameworks, Architecture of Internet of Things (IoT), Visualizing the Internet of Things (IoT), Essential Technologies of the Internet of Things (IoT), Key Technologies Involved in Internet of Things, Enablers of IoT, Collaborative Operations , Training. Smart Factories: Introduction, Smart factories in action, Importance, Real world smart factories, The way forward. A Roadmap: Digital Transformation, Transforming Operational Processes, Business Models, Increase Operational Efficiency, Develop New Business Models.				
Course Outcomes: After going through this course the student will be able to:				
CO1	:	Understand the opportunities, challenges brought about by Industry 4.0 for benefits of organizations and individuals		
CO2	:	Analyze the effectiveness of Smart Factories, Smart cities, Smart products and Smart services		
CO3	:	Apply the Industrial 4.0 concepts in a manufacturing plant to improve productivity and profits		
CO4	:	Evaluate the effectiveness of Cloud Computing in a networked economy		
Reference Books:				
1. Alasdair Gilchrist, Industry 4.0 The Industrial Internet Of Things, Apress Publisher, ISBN-13 (pbk): 978-1-4842-2046-7				
2. Alp Ustundag, Emre Cevikcan, Industry 4.0: Managing The Digital Transformation, Springer, 2018 ISBN 978-3-319-57869-9.				
3.Ovidiu Vermesan and Peer Friess, Designing the industry - Internet of things connecting the physical, digital and virtual worlds, Rivers Publishers, 2016 ISBN 978-87-93379-81-7				
4.Christoph Jan Bartodziej, The concept Industry 4.0- An Empirical Analysis of Technologies and Applications in Production Logistics, Springer Gabler, 2017 ISBN 978-3-6581-6502-4.				

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

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

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

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

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

RUBRIC for CIE			RUBRIC for SEE		
SL.No	Content	Marks	Q. No	Contents	Marks
1	Quizzes - Q1 & Q2	20	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	: 22MCE24L	WEB APPLICATION DEVELOPMENT LAB (Coding / Skill Laboratory)	CIE Marks	:	50
Credits L-T-P	: 1 - 0 - 1		SEE Marks	:	50
Hours	: 14L + 28P		SEE Durations	:	3 Hrs
Faculty Coordinator:		Dr. Prathiba D and Dr. Chethana R Murthy			
Content					28 Hrs
<p>Design and develop the web application/s as per the requirements specified.</p> <p>1. Web Application Layout, Links and Design Formatting</p> <p>a) Develop a web application to control over different layouts., b) Create a webpage with HTML describing your department use paragraph and list tags.</p> <p>c) Apply various colors to suitable distinguish key words, also apply font styling like italics, underline and two other fonts to words you find appropriate, also use header tags.</p> <p>d) Create links on the words e.g. “Wi-Fi” and “LAN” to link them to Wikipedia pages., e) Develop a web application with background banner image and navigation menus.</p> <p>f) Develop a web application with responsive images., g) Develop a web application using left menu. d. Develop setting to change the theme of entire web Application.</p> <p>2. Responsive Interface using Bootstrap and JavaScript</p> <p>a) Develop a responsive web application with Admin panel and tables with static data., b) Set up the Folder Structure., c) Write the Model code and initialize the application.</p> <p>d) Implement the list objects and use cases., e) Implement the create object use case., f) Implement the update object use case.</p> <p>3. Interactive Forms and Ajax Data Binding</p> <p>a) Develop Web Page Styles using JavaScript and CSS, b) Develop Script interactive forms, c) Data binding using Ajax., 4. Programming with React</p> <p>a) Setting up development environment. b) Write source code using Typescript. c) Basics Interactive examples.</p> <p>d) Function Components and Class Components</p> <p>e) React Native Fundamental, Handling Text Input, f) Using a scroll View, using List View. g) Platform Specific Code.</p> <p>5. Build a Drunken Snake Game using Hooks</p> <p>a) Introduction and scaffolding the project. b) Components, Props and Styles. c) State and Lifecycle Events. d) Extended Game Functionality. e) Finishing up and Deployment.</p> <p>6. PHP Sessions Box React for Data Visualization</p> <p>a) Introduction and scaffolding the Project. b) Pages and Layout. c) Working with an API, CSS-in-JS. d) Dynamic Pages and React Hooks. e) Custom React Hooks, Dynamic CSS-in-JS.</p> <p>f) Finishing up and Deployment. g) Optimization and PWA.</p> <p>7. Chat Application, API responses</p> <p>a) Firebase Environment. Introduction and Scaffolding the project.b) Private and Public pages, Context API.c) Creating Side bar and Dashboardd) Creating and displaying Chat Rooms.e) Creating Layout for Chat page.f) Context API Problem-solution for the chat messages.g) Denormalization of the data to be stored in app.</p> <p>h) Displaying chat feed for Interactive UI along with Real time user presence.</p> <p>8. Databases Handling</p> <p>a) Role Based Access.b) Messages Likes and deletion.c) File and Audio Chat Messagesd) Extended Chat Features and Deployment</p>					
Course Outcomes:					
After going through this course the student will be able to:					
CO1	:	Design interactive web applications with database using JavaScript, React and React Native.			
CO2	:	Apply features to create a functioning web application.			
CO3	:	Develop skills in client-side web application development technologies.			
CO4	:	Develop Client-side browser-based web application.			

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

Sl.No	RUBRIC FOR CIE		RUBRIC FOR SEE	
	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	
3	Laboratory Internal	10	Viva Voce	10
	Total Marks	50	Total Marks	50

SEMESTER: II				
Course Code	: 22HSS25T	PROFESSIONAL SKILL DEVELOPMENT- I	CIE Marks	: 50
Credits L-T-P	: 2-0-0		SEE Marks	: 50
Hours	: 28L	<i>Common Course to all M.Tech Programs</i>	SEE Durations	: 2 Hrs
Faculty Coordinator:		Dr. C.Bindu Ashwini		
UNIT - I				4 Hrs
Communication Skills: Basics of Communication, Personal Skills & Presentation Skills – Introduction, Application, Simulation, Attitudinal Development, Self Confidence, SWOC analysis. Resume Writing: Understanding the basic essentials for a resume, Resume writing tips Guidelines for better presentation of facts. Theory and Applications.				
UNIT - II				8 Hrs
Quantitative Aptitude and Data Analysis: Number Systems, Math Vocabulary, fraction decimals, digit places etc. Simple equations – Linear equations, Elimination Method, Substitution method, Inequalities. Reasoning – a. Verbal - Blood Relation, Sense of Direction, Arithmetic & Alphabet. b. Non- Verbal reasoning - Visual Sequence, Visual analogy and classification. Analytical Reasoning - Single & 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 flaws, arguments and assumptions. Verbal Analogies/Aptitude – introduction to different question types – analogies, Grammar review, sentence completions, sentence corrections, antonyms/synonyms, vocabulary building etc. Reading Comprehension, Problem Solving,				
UNIT - III				6 Hrs
Interview Skills: Questions asked & how to handle them, Body language in interview, and Etiquette – Conversational and Professional, Dress code in interview, Professional attire and Grooming, Behavioral and technical interviews, Mock interviews - Mock interviews with different Panels. Practice on Stress Interviews, Technical Interviews, and General HR interviews				
UNIT - IV				5 Hrs
Interpersonal and Managerial Skills: Optimal co-existence, cultural sensitivity, gender sensitivity; capability and maturity model, decision making ability and analysis for brain storming; Group discussion(Assertiveness) and presentation skills;				
UNIT - V				5 Hrs
Motivation: Self-motivation, group motivation, Behavioral Management, Inspirational and motivational speech with conclusion. (Examples to be cited). Leadership Skills: Ethics and Integrity, Goal Setting, leadership ability.				
Course Outcomes:				
After going through this course the student will be able to:				
CO1	:	Develop professional skill to suit the industry requirement.		
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 Mcmillan 2012 Edition, McGraw-Hill Publication ISBN: 9780071772204				
4. Ethnus, Aptimithra: Best Aptitude Book ,2014 Edition, Tata McGraw Hill ISBN: 9781259058738				

Phase *	Activity
I	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.
II	Test 2 is conducted after the completion of 18 hours of training programme (6 Classes). Question paper will have two parts. Part A will be Quiz for 10 Marks and Part B for 50 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 End Examination: SEE is conducted for 50 Marks for a duration of 2 hours.	



SEMESTER: III					
Course Code	: 22MCE31T	High Performance Computing Architectures	CIE Marks	:	100
Credits L-T-P	: 3- 1 - 0		SEE Marks	:	100
Hours	: 42L+28T		SEE Durations	:	3 Hrs
Faculty Coordinator:		Dr. Azra Nasreen and Dr. Minal Moharir			
UNIT - I					9 Hrs
Fundamentals of computer design					
Introduction; Classes computers; Defining computer architecture; Trends in Technology; Trends in power in Integrated Circuits; Trends in cost; Dependability, Measuring, reporting and summarizing Performance attributes; Quantitative Principles of computer design					
UNIT - II					9 Hrs
Introduction to Parallel Programming					
Motivation, Scope of Parallel Computing, Principles of Parallel Algorithm design: Preliminaries, Decomposition Techniques, Characteristics of Tasks and Interactions, Mapping Techniques for Load Balancing, Methods for containing Interaction Overheads, Parallel Algorithms Models					
UNIT - III					8 Hrs
Programming Using the Message Passing Paradigm					
Principles of Message Passing Programming, Building Blocks, MPI, Topologies and Embedding, Overlapping Communication with computation, Collective Communication and computation operations, Groups and Communicators.					
UNIT - IV					8 Hrs
Overview of OpenMP and GPU Architectures					
Introduction, the idea of OpenMP, the feature set, OpenMP Language Features, Parallel Construct, Sharing the work among threads in an OpenMP program, Clauses to control parallel and Work-Sharing Constructs, OpenMP Synchronization Constructs. Introduction to Graphics Processing Units, Detecting and Enhancing Loop-Level Parallelism, Mobile versus Server GPUs and Tesla versus Core i7, GPU programming using CUDA					
UNIT - V					8 Hrs
*Heterogeneous Computing From Serial To Parallel Programming Using OpenAcc, a simple data-parallel loop, the OpenAcc kernels and parallel construct, the various forms of OpenAcc parallelism.					
Intel FPGAs: Introduction to Intel FPGAs and Intel Quartus Prime Design Software- FPGA design and implementation.					
Intel SoC FPGAs:					
Introduction to Intel SoC FPGAs - IP design and Platform designer, Embedded System design using Cyclone V and ARM -SoC Design Flow					
Course Outcomes:					
After going through this course the student will be able to:					
CO1	:	Explore the fundamental concepts of parallel computer architecture			
CO2	:	Analyze the performance of parallel programming			
CO3	:	Design parallel computing constructs for solving complex problems.			
CO4	:	Demonstrate parallel computing concepts for suitable applications			
Reference Books					
1. Computer Architecture: A Quantitative Approach, John L Hennessy, David A Patterson, Elsevier, 5th Edition; 2011, ISBN: 9780123838728.					
2. Introduction to Parallel Computing, Ananth Grama, Anshul Gupta, George Karypis, Vipin Kumar : 2nd edition, Pearson Education, 2007					
3. Parallel Programming with Open ACC, Rob Farber1st edition, 2016, ISBN :9780124103979					
4. Using Open MP Portable Shared Memory Parallel Programming, Barbara Chapman, Gabriele Jost, Ruud van der Pas, 2008, The MIT Press, ISBN: 978-0-262-53302-7.					

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

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

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

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

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

Rubric for CIE & SEE Theory courses

RUBRIC for CIE			RUBRIC for SEE		
SLNo	Content	Marks	Q. No	Contents	Marks
1	Quizzes - Q1 & Q2	20	Each unit consists of TWO questions of 20 Marks each. Answer FIVE 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: III				
Course Code	: 22MIT3E1T	Augmented Reality & Virtual Reality	CIE Marks	: 100
Credits L-T-P	: 3- 1 - 0		SEE Marks	: 100
Hours	: 42L+28T		SEE Durations	: 3 Hrs
Faculty Coordinator:		Prof. Ashwini K B		
UNIT - I				9 Hrs
Introduction to Virtual Reality and its applications, Geometry of Virtual Worlds: Geometric models, Transforming models, 2D and 3D rotation yaw, pitch, and roll Programming with Unity: Unity Basics, Manipulating the Scene, Code blocks and Methods, Debugging Conditional and looping statements				
UNIT - II				9 Hrs
Programming with Unity: Working with objects, Working with Scripts, Player movement, Camera Movement, Menu and UI, Advanced 3D movement Further Learning for Unity: The Asset Store. Mouse-Aimed camera: First Person Controller, Third Person Controller.				
UNIT - III				8 Hrs
Augmented Reality, Mixed Reality and its applications, Tracking: Tracking, Calibration, and Registration, Characteristics of Tracking Technology, Stationary Tracking Systems, Mobile Sensors, Optical Tracking, Sensor Fusion. Computer Vision for Augmented Reality : Marker-based tracking, Marker-less tracking.				
UNIT - IV				8 Hrs
Modeling Tools for AR : An introduction to Blender. Modeling of an object, Sculpting objects, Importing from Blender to Unity, Modifiers, Particle system, Animation.				
UNIT - V				8 Hrs
Introduction to WebXR: Entering VR through WebXR, Life cycle of WebXR application, Creating an XR session through WebXR. Creating an AR website with WebXR: Object creation, spatial tracking, start AR session, animate, create an event handling function for the end of the session.				
Course Outcomes: After going through this course the student will be able to:				
CO1	:	Understand the concepts of Virtual Reality/Augmented Reality and its Applications		
CO2	:	Identify immersive effects and its usage to experience AR/VR through exploration of its environment		
CO3	:	Apply virtual/augmented environment to captivate its experiences		
CO4	:	Analyze the technology for unimodal/multimodal user interaction in AR and VR		
Reference Books				
1. "Virtual Reality", Steven M. LaValle, Copyright Steven M. LaValle 2017 Available for downloading at http://vr.cs.uiuc.edu/				
"AR and VR Using the WebXR API", Rakesh Baruah, 2021, ISBN-13 (pbk): 978-1-4842-6317-4 ISBN-13 (electronic): 978-1-4842-6318-1 https://doi.org/10.1007/978-1-4842-6318-1				
3. Augmented Reality Principles and Practice", Dieter Schmalstieg Tobias Höllerer, 2016 Pearson Education, Inc., ISBN-13: 978-0-321-88357-5				
4. Blender 3D: Designing Objects" , Romain Caudron, Pierre-Armand Nicq, Enrico Valenza, 2016, Packt Publishing Ltd, ISBN 978-1-78712-719-7				
Scheme of Continuous Internal Evaluation (CIE): 20 + 40 + 40 = 100				
QUIZZES: Quizzes will be conducted in online/offline mode. Two quizzes will be conducted & Each Quiz will be evaluated for 10 Marks. The sum of two quizzes will be the Final Quiz marks.				
TESTS: Students will be evaluated in test, descriptive questions with different complexity levels (Revised Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating). Two tests will be conducted. Each test will be evaluated for 50 Marks, adding upto 100 Marks. Final test marks will be reduced to 40 Marks.				
EXPERIENTIAL LEARNING: Students will be evaluated for their creativity and practical implementation of the problem. Case study-based teaching learning and Program specific requirements (15), Video based seminar/presentation/demonstration (25) adding upto 40 marks.				

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

Rubric for CIE & SEE Theory courses

RUBRIC for CIE			RUBRIC for SEE		
SLNo	Content	Marks	Q. No	Contents	Marks
1	Quizzes - Q1 & Q2	20	Each unit consists of TWO questions of 20 Marks each. Answer FIVE 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: III				
Course Code	: 22MCE3E2T	CYBER SECURITY	CIE Marks	: 100
Credits L-T-P	: 3- 1 - 0		SEE Marks	: 100
Hours	: 42L+28T		SEE Durations	: 3 Hrs
Faculty Coordinator:		Dr. Sowmyarani C N and Dr. Sindhu D V		
UNIT - I				9 Hrs
Cyber Security Fundamentals Network and Security Concepts, Information Assurance Fundamentals, Basic Cryptography, Symmetric Encryption, Public Key Encryption, The Domain Name System (DNS), Firewalls, Virtualization, Radio-Frequency Identification, Microsoft Windows Security Principles, Windows Tokens, Window Messaging, Windows Program Execution, The Windows Firewall				
UNIT - II				9 Hrs
Attacker Techniques and Motivations How Hackers Cover Their Tracks (Anti-forensics), How and Why Attackers Use Proxies, Tunneling Techniques, Fraud Techniques, Phishing, Smishing, Vishing and Mobile Malicious Code, Rogue Anti-Virus, Click Fraud, Threat Infrastructure, Botnets, Fast-Flux, Advanced Fast-Flux.				
UNIT - III				8 Hrs
Exploitation Techniques to Gain a Foothold , Shell code, Integer Overflow, Vulnerabilities, Stack-Based Buffer Overflows, Format-String Vulnerabilities, SQL Injection, Malicious PDF Files, Race Conditions, Web Exploit Tools, *DoS Conditions, Cross-Site Scripting (XSS).				
UNIT - IV				8 Hrs
Malicious Code Self-Replicating Malicious Code, Worms, Viruses, Evading Detection and Elevating Privileges ,Obfuscation ,Virtual Machine Obfuscation ,Persistent Software Techniques, Rootkits, Spyware, Attacks against Privileged User Accounts and Escalation of Privileges, Stealing Information and Exploitation, Form Grabbing, Man-in-the-Middle Attacks.				
UNIT - V				8 Hrs
Digital Forensics Process Model :Introduction to cybercrime scene, Documenting the scene and evidence, maintaining the chain of custody, forensic cloning of evidence, Live and dead system forensic, Hashing concepts to maintain the integrity of evidence, Report drafting.				
Course Outcomes: After going through this course the student will be able to:				
CO1	: Apply the concepts of cyber security to various applications.			
CO2	: Analyze the patterns and techniques used by attackers.			
CO3	: Analyze various types of malicious codes and exploit to attack the system resources.			
CO4	: Develop a defence mechanism to handle attacks.			
Reference Books				
1. Cyber Security Essentials, James Graham, Richard Howard, Ryan Olson- CRC Press, 2011 by Taylor and Francis Group. ISBN13: 978-1-4398-5126-5.				
2. Cyber security: turning national solutions into international cooperation, James A. Lewis, Volume 25, Number 4, 2003 by center for strategic and international studies, ISBN: 0-89206-426-9.				
3.Cyber security: The Essential Body of Knowledge, Dan Shoemaker, Ph.D., William Arthur Conklin, Wm Arthur Conklin 2012 by cengage learning, Import Edition ISBN13:978-1-4354-8169-5.				
4. The basics of digital Forensics (Latest Edition) – The primer for getting started in digital forensics by John Sammons – Elsevier Syngress Imprint				
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 & SEE Theory courses

RUBRIC for CIE			RUBRIC for SEE		
SLNo	Content	Marks	Q. No	Contents	Marks
1	Quizzes - Q1 & Q2	20	Each unit consists of TWO questions of 20 Marks each. Answer FIVE 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: III					
Course Code	: 22MCE3E3T	SOFTWARE PRODUCT DEVELOPMENT (DevOps)	CIE Marks	:	100
Credits L-T-P	: 3- 1 - 0		SEE Marks	:	100
Hours	: 42L+28T			SEE Durations	:
Faculty Coordinator:		Dr. Badarinath K and Prof. Girish Rao Salanke			
UNIT - I					9 Hrs
Introduction to DevOps: Agile Way of Thinking, Agile Frameworks, - Scrum Events and Artifacts, Scrum Roles, Agile Estimating, Planning, Monitoring and Control DevOps Overview, Relationship between Agile and DevOps, DevOps Toolchain, DASA DevOps Principles, Challenges with the Traditional Approach, Addressing Challenges through DevOps, DevOps Approach to the challenges, Overview of DevOps Tools, Best Practices for DevOps, Categories of DevOps Tools, Workflow of DevOps					
UNIT - II					9 Hrs
Version Control Systems: Overview of Version Control Systems, Role of Version Control Systems, Types of Control Systems and Their Supporting Tools, Overview of Git, Overview of Source code and Version Control Hosts, Deploy the Files to GitHub via Git					
UNIT - III					8 Hrs
Continuous Integration and Continuous Deployment: Overview and Importance of Continuous Integration , Overview and Features of Jenkins, Set up Jenkins, Build Tools and Their Uses, Continuous Integration with Jenkins and Maven					
UNIT - IV					8 Hrs
Configuration Management Tools and Containerization with Docker: Overview of Configuration Management Tools, Managing Infrastructure, Types of Configuration Management Tools, Overview of Puppet, Demonstrate Puppet Configuration, Overview of Chef, Demonstrate Chef Configuration Overview of Docker, Overview of Virtualization, Docker Installation on Multiple OS, MySQL Database in Docker Container, Docker Installation on Multiple OS, Using Docker Compose to Manage a Container, Docker Registry, Run Docker Registry with Centos, Docker Networking, Demonstrate Docker Networking with Two SSHs					
UNIT - V					8 Hrs
Continuous Monitoring and Need of Cloud in DevOps: Overview of Continuous Monitoring, Types of Monitoring Systems, Demonstrate Nagios, Working with Nagios Monitoring Tool, Overview of Grafana , ELK Stack. Containers Infrastructure Management tool - Kubernetes, Adding a Linux Node to the Kubernetes Cluster Overview of Cloud Computing, Cloud Services and Models, Using AWS in DevOps					
Course Outcomes: After going through this course the student will be able to:					
CO1	:	Explain the need for Optimization and improvements in core business, SCRUM methodology, the opportunities Based by DevOps and the automation in new product development.			
CO2	:	Apply DevOps tools for Configuration Management, Continuous Integration, Deployment, Delivery, and Monitoring.			
CO3	:	Demonstrate DevOps Tools - Git, Docker, Chef, Puppet, Jenkins and Nagios			
CO4	:	Analyse Application of appropriate tools to implement Cloud Computing and DevOps projects			
Reference Books					
1. Effective Devops: Building A Culture of Collaboration, Affinity, And Tooling At Scale, Shroff/O'Reilly; First edition, 2016, ISBN-10: 9352133765, ISBN-13: 978-9352133765					
2. Accelerate: The Science of Lean Software and Devops: Building and Scaling High Performing Technology Organizations, IT Revolution Press; 1st edition, 2018, ISBN-10: 1942788339, ISBN-13: 978-1942788331					
3.Site Reliability Engineering: How Google Runs Production Systems- 1st Edition, O'Reilly Publication, by Niall Richard Murphy, Betsy Beyer, Chris Jones, Jennifer Petoff ISBN-13: 978-1491929124, ISBN-10: 149192912X					
4. Practical DevOps - Second Edition, byJoakim Verona, Packt Publisher, ISBN – 9781788392570					

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 & SEE Theory courses

RUBRIC for CIE			RUBRIC for SEE		
SLNo	Content	Marks	Q. No	Contents	Marks
1	Quizzes - Q1 & Q2	20	Each unit consists of TWO questions of 20 Marks each. Answer FIVE 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: III				
Course Code	: 22MCE3E4T	Intelligent Systems	CIE Marks	: 100
Credits L-T-P	: 3- 1 - 0		SEE Marks	: 100
Hours	: 42L+28T	<i>Elective E (Professional Elective)</i>	SEE Durations	: 3 Hrs
Faculty Coordinator:		Dr. Badarinath K and Prof. Anitha Sandeep		
UNIT - I				9 Hrs
Introduction: The Foundations of Artificial Intelligence, History of Artificial Intelligence, The State of the Art, Intelligent Agent: Introduction, How Agents Should Act, Structure of Intelligent Agents, Problem-solving: Solving Problems by Searching Search Strategies, Avoiding Repeated States, Avoiding Repeated States				
UNIT - II				9 Hrs
Informed Search Methods: Best-First Search, Heuristic Functions, Memory Bounded Search, Iterative Improvement Algorithms, Game Playing: Introduction: Games as Search Problems, Perfect Decisions in Two-Person, Games Imperfect Decisions, Alpha-Beta Pruning, Games That Include an Element of Chance				
UNIT - III				8 Hrs
Knowledge Inference Knowledge representation - Production based system, Frame based system. Inference Backward chaining, Forward chaining, Rule value approach, Fuzzy reasoning - Certainty factors, Bayes Rule, Uncertainty Principles, Bayesian Theory-Bayesian Network-Dempster - Shafer theory.				
UNIT - IV				8 Hrs
Learning from Observations: A General Model of Learning Agents, Inductive Learning, Learning Decision Trees, Using Information Theory, Learning General Logical Descriptions, Why Learning Works: Computational Learning Theory, Reinforcement Learning: Passive Learning in a Known Environment, Passive Learning in an Unknown Environment, Active Learning in an Unknown Environment				
UNIT - V				8 Hrs
Expert Systems , Components, Production rules, Statistical reasoning, certainty factors, measure of belief and disbelief, Meta level knowledge, Introspection. Expert systems - Architecture of expert systems, Roles of expert systems - Knowledge Acquisition - Meta knowledge, Heuristics. Typical expert systems - MYCIN, DART, XOON, Expert systems shells.				
Course Outcomes: After going through this course the student will be able to:				
CO1	:	Analyze and explain basic intelligent system algorithms to solve problems		
CO2	:	Apply Artificial Intelligence and various logic-based techniques in real world problems.		
CO3	:	Assess their applicability by comparing different Intelligent System techniques		
CO4	:	Demonstrate skills like investigation, effective communication, working in team/Individual and following ethical practices by implementing intelligent systems concepts.		
Reference Books				
1. Artificial Intelligence – A Modern Approach , Stuart Russel, Peter Norvig , 3rd Edition, Pearson Education, 2010 , ISBN-10 : 0132071487 , ISBN-13 : 978-0132071482				
2. Artificial Intelligence (SIE) , Kevin Night, Elaine Rich, Nair B., , McGraw Hill, 1st Edition, 2008, ISBN: 9780070087705				
3. Introduction to AI and ES , Dan W. Patterson, Pearson Education, 1st Edition , 2007, ISBN: 0132097680				
4. Introduction to Expert Systems , Peter Jackson, 3rd Edition, Pearson Education, 2007, ISBN-978-0201876864				
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 & SEE Theory courses

RUBRIC for CIE			RUBRIC for SEE		
SLNo	Content	Marks	Q. No	Contents	Marks
1	Quizzes - Q1 & Q2	20	Each unit consists of TWO questions of 20 Marks each. Answer FIVE 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 III

Course Code	: 22MCE32N	INTERNSHIP	CIE Marks	: 50
Credits L-T-P	: 0 - 0 - 6		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
I	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.

SEMESTER III

Course Code	: 22MCE33P	MINOR PROJECT	CIE Marks	: 50
Credits L-T-P	: 0 - 0 - 6		SEE Marks	: 50
Hours/Week	: 12		SEE Durations	: 3 Hrs

Guidelines:

1. Each project group will consist of maximum of two students.
2. Each student / group has to select a contemporary topic that will use the technical knowledge of their program of study after intensive literature survey.
3. Allocation of the guides preferably in accordance with the expertise of the faculty.
4. The minor project would be performed in-house.
5. The implementation of the project must be preferably carried out using the resources available in the department/college.

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 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
I	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 %

* 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%

SEMESTER IV

Course Code	: 22MCE41P	MAJOR PROJECT	CIE Marks	: 100
Credits L-T-P	: 0 - 0 - 18		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	Weightage
I	Selection of Project Title, Formulation of Problem Statement and Objectives	20 %
II	Design, Implementation and Testing	40 %
II	Experimental Result & Analysis, Conclusions and Future Scope of Work, Report Writing and Paper Publication	40 %

* 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.

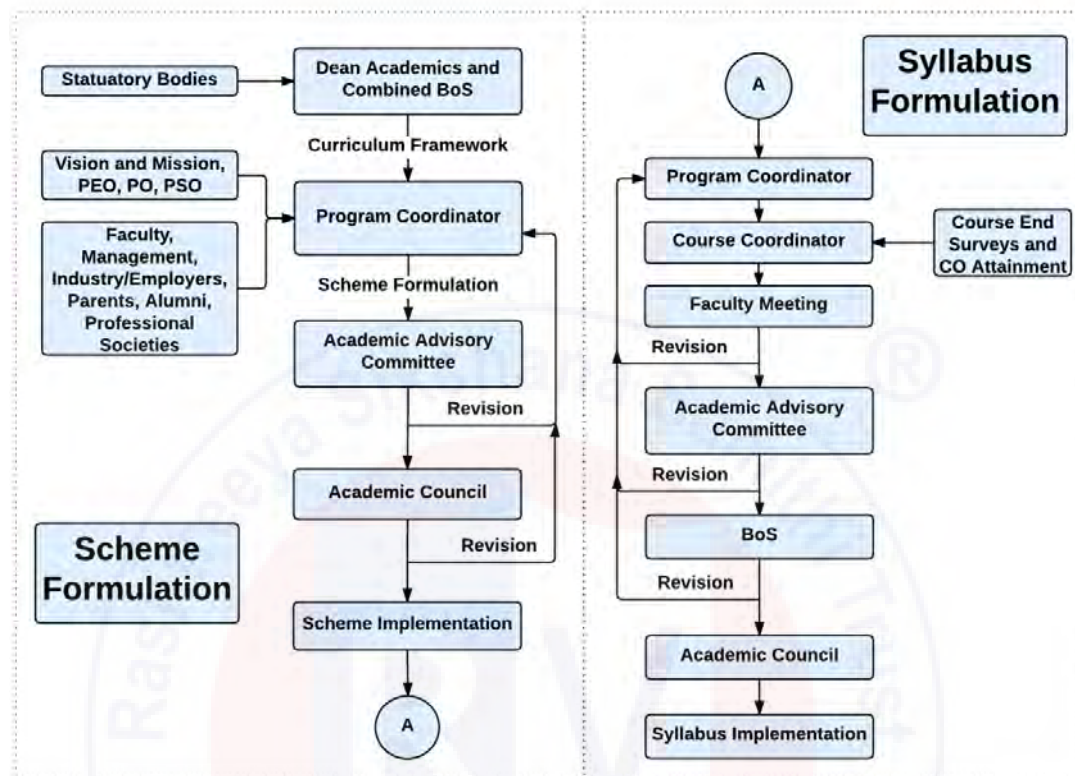
Stage-1 Report Evaluation: Evaluation of Project Report shall be done by the Guide and an External examiner.

Stage-2 Project Viva-voce: Major Project Viva-voce examination is conducted after receipt of evaluation reports from Guide and External examiner.

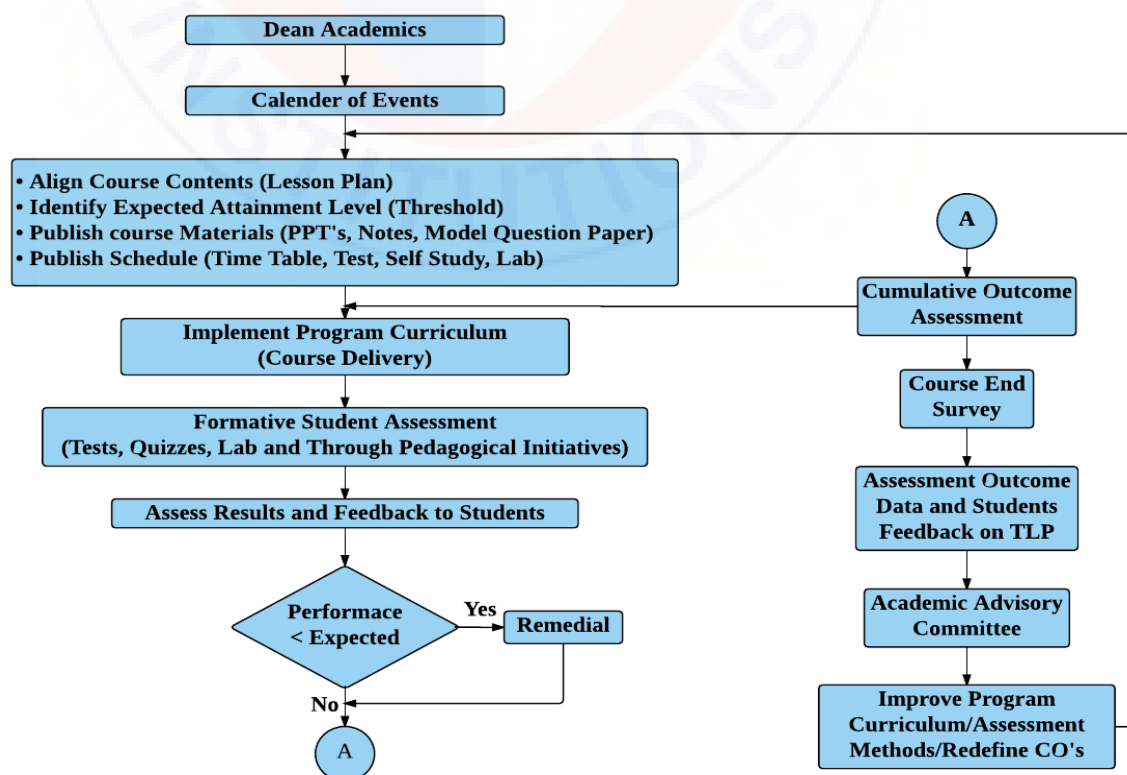
SEE procedure is as follows:

Report	Internal Examiner: 100 Marks	= 200	
Evaluation	External Examiner: 100 Marks	200 / 2 = 100	A
Viva-Voce	Jointly evaluated by Internal Guide & External Evaluator	= 100	B
Total Marks = (A + B) / 2 =		100	

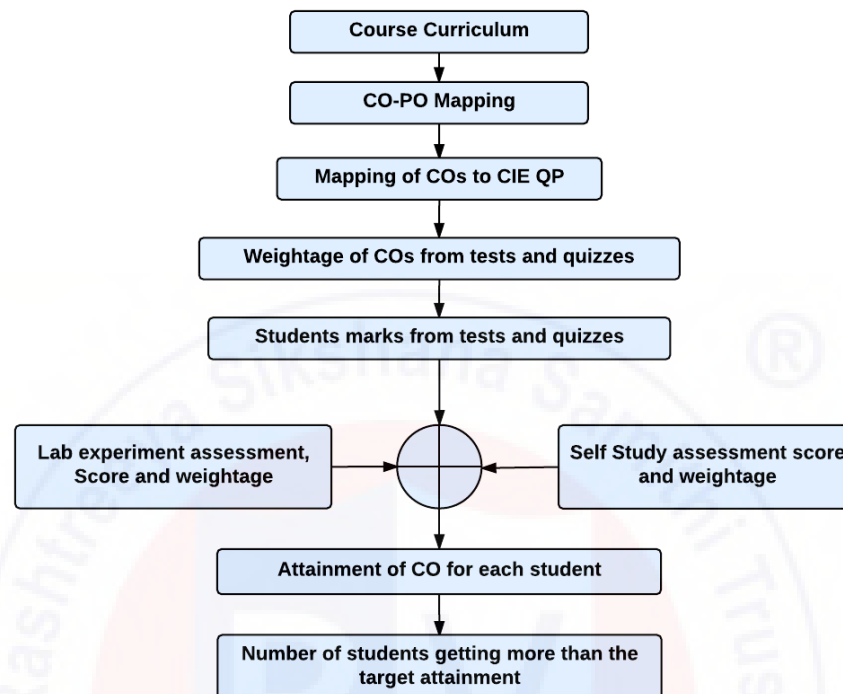
Curriculum Design Process



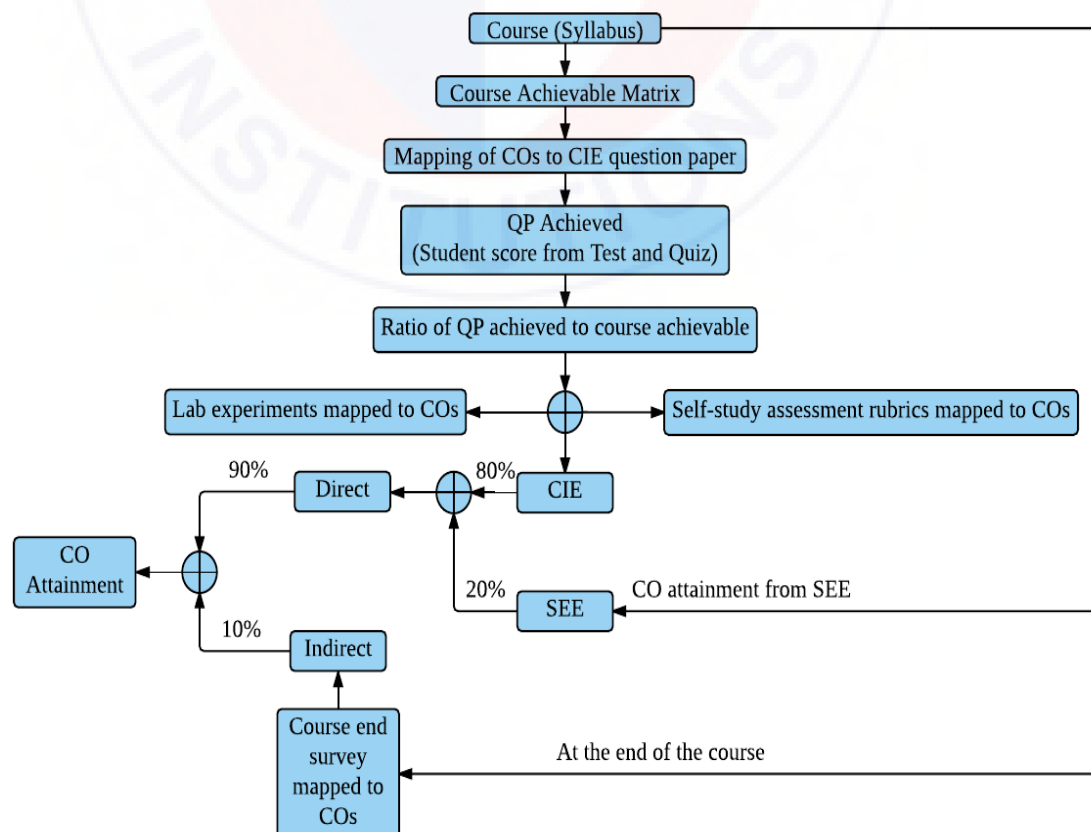
Academic Planning And Implementation



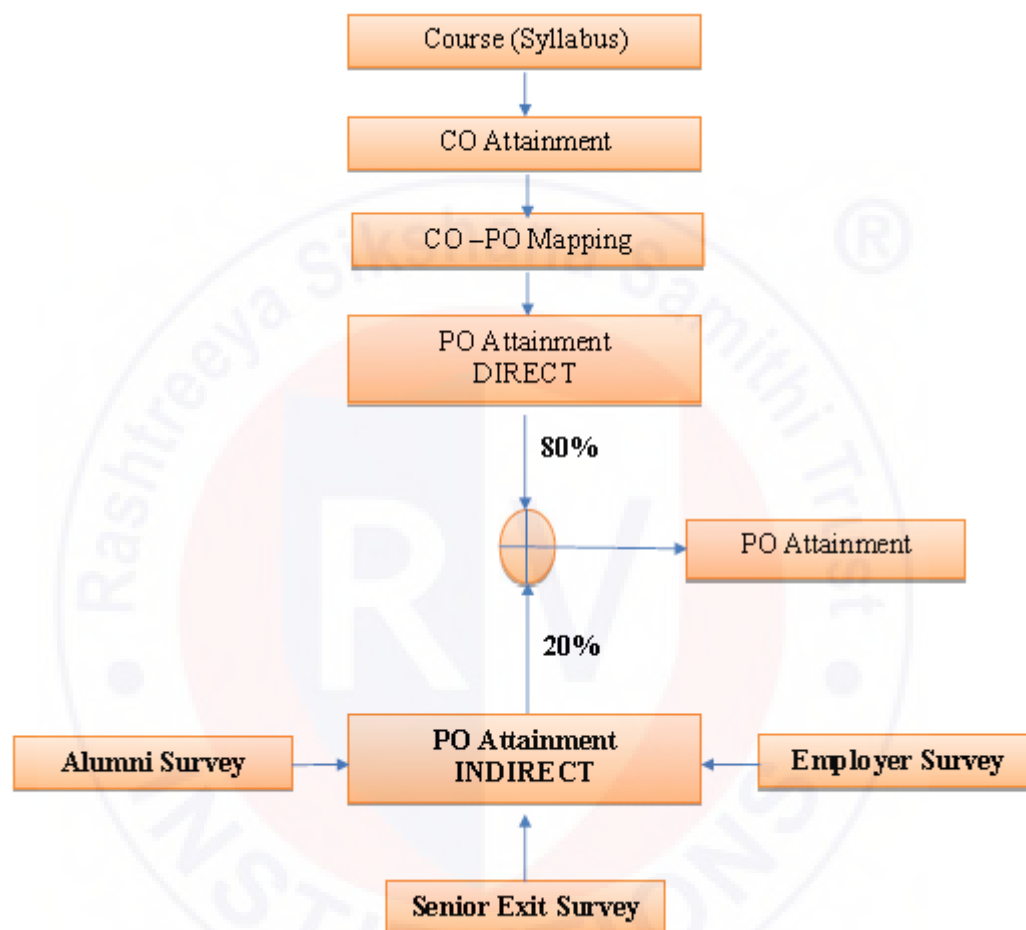
Process For Course Outcome Attainment



Final CO Attainment Process



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

NCC



NSS



"Not me but you"
"Education through
Community Service &
Community Service through education"

Cultural Activity Teams

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

VISION

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



MISSION

- ❖ To deliver outcome based Quality education, emphasizing on experiential learning with the state of the art infrastructure.
- ❖ To create a conducive environment for interdisciplinary research and innovation.
- ❖ To develop professionals through holistic education focusing on individual growth, discipline, integrity, ethics and social sensitivity.
- ❖ To nurture industry-institution collaboration leading to competency enhancement and entrepreneurship.
- ❖ To focus on technologies that are sustainable and inclusive, benefiting all sections of the society.



QUALITY POLICY

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

CORE VALUES

Professionalism, Commitment, Integrity, Team Work, Innovation



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