RV College of Engineering®

Master of Technology (M.Tech)
in

SOFTWARE ENGINEERING (MSE)

Scheme And Syllabus Of I & IV Semester
(2022 Scheme)

B.E. Programs : AI, AS, BT, CH, CS, CV, CD, CY, EC, EE, EI, ET, IM, IS, ME.
M. Tech (13) MCA, M.Sc. (Engg.)
Ph.D. Programs : All Departments are recognized as
Research Centres by VTU Except AI & AS

2024

96TH
NIRF RANKING IN ENGINEERING (2023)

1501+
501-600

EDUFUTURE EXCELLENCE AWARD
BEST PRIVATE ENGINEERING UNIVERSITY (SOUTH)
BY ZEE DIGITAL

1001+
SUBJECT RANKING (ENGINEERING)

801+
SUBJECT RANKING (COMPUTER SCIENCE)

IIRF 2023
ENGINEERING RANKING INDIA
NATIONAL RANK-10
STATE RANK - 2
ZONE RANK - 5

QS-IGUAGE DIAMOND UNIVERSITY RATING (2021-2024)

CURRICULUM STRUCTURE

61 CREDITS PROFESSIONAL CORES (PC)

23 CREDITS BASIC SCIENCE

22 CREDITS ENGINEERING SCIENCE

18 CREDITS PROJECT WORK / INTERNSHIP

12 CREDITS* OTHER ELECTIVES & AEC

12 CREDITS PROFESSIONAL ELECTIVES

12 CREDITS HUMANITIES & SOCIAL SCIENCE

160 CREDITS TOTAL

*ABILITY ENHANCEMENT COURSES (AEC), UNIVERSAL HUMAN VALUES (UHV), INDIAN KNOWLEDGE SYSTEM (IKS), YOGA.

17
Centers of Excellence

11
Centers of Competence

1381
Publications On Web Of Science

397
Publications On Web Of Science

1699
Citations

78
Patents Filed

38
Patents Granted

58
Published Patents

11
Skill Based Laboratories Across Four Semesters

MOUS: 90+WITH INSDUSTRIES / ACADEMIC INSTITUTIONS IN INDIA & ABROAD

EXECUTED MORE THAN RS.40 CRORES WORTH SPONSORED RESEARCH PROJECTS & CONSULTANCY WORKS SINCE 3 YEARS

RV College of Engineering®
Mysore Road, RV Vidyaniketan Post,
Bengaluru - 560059, Karnataka, India

Go, change the world

Master of Technology in

SOFTWARE ENGINEERING

SCHEME & SYLLABUS of I TO IV SEMESTER
2022 SCHEME

Glossary of Abbreviations

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

POSTGRADUATE PROGRAMS

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

DEPARTMENT OF INFORMATION SCIENCE & ENGINEERING

VISION

To be the hub for innovation in Information Science & Engineering through Teaching, Research, Development and Consultancy; thus make the department a global resource center in advanced, sustainable and inclusive

MISSION

1. To enable students to become responsible professionals, strong in fundamentals of information science and engineering through experiential learning
2. To bring research and entrepreneurship into classrooms by continuous design of innovative solutions through research publications and dynamic development-oriented curriculum.
3. To facilitate continuous interaction with the outside world through student internship, faculty consultancy, workshops, faculty development programs, industry collaboration and association with the professional societies.
4. To create a new generation of entrepreneurial problem solvers for a sustainable future through green technology with an emphasis on ethical practices, inclusive societal concerns, and environment
5. To promote teamwork through interdisciplinary projects, co-curricular and social activities.

PROGRAMME OUTCOMES (PO)

M. Tech in **Software Engineering** graduates will be able to:

PO1: An ability to independently carry out research /investigation and development work to solve practical problems.

PO2: An ability to write and present a substantial technical report/document.

PO3: An ability to develop software in various domains in a systematic way by applying Analytical and Programming skills leading to practical solutions.

PO4: Design, develop and deliver complex, scalable, and cost-effective software systems by applying Software Engineering principles, tools and processes.

PO5: Demonstrate with responsibilities and capabilities of professional software engineer with importance to quality and management issues involved in software construction.

PO6: Demonstrated capability to take up higher studies, Entrepreneurships and self-driven career development the chosen area of interest.

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M.Tech in Software Engineering: MSE

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	MMA203T	Linear Algebra and Probability Theory	3	1	0	**4**	MA	Theory	1.5	100	3	100
2	MSE201I	Data Structures and Algorithms	3	0	1	**4**	IS	Theory+Lab	1.5	100	3	100
3	MSE101T	Agile Methodology	3	1	0	**4**	IS	Theory	1.5	100	3	100
4	MSE401L	Software Application Development Lab	1	0	1	**2**	IS	Lab	1.5	50	3	50
5	XXXXXXAX	Elective A (Professional Elective)	3	0	0	**3**	IS/CS	Theory	1.5	100	3	100
6	XXXXXXBX	Elective B (Professional Elective)	3	0	0	**3**	IS/CS	Theory	1.5	100	3	100

Note: For the course code 22HSS42, Students need to select one ONLINE MOOC course as recommended by HSS BoS. This course can be selected anytime between I to III semester and it will be evaluated during IV semester

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Code	Elective A (Professional Elective)	Code	Elective B (Professional Elective)
MCE301A1	Artificial Intelligence & Machine Learning	MCN201B1	Social Network Analysis
MCN301A2	Block Chain Technologies	MSE207B2	Human Computer Interaction
MIT301A3	Mobile Application Development	MIT208B3	IoT and Applications
MSE205A4	Reliability Models	MSE301B4	Microservices Development

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	MIM431T	Research Methodology	3	0	0	**3**	IM	Theory	1.5	100	3	100
2	MSE432I	Cloud Native Devops	3	0	1	**4**	IS	Theory+Lab	1.5	100	3	100
3	MSE233T	Software Architecture Patterns	3	0	0	**3**	IS	Theory	1.5	100	3	100
4	XXXXXXCX	Elective C (Professional Elective)	3	0	0	**3**	IS	Theory	1.5	100	3	100
5	XXXXXXGX	Elective G (Global Elective)	3	0	0	**3**	Res. BoS	Theory	1.5	100	3	100
6	MIT438L	API Development and Integration Lab	1	0	1	**2**	IS	Lab	1.5	50	3	50
7	MHS131T	Professional Skills Development-I	2	0	0	**2**	HSS	Theory*	1.5	50	2	50

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

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Code	Elective C (Professional Elective)
MSE333C1	Robotic Process Automation
MSE335C2	Software Project Management
MSE236C3	User Interface & User Experience
MSE337C4	Requirements Engineering

Elective G (Global Elective)			
MBT331G	Bioinspired Engineering	MET331G	Tracking and Navigation Systems
MBT332G	Health Informatics	MIM331G	Project Management
MCS331G	Business Analytics	MIS331G	Database and Information Systems
MCV331G	Industrial and Occupational Health and Safety	MIS332G	Management Information Systems
MCV332G	Intelligent Transportation Systems	MMA331G	Statistical and Optimization Methods
MEC331G	Electronic System Design	MME331G	Industry 4.0
MEC332G	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	MSE261T	Software Quality Testing and Automation	3	1	0	**4**	IS	Theory	1.5	100	3	100
2	XXXXXXDX	Elective D (Professional Elective)	3	1	0	**4**	IS	Theory	1.5	100	3	100
3	MSE461N	Internship	0	0	6	**6**	IS	Internship	1.5	50	3	50
4	MSE461P	Minor Project	0	0	6	**6**	IS	Project	1.5	50	3	50

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Code	Elective D (Professional Elective)
MIT362D1	Augmented Reality & Virtual Reality
MSE263D2	Decision Support Systems
MSE264D3	Web Intelligence
MSE265D4	Mobile Commerce

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	MSE491P	Major Project	0	0	18	**18**	IS	Project	1.5	100	3	100
2	MHS191	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	:	MMA203T	**LINEAR ALGEBRA AND PROBABILITY THEORY**	CIE Marks	:	100
Credits L-T-P	:	3-1-0		SEE Marks	:	100
Hours	:	42L+28T	*Common Course (MDC, MIT, MSE)*	SEE Durations	:	3 Hrs
Faculty Coordinator:			Dr. Sowmya M			

UNIT - I	**9 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	**9 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	**8 Hrs**
Symmetric and Quadratic forms: Quadratic forms, constrained optimization, symmetric forms, diagonalization, singular value decomposition, mean and covariance matrix, principal component analysis.	
UNIT - IV	**8 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	**8 Hrs**
Random Processes: Introduction, classification of random processes, stationary and independence, auto correlation function and properties, cross correlation, cross covariance functions. Markov processes, transition and state probability in Markov chain, ergodic processes and ergodicity.	

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 random process 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 random process.
CO3	:	Evaluate the solution of the problems using appropriate linear algebra, statistical and random process techniques to the real world problems arising in many practical situations.
CO4	:	Compile the overall knowledge of multivariate probability distributions, linear algebra and random process 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***		
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: I						
Course Code	:	MSE201I	**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. B M Sagar, Dr.Ashwini K B			

UNIT - I	**9 Hrs**
Review of Analysis Techniques: Growth of Functions: Asymptotic notations; Standard notations and common functions; Recurrences and Solution of Recurrence equations- The substitution method, The recurrence – tree method, The master method	
UNIT - II	**9 Hrs**
Graph Algorithms: Bellman - Ford Algorithm; Single source shortest paths in a DAG; Johnson's Algorithm for sparse graphs; Flow networks and Ford-Fulkerson method; Maximum bipartite matching. Polynomials and the FFT: Representation of polynomials; The DFT and FFT; Efficient implementation of FFT, A*Search	
UNIT - III	**8 Hrs**
Trees: 2-3- tree, 2-3-4 tree, Augmenting Data Structures. **Heaps:** Binary Heap, Priority Queues: Leftist Heap, Skew Heap, Binomial Heap, Fibonacci Heap.	
UNIT - IV	**8 Hrs**
Number -Theoretic Algorithms: Elementary notions; GCD; Modular Arithmetic; Solving modular linear equations; The Chinese remainder theorem; Powers of an element; RSA cryptosystem; Primality testing; Integer factorization	
UNIT - V	**8 Hrs**
String-Matching Algorithms: Naïve string Matching; Rabin - Karp algorithm; String matching with finite automata; Knuth-Morris-Pratt algorithm; Boyer – Moore algorithms.	
LABORATORY	**28 Hrs**
Laboratory Programs The following programs will be executed on Java/C/C++/Python any equivalent tool/language by adapting exception handling technique wherever it is suitable Part-A 1. Design, develop, and write a program to implement insertion and search operation in a 2-3-4 tree. Determine its complexity. 2. Design, develop, and write a program to implement Fibonacci Heap/ Binomial Heap 3. Design, develop, and write a program to find the shortest path between source and destination using A* search 4. Design and implement RSA public key to decrypt ciphertext 5. Design, develop, and write a program to implement to solve string matching problem using naive approach and the Rabin Karp algorithm and compare their complexity. Part-B Design and Implement Realtime applications using the available data structures	

Course Outcomes:

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

CO1	:	Understand the fundamentals of different Data Structures and Algorithms
CO2	:	Apply data structures and algorithms with an emphasis on persistence.
CO3	:	Analyze the impact of Data Structures and algorithms for better performance
CO4	:	Design and implement efficient solutions to real world problems

Reference Books

1. Introduction to algorithms, Cormen, Thomas H., Leiserson, Charles E., Rivest, Ronald L. and Clifford Stein – 3rd Edition, MIT Press, 2009, ISBN-13: 978-0262033848.

2. Algorithms in a Nutshell by George T. Heineman, Gary Pollice, and Stanley Selkow, Published by O'Reilly ISBN: 978-0-596-51624-6

3. Introduction to Algorithms- A Creative Approach, UDI Manber, Addison-Wesley Publishing company, ISBN 0-201-12037-2

4. Algorithms Unlocked, Thomas H. Cormen , The MIT Press, ISBN 978-0-262-51880-2

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***		
Sl.No	**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	:	MSE101T	**AGILE METHODOLOGY**	CIE Marks	:	100
Credits L-T-P	:	3 - 1 - 0	**(Theory)**	SEE Marks	:	100
Hours	:	42L + 28T	*(Professional Core - 2)*	SEE Durations	:	3 Hrs
Faculty Coordinator:			Prof.Smitha G R			

UNIT - I	**9 Hrs**
Introduction to Agile: History of Agile, Snowbird, After Snowbird, Agile Overview, The Iron Cross, Charts on the Wall, The First Thing You Know, The Meeting, The Analysis Phase, The Design Phase, The Implementation Phase,The Death March Phase, Hyperbole? A Better Way, Iteration Zero ,Agile Produces Data, Hope versus Management, naging the Iron Cross, Business Value Order, Here Endeth the Overview ,Circle of Life	
UNIT- II	**9 Hrs**
The Reasons for Agile: Professionalism, Software Is Everywhere, We Rule the World, The Disaster, Reasonable Expectations, Continuous Technical Readiness, Stable Productivity, Inexpensive Adaptability, Continuous Improvement, Fearless Competence QA Should Find Nothing, Test Automation, We Cover for Each Other, Honest Estimates, You Need to Say "No", Continuous Aggressive Learning, Mentoring, The Bill of Rights, Customer Bill of Rights, Developer Bill of Rights, Customers, Developers	
UNIT - III	**8 Hrs**
Business Practices, Planning, Trivariate Analysis, Stories and Points, ATM Stories, Stories, Story Estimation, Managing the Iteration, The Demo, Velocity, Tapes, Disks and SCCS, Subversion, Git and Tests, Acceptance Tests, Tools and Methodologies, Behavior-Driven Development, The Practice, Whole Team, Co-Location, Small Releases	
UNIT - IV	**8 Hrs**
Team Practices: Metaphor, Domain-Driven Design, Sustainable Pace, Overtime, Marathon, Dedication, Sleep, Collective Ownership, The X Files, Continuous Integration, Then Came Continuous Build, The Continuous Build Discipline, Standup Meetings	
UNIT - V	**8 Hrs**
Technical Practices: Test-Driven Development, Double-Entry Bookkeeping, The Three Rules of TDD, Debugging, Documentation, Completeness, Design, Courage, Refactoring, Red/Green/Refactor, Bigger Refactorings, Simple Design, Design Weight, Pair Programming, What Is Pairing? Why Pair? Pairing as Code Review, What about the Cost? Just Two? Management	

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

CO1	:	Analyze existing problems with the team, development process and wider organization
CO2	:	Apply a thorough understanding of Agile principles and specific practices
CO3	:	Select the most appropriate way to improve results for a specific circumstance or need
CO4	:	Evaluate likely successes and formulate plans to manage likely risks or problems

Reference Books

1.Clean Agile: Back to Basics ,Robert C. Martin Series, December 2019, Publisher: Pearson ISBN: 9780135782002

2. The Art of Agile Development (Pragmatic guide to agile software development), James shore, Chromatic, O'Reilly Media, 2007, Shroff Publishers & Distributors

3. The Good, the Hype and the Ugly, Meyer, B., Agile!:, 1st Edition, 2014, Springer. ISBN 978-3-319-05155-0

4. Agile and Iterative Development A Manger's Guide, Craig Larman , First Edition, India, 2004, Pearson Education

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

Sl.No	Content	Marks
1	Quizzes - Q1 & Q2	20
2	Tests - T1 & T2	40
3	Experiential Learning - EL1 & EL2	40
	Total Marks	100

RUBRIC for SEE

Q. No	Contents	Marks
Each unit consists of TWO questions of 20 Marks each. Answer FIVE full questions selecting ONE from each unit (1 to 5).		
1 & 2	Unit-1: Question 1 or 2	20
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	:	MSE401L	**Software Application Development Lab**	CIE Marks	:	50
Credits L-T-P	:	1 - 0 - 1		SEE Marks	:	50
Hours	:	14L+28P	*(Coding / Skill Laboratory)*	SEE Durations	:	3 Hrs
Faculty Coordinator:			Dr.Mamatha G S, Dr.Kavitha S N			

Content

Prerequisites: Fundamentals of HTML and CSS, JavaScript, MongoDB, Angularjs, Nodejs, Expressjs with basic knowledge of routing and http m**eth**o**ds.**

Objective: The course aims on enhancing skills required for full-stack solution for JavaScript development using MongoDB, Express.js, AngularJS, and No**de.js Syllabus:** MEAN, a free, open-source, full-stack solution for MEAN applications. MEAN combines MongoDB, Express.js, AngularJS, and Node.js into a single, full¬stack solution for JavaScript development. This lab focuses on development techniques of every layer in the MEAN stack, using any simple application project that has a Backend server side Api built with Node , Express and MongoDB and a Frontend client built with angular 6 that will exchange with the backend Api. Data will be exchanged between a browser based client and an API backend service . **Learnings:**

- Installing and setting up the MEAN development environment
- Configuring Angular Component with a form to add new items and also to edit existing items
- Creating http methods
- Connect Angular Frontend to a NodeJS & Express & MongoDB Backend
- Installing and working with MongoDB and Node.js

Course Outcomes:

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

CO1	:	Comprehend the concepts of angular JS elements and components.
CO2	:	Apply knowledge of hooks, events, state managements and routing in web and mobile application development.
CO3	:	Design and develop routing process with http methods.
CO4	:	Develop and test applications using specific tools.

Reference Books

1. Node.Js, Mongodb and Angular Web Development: The Definitive Guide to Using the Mean Stack to Build Web Applications (Developer's Library) by Brad Dayley (Author), Brendan Dayley (Author), Caleb Dayley (Author),2nd edition,ISBN-100134655532,2 February 2018

2. Full Stack JavaScript Development With MEAN: MongoDB, Express, AngularJS, and Node.JS, 1st Edition,ISBN-100992461251,January 2015

3. Beginning MEAN Stack (MongoDB, Express, Angular, Node.js) by Greg Lim (Author), Daniel Correa (Editor), 1st edition, ISBN-13-979-8460912742, August 2021

4. Angular: Up and Running: Learning Angular, Step by Step , Shyam Seshadri (Author), 1st edition,15 June 2018,O′Reilly Publisher,ISBN-101491999837

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 2. Results, Analysis & Discussions	40
2	Innovative Experiment/Concept Design & Implementation	10		
3	Laboratory Internal	10	Viva Voce	10
	Total Marks	50	Total Marks	50

SEMESTER: I						
Course Code	:	MCE301A1	**ARTIFICIAL INTELLIGENCE & MACHINE LEARNING**	CIE Marks	:	100
Credits L-T-P	:	3- 0 - 0		SEE Marks	:	100
Hours	:	42L	*Elective A (Professional Elective)*	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

Sl.No	Content	Marks
1	Quizzes - Q1 & Q2	20
2	Tests - T1 & T2	40
3	Experiential Learning - EL1 & EL2	40
	Total Marks	100

RUBRIC for SEE

Q. No	Contents	Marks
Each unit consists of TWO questions of 20 Marks each. Answer FIVE full questions selecting ONE from each unit (1 to 5).		
1 & 2	Unit-1: Question 1 or 2	20
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	:	MCN301A2	**BLOCKCHAIN TECHNOLOGIES**	CIE Marks	:	100
Credits L-T-P	:	3 - 0 - 0		SEE Marks	:	100
Hours	:	42L	*Elective A (Professional Elective)*	SEE Durations	:	3 Hrs
Faculty Coordinator:			Dr. Ramakanth Kumar P and Dr. Sharvani G S			

UNIT - I	**9 Hrs**
Blockchain: Distributed systems, History of blockchain, Introduction to blockchain, Types of blockchain, CAP theorem and blockchain, Benefits and limitations of blockchain	
UNIT - II	**9 Hrs**
Decentralization and Cryptography: Decentralization using blockchain, Methods of decentralization, Routes to decentralization, Decentralized organizations. Cryptography and Technical Foundations: Cryptographic primitives, Asymmetric cryptography, Public and private keys	
UNIT - III	**8 Hrs**
Bitcoin and Alternative Coins A: Bitcoin, Transactions, Blockchain, Bitcoin payments B: Alternative Coins, Theoretical foundations, Bitcoin limitations, Namecoin, Litecoin, Primecoin, Zcash	
UNIT - IV	**8 Hrs**
Smart Contracts and Ethereum: Smart Contracts: Definition, Ricardian contracts. Ethereum: Introduction, Ethereum blockchain, Elements of the Ethereum blockchain, Precompiled contracts.	
UNIT - V	**8 Hrs**
Alternative Blockchains: Blockchains Blockchain-Outside of Currencies: Internet of Things, Government, Health, Finance, Media	

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

CO1	:	Apply fundamentals, technologies and models of blockchain
CO2	:	Develop decentralised systems using bitcoin, smart contracts and Etherum platform to implement the Block chain Application
CO3	:	Design secure decentralization algorithm using block chains for real time use cases
CO4	:	Analyze the function of Blockchain as a method of securing distributed ledgers in different case studies.

Reference Books

1. Mastering Blockchain - Distributed ledgers, decentralization and smart contracts explained, Author- Imran Bashir, Packt Publishing Ltd, Second Edition,ISBN 978-1- 78712-544-5, 2017 .

2. Bitcoin and Cryptocurrency Technologies, Author- Arvind Narayanan, Joseph Bonneau,Edward Felten, Andrew Miller, Steven Goldfeder, Princeton University, 2016, ISBN: 9780691171692

3. Blockchain Basics: A Non-Technical Introduction in 25 Steps, Author- Daniel Drescher,Apress, First Edition, 2017, ISBN-13 : 978-1484226032

4. Mastering Bitcoin: Unlocking Digital Cryptocurrencies, Andreas M. Antonopoulos,O'Reilly Media, First Edition, 2014, ISBN-13: 978-1449374044

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: I						
Course Code	:	MIT301A3	**MOBILE APPLICATION DEVELOPMENT**	CIE Marks	:	100
Credits L-T-P	:	3 - 0 - 0		SEE Marks	:	100
Hours	:	42L	*Elective A (Professional Elective)*	SEE Durations	:	3 Hrs
Faculty Coordinator:			Prof. Sharadadevi K			

UNIT - I — **9 Hrs**

Essentials For Mobile Application Development :
Background about mobile technologies, Overview of Android, Android architecture, Android for mobile application development, Android development Framework – Android SDK, Emulators / Android AVD Android Project Framework , Setting up development environment, Running android app, Dalvik Virtual Machine & .apk file extension, android debug bridge. Fundamentals: Basic Building blocks - Activities, Services, Broadcast Receivers & Content providers, UI Components - Views & notifications, Components for communication -Intents & Intent Filters, Android API levels (versions & version names)

UNIT - II — **9 Hrs**

Android UI Architecture & UI Widgets :
Application context, Intents, Activity life cycle, Supporting different devices, multiple screen sizes, Fundamental Android UI design – Layouts, Drawable resources, UI widgets, Notification, Toasts, Menu, Dialogs, Lists & Adapters, Building dynamic UI with fragments.

UNIT - III — **8 Hrs**

Data Storage, Services & Content Providers :
Saving Data, Interacting with other Applications, Working with system permissions, Applications with content sharing, Shared Preferences, Preferences activity, Files access, SQLite database, Threads, Overview of services in Android, Implementing a Service, Service lifecycle, Inter Process Communication.

UNIT - IV — **8 Hrs**

Advanced Android :
Building apps with Multimedia, Building apps with Graphics & Animations, Building apps with Location Based Services and Google maps, Building apps with Connectivity & Cloud, Sensors, Bluetooth, Camera, Telephony Services.

UNIT - V — **8 Hrs**

Testing, Debugging & Deployment of Android Application :
Role and use of Dalvik Debug Monitor Server (DDMS), adb tool, How to debug Android application, Use of Step Filters, Breakpoints, Suspend and Resume, How to use LogCat, Preparing for publishing – Signing & Versioning of apps, Using Google Play to distribute & Monetize, Best practices for security & privacy.

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

CO1	:	Comprehend the basic features of Android Platform and the Application Development Process. Acquire familiarity with basic building blocks of Android Application and its architecture.
CO2	:	Apply and explore the basic framework, usage of SDK to build apps incorporating Android features in developing mobile applications.
CO3	:	Demonstrate proficiency in coding on a mobile programming platform using advanced Android technologies like multimedia, involving the sensors and hardware features of the phone.
CO4	:	Demonstrate proficiency in testing, debugging and deployment of Android applications.

Reference Books

1. Android Programming, Phillips, Stewart, Hardy and Marsicano, 2nd edition, 2015; Big Nerd Ranch Guide; ISBN-13 978-0134171494

2. Professional Android 2 Application Development; Reto Meier; 1st Edition; 2012;Wiley India Pvt.ltd; ISBN-13: 9788126525898

3. Beginning Android 3; Mark Murphy; 1st Edition; 2011; A press Springer India Pvt Ltd. ; ISBN-13: 978-1-4302-3297-1

4. Android Programming – Pushing the limits by Hellman; Eric Hellman; Wiley; 2013; ISBN 13: 978-1118717370

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

Sl.No	Content	Marks
1	Quizzes - Q1 & Q2	20
2	Tests - T1 & T2	40
3	Experiential Learning - EL1 & EL2	40
	Total Marks	100

RUBRIC for SEE

Q. No	Contents	Marks
Each unit consists of TWO questions of 20 Marks each. Answer FIVE full questions selecting ONE from each unit (1 to 5).		
1 & 2	Unit-1: Question 1 or 2	20
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	:	MSE205A4	**RELIABILITY MODELS**	CIE Marks	:	100
Credits L-T-P	:	3- 0 - 0		SEE Marks	:	100
Hours	:	42L	*Elective A (Professional Elective)*	SEE Durations	:	3 Hrs
Faculty Coordinator:			Prof. Rashmi R			

UNIT - I **9 Hrs**

Introduction:

Introduction: Quality: Popular views; Quality: Professional views; Software quality; Total quality management. Overview of Software Quality Metrics: Product quality metrics; In-process quality metrics; Metrics for software maintenance; Examples of metrics programs; Collecting software engineering data.

UNIT - II **9 Hrs**

Applying the 7 Basic Quality Tools in Software Development:

Ishikawa's seven basic tools; Checklist; Pareto diagram; Histogram; Run charts; Scatter diagram; Control chart; Cause-and-effect diagram; Relations diagram.

Defect Removal Effectiveness:

Review; A closer look at defect removal effectiveness; Defect removal effectiveness and quality planning; Cost effectiveness of phase defect removal; Defect removal effectiveness and process maturity level.

UNIT - III **8 Hrs**

The Rayleigh Model:

Reliability models; The Rayleigh model; Basic assumptions; Reliability and predictive validity. Exponential Distribution and Reliability Growth Models:

The exponential model; Reliability growth models; Model assumptions; Criteria for model evaluation; Modeling process; Test compression factor; Estimating the distribution of total defects over time.

UNIT - IV **8 Hrs**

Quality Management Models:

The Rayleigh model framework; The code integration pattern; The PTR submodel; The PTR arrival / backlog projection model; Reliability growth models; Criteria for model evaluation; In-process metrics and reports; Orthogonal defect classification.

In-Process Metrics for Software Testing:

In-process metrics for software testing; In-process metrics and quality management; Possible metrics for acceptance testing to evaluate vendor-developed software; When is the product good enough to ship?

UNIT - V **8 Hrs**

Metrics and Lessons Learned for Object-Oriented Projects:

Object-oriented concepts and constructs; Design and complexity metrics; Productivity metrics; Quality and quality management metrics; Lessons learned for OO projects.

Availability Metrics:

Definition and measurements of system availability; Reliability, availability, and defect rate; Collecting customer outage data for quality improvement; In-process metrics for outage and availability.

Course Outcomes:

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

CO1	:	Comprehend the need for measurement of software artefacts.
CO2	:	Apply various software quality metrics in process of software development
CO3	:	Design and analyse various models for software management.
CO4	:	Compare and evaluate metrics and various models for assuring software quality.

Reference Books

1. Metrics and Models in Software Quality Engineering; Stephan H. Kan, 2nd Edition, Pearson, 2015, ISBN-13:9789332551602.

2. Software Metrics: A Rigorous Approach, Fenton N. E., S. L. Pfleeger; 2nd Edition, Thomson, 2003, ISBN-13: 9789812403858.

3. Software Quality Engineering:, Jeff Tian; John Wiley and Sons Inc., 2014, ISBN-13:9788126508051.

4. Metrics-driven Enterprise Software Development; Sdatta , Cengage Learning India Pvt.ltd; 2014, ISBN-13:9788131522370.

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: I						
Course Code	:	MCN201B1	**SOCIAL NETWORK ANALYSIS**	CIE Marks	:	100
Credits L-T-P	:	3 - 0 - 0		SEE Marks	:	100
Hours	:	42L	*Elective B (Professional Elective)*	SEE Durations	:	3 Hrs
Faculty Coordinator:			Dr. Deepamala N and Prof. Prapulla S B			

UNIT - I	**9 Hrs**
Overview: Aspects of Networks, Central Themes and Topics Graphs Basic Definitions, Paths and Connectivity, Distance and Breadth-First Search, Network Datasets: An Overview	
UNIT - II	**9 Hrs**
Strong and Weak Ties: Triadic Closure, The Strength of Weak Ties, Tie Strength and Network Structure in Large-Scale Data, Tie Strength, Social Media, and Passive Engagement, Closure, Structural Holes, and Social Capital, Advanced Material: Betweenness Measures and Graph Partitioning **Networks in Their Surrounding Contexts** Homophily, Mechanisms Underlying Homophily: Selection and Social Influence, Affiliation, Tracking Link Formation in On-Line Data, A Spatial Model of Segregation	
UNIT - III	**8 Hrs**
Games: What is a Game? Reasoning about Behaviour in a Game, Best Responses and Dominant Strategies, Nash Equilibrium, Multiple Equilibria: Coordination Games, Multiple Equilibria: The Hawk-Dove Game, Mixed Strategies, Mixed Strategies: Examples and Empirical Analysis, Pareto-Optimality and Social Optimality, Advanced Material: Dominated Strategies and Dynamic Games	
UNIT - IV	**8 Hrs**
The Structure of the Web: The World Wide Web, Information Networks, Hypertext, and Associative Memory, The Web as a Directed Graph, The Bow-Tie Structure of the Web, The Emergence of Web 2.0. **Link Analysis and Web Search Searching the Web:** The Problem of Ranking, Link Analysis using Hubs and Authorities, PageRank, Applying Link Analysis in Modern Web Search, Applications beyond the Web, Advanced Material: Spectral Analysis, Random Walks, and Web Search	
UNIT - V	**8 Hrs**
Power Laws and Rich-Get-Richer Phenomena Popularity as a Network Phenomenon, Power Laws, Rich-Get-Richer Models, The Unpredictability of Rich-Get-Richer Effects, The Long Tail, The Effect of Search Tools and Recommendation Systems, Advanced Material: Analysis of Rich-Get-Richer Processes **Applications of Social Networks** Fraud, Crime, terrorism etc.	

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

CO1	:	Explore notation and terminology used in Social Networks.
CO2	:	Analyse basic principles behind Social Network analysis algorithms.
CO3	:	Design applications like web search using algorithms of social networks
CO4	:	Apply social networks on real world applications

Reference Books

1. David Easley and John Kleinberg. "Networks, Crowds, and Markets: Reasoning About a Highly Connected World." Cambridge University Press 2010. ISBN: 978-05211953311.

2. Stanley Wasserman and Katherine Faust. "Social Network Analysis. Methods and Applications." Cambridge University Press, 1994. ISBN: 978-0521387071

3. Eric Kolaczyk, Gabor Csardi, "Statistical Analysis of Network Data with R", Springer, 2014. ISBN: 978-1-4939-0983-4

4. Newman, Mark, "Networks", Oxford university press, 2018. ISBN:978-0199206650

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

Sl.No	Content	Marks
1	Quizzes - Q1 & Q2	20
2	Tests - T1 & T2	40
3	Experiential Learning - EL1 & EL2	40
	Total Marks	100

RUBRIC for SEE

Q. No	Contents	Marks
Each unit consists of TWO questions of 20 Marks each. Answer FIVE full questions selecting ONE from each unit (1 to 5).		
1 & 2	Unit-1: Question 1 or 2	20
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	:	MSE207B2	**HUMAN COMPUTER INTERACTION**	CIE Marks	:	100
Credits L-T-P	:	3 - 0 - 0		SEE Marks	:	100
Hours	:	42L	*Elective B (Professional Elective)*	SEE Durations	:	3 Hrs
Faculty Coordinator:			Dr. G S Mamatha			

UNIT - I — **9 Hrs**

Usability of Interactive Systems:
Introduction, Usability goals and Measures, Usability Motivations, Universal Usability, Goals for Our Profession; Guidelines, Principles, and Theories: Introduction, Guidelines, Principles, Theories.

UNIT - II — **9 Hrs**

Managing Design Processes: Introduction, Organizational Design to Support Usability, The Four Pillars of Design, Development Methodologies, Ethnographic Observation, Participatory Design, Scenario Development, Social Impact Statement for Early Design Review, Legal Issues. Evaluating Interface Designs: Introduction, Expert Reviews, Usability Testing and Laboratories, Survey Instruments, Acceptance Tests, Evaluation During Active
Use Controlled Psychologically Oriented Experiments.

UNIT - III — **8 Hrs**

Direct Manipulation and Virtual Environment :
Introduction Examples of Direct Manipulation, Discussion of Direct Manipulation, 3D Interfaces Teleoperation, Virtual and Augmented Reality. Menu Selection, Form Fill-in, and Dialog Boxes: Introduction, Task-Related Menu Organization, Single Menus, Combinations of Multiple Menus, Content Organization Fast Movement through Menus, Data Entry with Menus: Form Fill-in, Dialog Boxes and Alternatives, Audio Menus and Menus for Small Displays.

UNIT - IV — **8 Hrs**

Collaboration and Social Media Participation :
Introduction, Goals of Collaboration and Participation, Asynchronous Distributed Interfaces: Different Place, Different TimeSynchronous Distributed Interfaces: Different Place, Same Time, Face-to-Face Interfaces: Same Place, Same Time. **Quality of Service:** Introduction, Models of Response Time Impacts Expectations and Attitudes, User Productivity, Variability in Response Time, Frustrating Experiences.

UNIT - V — **8 Hrs**

Mobile HCI:
Mobile Ecosystem: Platforms, Application frameworks- Types of Mobile Applications: Widgets, Applications, Games- Mobile Information Architecture, Mobile 2.0, Mobile Design: Elements of Mobile Design, Tools.
Web Interface Design : Designing Web Interfaces – Drag & Drop, Direct Selection, Contextual Tools, Overlays, Inlays and Virtual Pages, Process Flow. Case Studies

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

CO1	:	Demonstrate Understanding of fundamental design and evaluation methodologies of computer Interaction between the human and computer components.
CO2	:	Apply and analyse HCI design principles and guidelines in the software process.
CO3	:	Compare and Implement Interaction design rules.
CO4	:	Enumerate the cognitive computerized models and HCI implication for designing multimedia, e-learning web sites.

Reference Books

1. Designing the User Interface: Techniques for Effective Human-Computer Interaction, Ben Shneiderman and Catherine Plaisant, 6th Edition, Pearson Publications, 2016, ISBN: 9780123822291.
2. The essential guide to user interface design, Wilbert O Galitz, 3rd Edition , Wiley, 2007, ISBN: 978-0-471-27139-0.
3. Mobile Design and Development, Brian Fling, First Edition , O'Reilly Media Inc., 2009 (UNIT –V)
4. Designing Web Interfaces, Bill Scott and Theresa Neil, First Edition, O'Reilly, 2009.(UNIT-V).

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

SL.No	Content	Marks
1	Quizzes - Q1 & Q2	20
2	Tests - T1 & T2	40
3	Experiential Learning - EL1 & EL2	40
	Total Marks	100

RUBRIC for SEE

Q. No	Contents	Marks
Each unit consists of TWO questions of 20 Marks each. Answer FIVE full questions selecting ONE from each unit (1 to 5).		
1 & 2	Unit-1: Question 1 or 2	20
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	:	MIT208B3	**IOT AND APPLICATIONS**	CIE Marks	:	100
Credits L-T-P	:	3 - 0 - 0		SEE Marks	:	100
Hours	:	42L	*Elective B (Professional Elective)*	SEE Durations	:	3 Hrs
Faculty Coordinator:			Prof. B K Srinivas			

UNIT - I	**9 Hrs**
What is IoT, Genesis of IoT, IoT and Digitization, IoT Impact, Convergence of IT and IoT, IoT Challenges, IoT Network Architecture and Design, Drivers Behind New Network Architectures, Comparing IoT Architectures, A Simplified IoT Architecture, The Core IoT Functional Stack, IoT Data Management and Compute Stack.	
UNIT - II	**9 Hrs**
Smart Objects: The "Things" in IoT, Sensors, Actuators, and Smart Objects, Sensor Networks, Connecting Smart Objects, Communications Criteria, IoT Access Technologies.	
UNIT - III	**8 Hrs**
IP as the IoT Network Layer, The Business Case for IP, The need for Optimization, Optimizing IP for IoT, Profiles and Compliances, Application Protocols for IoT, The Transport Layer, IoT Application Transport Methods.	
UNIT - IV	**8 Hrs**
Data and Analytics for IoT, An Introduction to Data Analytics for IoT, Machine Learning, Big Data Analytics Tools and Technology, Edge Streaming Analytics, Network Analytics, Securing IoT, A Brief History of OT Security, Common Challenges in OT Security, How IT and OT Security Practices and Systems Vary, Formal Risk Analysis Structures: OCTAVE and FAIR, The Phased Application of Security in an Operational Environment	
UNIT - V	**8 Hrs**
IoT Physical Devices and Endpoints : Arduino UNO: Introduction to Arduino, Arduino UNO, Installing the Software, Fundamentals of Arduino Programming. IoT Physical Devices and Endpoints - RaspberryPi: Introduction to RaspberryPi, About the RaspberryPi Board: Hardware Layout, Operating Systems on RaspberryPi, Configuring RaspberryPi, Programming RaspberryPi with Python, Wireless Temperature Monitoring System Using Pi, DS18B20 Temperature Sensor, Connecting Raspberry Pi via SSH, Accessing Temperature from DS18B20 sensors, Remote access to RaspberryPi, Smart and Connected Cities, An IoT Strategy for Smarter Cities, Smart City IoT Architecture, Smart City Security Architecture, Smart City Use-Case Examples.	

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

CO1	:	Compare and contrast the deployment of smart objects and the technologies to connect them to network.
CO2	:	Appraise the role of IoT protocols for efficient network communication.
CO3	:	Elaborate the need for Data Analytics and Security in IoT.
CO4	:	Illustrate different sensor technologies for sensing real world entities and identify the applications of IoT in Industry.

Reference Books

1. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, Jerome Henry,IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things", 2017, 1stEdition, Pearson Education (Cisco Press Indian Reprint). (ISBN: 978-9386873743)

2. Srinivasa K G, "Internet of Things",CENGAGE Leaning India, 2017

3. Vijay Madisetti and ArshdeepBahga, "Internet of Things (A Hands-on-Approach)", 1stEdition, VPT, 2014. (ISBN: 978-8173719547)

4. Raj Kamal, "Internet of Things: Architecture and Design Principles", 1st Edition, McGraw Hill Education, 2017. (ISBN: 978-9352605224)

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		
Sl.No	**Content**	**Marks**
1	Quizzes - Q1 & Q2	20
2	Tests - T1 & T2	40
3	Experiential Learning - EL1 & EL2	40
	Total Marks	100

RUBRIC for SEE		
Q. No	**Contents**	**Marks**
Each unit consists of TWO questions of 20 Marks each. Answer FIVE full questions selecting ONE from each unit (1 to 5).		
1 & 2	Unit-1: Question 1 or 2	20
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	:	MSE301B4	**MICROSERVICES DEVELOPMENT**	CIE Marks	:	100
Credits L-T-P	:	3 -0 - 0		SEE Marks	:	100
Hours	:	42L	*Elective B (Professional Elective)*	SEE Durations	:	3 Hrs
Faculty Coordinator:			Prof. Rashmi R			

UNIT - I **9 Hrs**

Decomposition Strategies :

What is the microservice architecture exactly?, What is software architecture and why it matters, Overview of architectural styles, The microservice architecture is an architectural style, Defining an application's microservice architecture, Identifying the system operations, Defining services by applying the Decompose by business capability pattern, Defining services by applying the Decompose by sub-domain pattern, Decomposition guidelines, Obstacles to decomposing an application into services, Defining service APIs.

Inter-Process Communication in a Microservice Architecture :

Overview of inter-process communication in a microservice architecture, Communicating using the synchronous Remote procedure invocation pattern, Communicating using the asynchronous Messaging pattern, using asynchronous messaging to improve availability.

UNIT - II **9 Hrs**

Managing Transactions with Sagas :

Transaction management in a microservice architecture, Coordinating sagas, Handling the lack of isolation, The design of the Order Service and the Create Order Saga.

Designing Business Logic in a Microservice Architecture :

Business logic organization patterns, Designing a domain model using the DDD aggregate pattern, Publishing domain events, Kitchen Service business logic.

UNIT - III **8 Hrs**

Developing Business Logic with Event Sourcing :

Developing business logic using event sourcing, Implementing an event store, Using sagas and event sourcing together.

Implementing Queries in a Microservice Architecture :

Querying using the API Composition pattern, Using the Command Query Responsibility Segregation (CQRS) pattern, Designing CQRS Views.

UNIT - IV **8 Hrs**

Testing Microservices :

Testing strategies for microservice architectures, Writing unit tests for a service. Developing

Production Ready Services :

Developing secure services, Designing configurable services, Designing observable services, Developing services using the Microservice chassis pattern.

UNIT - V **8 Hrs**

Deploying Microservices :

Deploying services using the Language-specific packaging format pattern, Deploying services using the Service per Virtual machine pattern, Deploying services using the Service per container pattern, Deploying the FTGO application with Kubernetes, Deploying services using the Serverless deployment pattern.

Course Outcomes:

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

CO1	:	Comprehend the concepts of microservices architecture and deciding when to use microservices.
CO2	:	Design and develop microservices using several patterns.
CO3	:	Develop and test microservices.
CO4	:	Migrate to a microservice architecture and deploy the microservices.

Reference Books

1. Chris Richardson, Microservices Patterns, 1st Edition, Manning Publication, 2018, ISBN 9781617294549
2. Sam Newman, Building Microservices, 2nd Edition, O'Reilly Publication, 2021, ISBN: 9781492034025
3. Eberhard Wolff, Microservices: A Practical Guide, 1st Edition, Atlantic Publication, 2018, ISBN: 17170759
4. Harry Percival, Bob Gregory, Architecture Patterns with Python: Enabling Test-Driven Development, Domain-Driven Design, and Event-Driven Microservices (Greyscale Indian Edition), 1st Edition, Shroff/O'Reilly Publication, 2020, ISBN: 9352139739

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	:	**MIM431T**	**RESEARCH METHODOLOGY**	CIE Marks	:	100
Credits L-T-P	:	3-0-0		SEE Marks	:	100
Hours	:	42L	*Common Course to all M.Tech Programs)*	SEE 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		
Sl.No	**Content**	**Marks**
1	Quizzes - Q1 & Q2	20
2	Tests - T1 & T2	40
3	Experiential Learning - EL1 & EL2	40
	Total Marks	100

RUBRIC for SEE		
Q. No	**Contents**	**Marks**
Each unit consists of TWO questions of 20 Marks each. Answer FIVE full questions selecting ONE from each unit (1 to 5).		
1 & 2	Unit-1: Question 1 or 2	20
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	:	MSE432I	**CLOUD NATIVE DEVOPS**	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.Mamatha G S			

UNIT - I — **9 Hrs**

Revolution in the cloud: The creation of the cloud, The dawn of DevOps, The Coming of Containers, Conducting the Container Orchestra, Kubernetes, Cloud Native,The Future of Operations.

First Steps with Kubernetes : Running Your First Container, The Demo Application, Building a Container, Container Registries, Hello Kubernetes, Minikube.

Getting Kubernetes : Cluster Architecture, The Costs of Self-Hosting Kubernetes, Managed Kubernetes Services, Kubernetes Installers, Clusterless Container Services.

UNIT - II — **9 Hrs**

Working with Kubernetes Objects: Deployments, Pods, ReplicaSets, Maintaining Desired State, The Kubernetes Scheduler, Resource Manifests in YAML Format, Helm: A Kubernetes Package Manager.

Managing Resources: Understanding Resources, Managing the Container Life Cycle, Using Namespaces, Optimizing Cluster Costs.

UNIT - III — **8 Hrs**

Operating Clusters: Cluster Sizing and Scaling, Conformance Checking, Chaos Testing.

Kubernetes Power Tools: Mastering kubectl, Working with Resources, Working with Containers, Contexts and Namespaces, Kubernetes Shells and Tools Kubernetes IDEs.

UNIT - IV — **8 Hrs**

Running Containers: Containers and Pods, Container Manifests, Container Security, Volumes, Restart Policies, Image Pull Secrets, Init Containers.

Managing Pods: Labels, Node Affinities, Pod Affinities and Anti-Affinities, Taints and Tolerations, Pod Controllers, Ingress, Service Mesh.

UNIT - V — **8 Hrs**

Configuration and Secrets: ConfigMaps, Kubernetes Secrets, Secrets Management Strategies, Encrypting Secrets with Sops, Sealed Secrets.

Security, Backups, and Cluster Health: Access Control and Permissions, Cluster Security Scanning, Container Security Scanning, Backups, Monitoring Cluster Status.

LABORATORY — **28 Hrs**

1. Introduction to Source Control like (Git, Gitlab, Code Review, Pull request, etc)
2. Docker Fundamentals (Image, Container, volumes, networking)
3. Kubernetes (Introduction, Deployment platform)
4. Continuous Integration(CI) and Continuous Deployment(CD).
5. Hands on working with IBM CI/CD Devops toolchains.
6. Best industry practices for Devops on cloud. Pre-requisite (Must be completed by students before start of the lab)

1. IBM Cloud Account. (https://cloud.ibm.com/registration)
2. IBM Kubernetes Cluster (https://www.ibm.com/in-en/cloud/free/kubernetes)
3. Docker Desktop (https://www.docker.com/products/docker-desktop) for windows/Mac
4. IBM Cloud CLI (https://cloud.ibm.com/docs/cli?topic=cli-getting-started)
5. Git (https://git-scm.com) IBM portals for hands-on lab study : Docker Essentials https://www.credly.com/org/ibm/badge/docker-essentials-a-developer-introduction Kubernetes Essentials https://www.credly.com/org/ibm/badge/operating-kubernetes-on-ibm-cloud

Cloud Native Applications
https://www.credly.com/org/ibm/badge/building-cloud-native-and-multicloud-applications
https://developer.ibm.com/tutorials/build-a-cicd-tekton-pipeline-for-deploying-a-nodejs-application/

Course Outcomes: After going through this course the student will be able to:		
CO1	:	Apply the concept of cloud native DevOps to applications.
CO2	:	Analyse the usage of cloud, creating a docker image, kubernetes deployment for a given application.
CO3	:	Design and implement cloud native applications and deployment.
CO4	:	Evaluate the building, deploying and scaling of applications in cloud.

Reference Books

1. Justin Domingus and John Arundel, Cloud Native DevOps with Kubertnetes, 2nd Edition, ORielly, 2022, ISBN: 9789355421944

2. Mitesh Soni, Agile, DevOps and Cloud Computing with Microsoft Azure, BPB Publications, 2019, ISBN: 978-93-88511-902

3. Nicole Forsgren, Jez Humble and Gene Kim, The Science of Lean Software and DevOps, ACCELERATE, IT Revolution Press, 2018, ISBN: 978-1942788331

4. IBM,IBM Cloud DevOps Field Guide, IBM Corporation, 2021, https://www.ibm.com/cloud/architecture/content/field-guide/devops-field-guide/

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***		
Sl.No	**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	:	MSE233T	**SOFTWARE ARCHITECTURE PATTERNS**	CIE Marks	:	100
Credits L-T-P	:	3 - 0 - 0		SEE Marks	:	100
Hours	:	42L	*(Professional Core - 4))*	SEE Durations	:	3 Hrs
Faculty Coordinator:			Prof.Rekha B S			

UNIT - I	**9 Hrs**
Envisioning Architecture: The Architecture Business Cycle, What is Software Architecture, Architectural patterns, reference models, reference architectures, architectural structures and views. Creating an Architecture Quality Attributes, Achieving qualities, Architectural styles and patterns, designing the Architecture, Documenting software architectures, Reconstructing Software Architecture.	
UNIT - II	**9 Hrs**
Analyzing Architectures : Architecture Evaluation, Architecture design decision making, ATAM, CBAM. Moving from one system to many Software Product Lines, Building systems from off the shelf components, Software architecture in future.	
UNIT - III	**8 Hrs**
Patterns : Pattern Description, Organizing catalogs, role in solving design problems, Selection and usage. Creational and Structural patterns Abstract factory, builder, factory method, prototype, singleton, adapter, bridge, composite, façade, flyweight.	
UNIT - IV	**8 Hrs**
Behavioral Patterns : Chain of responsibility, command, Interpreter, iterator, mediator, memento, observer, state, strategy template method, visitor.	
UNIT - V	**8 Hrs**
Case Studies A-7E – A case study in utilizing architectural structures, The World Wide Web – a case study in interoperability, Air Traffic Control – a case study in designing for high availability, Celsius Tech – a case study in product line development	

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

CO1	:	Use design patterns to keep code quality high without overdesign.
CO2	:	Apply the knowledge to create an architecture for given application
CO3	:	Analyze the architecture and build the system from the components.
CO4	:	Design creational and structural patterns and implement a case study in utilizing architectural structures

Reference Books

1. Software Architecture in Practice, second edition, Len Bass, Paul Clements & Rick Kazman, Pearson Education, 2003.
2. Design Patterns, Erich Gamma, Pearson Education, 2015, ISBN-10-9332555400
3. Design Patterns in Java, Steven John Metsker & William C. Wake, Pearson education, 2006
4. Head First Design patterns, Eric Freeman & Elisabeth Freeman, O'REILLY, 2007.

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

Sl.No	Content	Marks
1	Quizzes - Q1 & Q2	20
2	Tests - T1 & T2	40
3	Experiential Learning - EL1 & EL2	40
	Total Marks	100

RUBRIC for SEE

Q. No	Contents	Marks
Each unit consists of TWO questions of 20 Marks each. Answer FIVE full questions selecting ONE from each unit (1 to 5).		
1 & 2	Unit-1: Question 1 or 2	20
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	:	MSE333C1	**Robotic Process Automation**	CIE Marks	:	100
Credits L-T-P	:	3 - 0 - 0		SEE Marks	:	100
Hours	:	42L	*Elective C (Professional Elective)*	SEE Durations	:	3 Hrs
Faculty Coordinator:			Dr.Mamatha G S			

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 Roboic 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: 978-1-78847-094-0

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 Publications, 2021, ISBN: 978-9389898286

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		
Sl.No	**Content**	**Marks**
1	Quizzes - Q1 & Q2	20
2	Tests - T1 & T2	40
3	Experiential Learning - EL1 & EL2	40
	Total Marks	100

RUBRIC for SEE		
Q. No	**Contents**	**Marks**
Each unit consists of TWO questions of 20 Marks each. Answer FIVE full questions selecting ONE from each unit (1 to 5).		
1 & 2	Unit-1: Question 1 or 2	20
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	:	MSE335C2	**SOFTWARE PROJECT MANAGEMENT**	CIE Marks	:	100
Credits L-T-P	:	3 - 0 - 0		SEE Marks	:	100
Hours	:	42L	*Elective C (Professional Elective)*	SEE Durations	:	3 Hrs
Faculty Coordinator:			Prof. Rekha B S			

UNIT - I	**9 Hrs**
PROJECT EVALUATION AND PROJECT PLANNING : Importance of Software Project Management – Activities - Methodologies – Categorization of Software Projects – Setting objectives – Management Principles – Management Control – Project portfolio Management – Cost-benefit evaluation technology – Risk evaluation – Strategic program Management – Stepwise Project Planning.	
UNIT - II	**9 Hrs**
PROJECT LIFE CYCLE AND EFFORT ESTIMATION : Software process and Process Models – Selection of an Appropriate Project Approach - Rapid Application development – Agile methods – Dynamic System Development Method – Extreme Programming– Managing interactive processes – Basics of Software estimation – Effort and Cost estimation techniques – COSMIC Full function points - COCOMO II - a Parametric Productivity Model.	
UNIT - III	**8 Hrs**
ACTIVITY PLANNING AND RISK MANAGEMENT : Objectives of Activity planning – Project schedules – Activities – Sequencing and scheduling – Network Planning models – Formulating Network Model – Forward Pass & Backward Pass techniques – Critical path (CRM) method – Risk Management – Nature of Risks, Types of Risks, Managing Risks, Risk Planning and Control, Evaluating risks to the schedule – Resource Allocation – Identifying Resources Requirements, Scheduling Resources, Creation of critical paths – Cost schedules.	
UNIT - IV	**8 Hrs**
PROJECT MONITORING AND CONTROL : Framework for monitoring and control – Collection of data – Visualizing progress – Cost monitoring – Earned Value Analysis – Prioritizing Monitoring – Project tracking – Change control – Software Configuration Management – Managing contracts – Contract Management.	
UNIT - V	**8 Hrs**
MANAGING PEOPLE AND ORGANIZING TEAMS : Organizational behavior – Best methods of staff selection - Instruction in the best method - Motivation – Working in teams – Decision making – Leadership, Organizational structures	

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

CO1	:	Understand Software Project Manamement principles to be followed during its development.
CO2	:	Estimate the risks involved in various Project activities.
CO3	:	Gain extensive knowledge about the basic concepts, framework and the process models.
CO4	:	Obtain adequate knowledge about software process models and software effort estimation techniques.

Reference Books

1. Bob Hughes, Mike Cotterell and Rajib Mall: Software Project Management – Sixth Edition, Tata McGraw Hill, 2016, ISBN - 9789387067189

2. Robert K. Wysocki ―Effective Software Project Management – Wiley Publication, 2015, ISBN- ISBN: 0471360287, ISBN13-9780471360285.

3. Gopalaswamy & Ramesh, ―Managing Global Software Projects – McGraw Hill Education (India), 2017, ISBN13 - 9780070598973.

4. Walker Royce: ―Software Project Management- Addison-Wesley, 2000.

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

Sl.No	Content	Marks
1	Quizzes - Q1 & Q2	20
2	Tests - T1 & T2	40
3	Experiential Learning - EL1 & EL2	40
	Total Marks	100

RUBRIC for SEE

Q. No	Contents	Marks
Each unit consists of TWO questions of 20 Marks each. Answer FIVE full questions selecting ONE from each unit (1 to 5).		
1 & 2	Unit-1: Question 1 or 2	20
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	:	MSE236C3	**User Interface and User Experience (UI & UX)**	CIE Marks	:	100
Credits L-T-P	:	3- 0 - 0		SEE Marks	:	100
Hours	:	42L	*Elective C (Professional Elective)*	SEE Durations	:	3 Hrs
Faculty Coordinator:			Dr.Mamatha G S			

UNIT - I	**9 Hrs**
What's a UI Pattern? : How Users Interact With Design Patterns, Following Universal Design Conventions, Applying Empathy to UI Design Patterns. Why Use UI Patterns?: Why Patterns Work, Expectations Reinforce Themselves, Deadline-Busting Communication, Why not use patterns?. The Importance of Prototyping First: Got a Pattern? Plan it Out, Thinking Through the Process, Patterns Take Guesswork Off of Developers' Plates.	
UNIT - II	**9 Hrs**
User Testing: Insights You Can't Ignore. Prototyping UI Patterns: Explaining the Gray Box, Pattern Libraries Are Prototyping Shortcuts, Reusable elements, Patterns and Prototypes Work Together, Applying UI Design Patterns: Building a Pattern Library, Riffing on Design Patterns, Tweaking Pattern Styles, Going forward, Useful UI Pattern Examples, Formatting Data, Getting input, Navigation, Teasers.	
UNIT - III	**8 Hrs**
Design for Usefulness: Painkillers & Vitamins, Embracing Goal-Centered Design, Test for Relevancy With an MVP, A Quick MVP Case Study: Buffer. Designing for Usability: Forgiving, Satisfying, The 6-Step Process to Improve Usability. Designing for Desirability: Desirable Products Are More Usable, Desire Is Relative to Users, Elements of Desirable Design.	
UNIT - IV	**8 Hrs**
Designing for Findability : Building the Right Information Architecture, 5 IA Layouts for the Web, 5 Navigational Menu Patterns, Testing Findability. Designing for Accessibility: Universal Design, What Accessibility Means for UX Design, Benefits of Accessibility, Accessibility Best Practices	
UNIT - V	**8 Hrs**
The Core of Desirable Design: The Habit Loop, A Quick Case Study, Quick Case Study: Apple.com. **Designing for Credibility:** First Impressions Matter, Quick Case Study: Chase, Building a Credible Product Interface, Selling the Product Through Social Proof, Persuading Through Transparency.	

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

CO1	:	Apply the concept of User Interface and User Experience to increase look and feel various applications.
CO2	:	Analyse the usability, accesssibility, availability and other factors of User Interface design patterns.
CO3	:	Design and implement techniques of implementing design patterns.
CO4	:	Evaluate the design patetrns and elements of user experience.

Reference Books

1. Ben Gremillion,Jerry Cao, Kamil, Tactical UI Design Patterns, The Handbook to faster Design, UXPin Inc., 2015.

2. Jerry Cao, Kamil,Matt Ellis, The Elements of Successful UX Design, Best Practices of Meaningful products, UXPin Inc., 2015.

3. User Friendly- How the Hidden Rules of Design Are Changing the Way We Live, Work, and Play, Cliff Kuang, Picador Paper; Reprint edition, 2020, ISBN: 1250758203

4. Jenifer Tidwel, Designing Interfaces: Patterns for Effective Interaction Design, 3rd Edition, O'Reilly, 2020, ISBN: 1492051969

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

Sl.No	Content	Marks
1	Quizzes - Q1 & Q2	20
2	Tests - T1 & T2	40
3	Experiential Learning - EL1 & EL2	40
	Total Marks	100

RUBRIC for SEE

Q. No	Contents	Marks
Each unit consists of TWO questions of 20 Marks each. Answer FIVE full questions selecting ONE from each unit (1 to 5).		
1 & 2	Unit-1: Question 1 or 2	20
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	:	MSE337C4	**REQUIREMENTS ENGINEERING**	CIE Marks	:	100
Credits L-T-P	:	3- 0 - 0		SEE Marks	:	100
Hours	:	42L	*Elective C (Professional Elective)*	SEE Durations	:	3 Hrs
Faculty Coordinator:			Prof. B K Srinivas			

UNIT - I — **9 Hrs**

Introduction to Requirements Engineering; Motivation, Requirement Engineering-Definition, Requirement vs Goals, Requirement Level Classification, Requirement Specification Types, Domain Vocabulary Understanding, Requirements Engineering Activities, The Requirement Engineer, Requirement Engineering Paradigms, Problems with Traditional Requirements Engineering, Difficulties in enveloping system Behavior.

Mission Statement, Customers, and Stakeholders; Customer interaction, Stakeholders, Customer Wants and needs, Customer Mindset, Stakeholder Prioritization, Communicating with Customers and other Stakeholders, Stakeholder Negotiations.

UNIT - II — **9 Hrs**

Requirements Elicitation; Introduction, Elicitation Techniques - Survey, Elicitation Summary, Elicitation Support Technologies.

Requirements Risk Management; Definition, Requirements Validation and Verification - Techniquies, Requirement Validation Matrix, Importance of Measuring in Requirement Verification and Validation, Standards for Verification and Validation

UNIT - III — **8 Hrs**

Requirements Management; Introduction, Expectation: Pascal's Wager, Global Requirement Management, Antipatterns in Requirements Management, Other Paradigms for Requirements Management, Reference Models **Requirement Management and Engineering;** Advantages of RM & E in project management, Advantages for finding solutions in design and architecture, Advantages in customer service, sales and marketing, Advantages in test and verification management.

UNIT - IV — **8 Hrs**

Writing the Requirements Document: Requirements Presentation Approaches, IEEE Standard 830-1998, Use Cases, Behavioral Specifications, The Requirments Document, Best Practices

Requirement Specification and Agile Methodologies:Introduction, Principles, Extreme Programming, Scrum, Requirements Engineering for Agile Methodologies, Writing User Stories, Agile Requirements Engineering, Challenges for Requirements Engineering in Agile Methodologies

UNIT - V — **8 Hrs**

Tool Support for Requirements Engineering: Introduction, Traceability Support, Commercial Requirement Engineering Tools, Open Source Requirement Engineering Tools, Open Source Requirements Management Tools, Requirements Engineering Tool Best Practices, NASA Requirement Testing- NASA ARM Tool, Imperatives, Continuances, Directives, Options, Weak Phrases

Course Outcomes:

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

CO1	:	Identify the obvious difficulties in trying to communicate about a system, highlights the importance of domain understanding in requirements engineering
CO2	:	Understand the formal methods, social models, and modern requirements writing techniques to be useful to the practicing engineer.
CO3	:	Validate requirements as they are written to avoid submitting a bad document for review.
CO4	:	Gain insight on software tools and techniques for requirements engineering and management to simplify the process of requirement management.

Reference Books

1. Phillip A. Laplante, Requirements Engineering for Software and Systems, 2009 Edition, CRC Press, ISBN: 78-1-4200-6468-1

2. Colin Hood, Simon Wiedemann, Stefan Fichtinger, Urte Pautz, Requirements Management, 2008 Edition, Springer, ISBN: 978-3-540-47689-4

3. Project Management Institute, Requirements Management: A Practice Guide, First Edition, 2016, ISBN: 78-1-4200-6468-1

4. Axel Van Lamsweerde, Requirements Engineering: From System Goals to UML Models to Software Specifications, First Edition, 2013, ISBN: 978-8126545896

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	:	MBT331G	**BIOINSPIRED ENGINEERING**	CIE Marks	:	100
Credits L-T-P	:	3-0-0		SEE Marks	:	100
Hours	:	42L	*Elective G (Global Elective*	SEE Durations	:	3 Hrs
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 - II — **9 Hrs**

Lessons from Nature:Bioinspired Materials and mechanism: Firefly-Bioluminescence, Cockleburs –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 - V — **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 echolation. Insect foot adaptations for adhesion. Thermal insulation and storage materials. Bees and Honeycomb Structure. Arti□cial 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 edtion, 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

Sl.No	Content	Marks
1	Quizzes – Q1 & Q2	20
2	Tests – T1 & T2	40
3	Experiential Learning – EL1 & EL2	40
	Total Marks	100

RUBRIC for SEE

Q. No	Contents	Marks
Each unit consists of TWO questions of 20 Marks each. Answer FIVE full questions selecting ONE from each unit (1 to 5).		
1 & 2	Unit-1: Question 1 or 2	20
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	:	MBT332G	**HEALTH INFORMATICS**	CIE Marks	:	100
Credits L-T-P	:	3-0-0		SEE Marks	:	100
Hours	:	42L	*Elective G (Global Elective)*	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, termonology 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 Resoruces	
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		
Sl.No	**Content**	**Marks**
1	Quizzes - Q1 & Q2	20
2	Tests - T1 & T2	40
3	Experiential Learning - EL1 & EL2	40
	Total Marks	100

RUBRIC for SEE		
Q. No	**Contents**	**Marks**
Each unit consists of TWO questions of 20 Marks each. Answer FIVE full questions selecting ONE from each unit (1 to 5).		
1 & 2	Unit-1: Question 1 or 2	20
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	:	MCS331G	**BUSINESS ANALYTICS**	CIE Marks	:	100
Credits L-T-P	:	3-0-0		SEE Marks	:	100
Hours	:	42L	*Elective G (Global Elective)*	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 Stubs , 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

Sl.No	Content	Marks
1	Quizzes – Q1 & Q2	20
2	Tests – T1 & T2	40
3	Experiential Learning – EL1 & EL2	40
	Total Marks	100

RUBRIC for SEE

Q. No	Contents	Marks
Each unit consists of TWO questions of 20 Marks each. Answer FIVE full questions selecting ONE from each unit (1 to 5).		
1 & 2	Unit-1: Question 1 or 2	20
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	:	MCV331G	**INDUSTRIAL AND OCCUPATIONAL HEALTH AND SAFETY**	CIE Marks	:	100
Credits L-T-P	:	3-0-0		SEE Marks	:	100
Hours	:	42L	*Elective G (Global Elective)*	SEE Durations	:	3 Hrs
Faculty Coordinator:			Dr.V.AnanthaRam			

UNIT - I	**8 Hrs**
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	**9 Hrs**
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	**9 Hrs**
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	**8 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	**8 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

Sl.No	Content	Marks
1	Quizzes - Q1 & Q2	20
2	Tests - T1 & T2	40
3	Experiential Learning - EL1 & EL2	40
	Total Marks	100

RUBRIC for SEE

Q. No	Contents	Marks
Each unit consists of TWO questions of 20 Marks each. Answer FIVE full questions selecting ONE from each unit (1 to 5).		
1 & 2	Unit-1: Question 1 or 2	20
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	:	MCV332G	**INTELLIGENT TRANSPORTATION SYSTEMS**	CIE Marks	:	100
Credits L-T-P	:	3-0-0		SEE Marks	:	100
Hours	:	42L	*Elective G (Global Elective)*	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 - II	**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 - V	**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

Sl.No	Content	Marks
1	Quizzes - Q1 & Q2	20
2	Tests - T1 & T2	40
3	Experiential Learning - EL1 & EL2	40
	Total Marks	100

RUBRIC for SEE

Q. No	Contents	Marks
Each unit consists of TWO questions of 20 Marks each. Answer FIVE full questions selecting ONE from each unit (1 to 5).		
1 & 2	Unit-1: Question 1 or 2	20
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	:	MEC331G	**ELECTRONIC SYSTEM DESIGN**	CIE Marks	:	100
Credits L-T-P	:	3-0-0		SEE Marks	:	100
Hours	:	42L	*Elective G (Global Elective)*	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 - II	**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 - V	**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

Sl.No	Content	Marks
1	Quizzes - Q1 & Q2	20
2	Tests - T1 & T2	40
3	Experiential Learning - EL1 & EL2	40
	Total Marks	100

RUBRIC for SEE

Q. No	Contents	Marks
Each unit consists of TWO questions of 20 Marks each. Answer FIVE full questions selecting ONE from each unit (1 to 5).		
1 & 2	Unit-1: Question 1 or 2	20
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	:	MEC332G	**EVOLUTION OF WIRELESS TECHNOLOGIES**	CIE Marks	:	100
Credits L-T-P	:	3-0-0		SEE Marks	:	100
Hours	:	42L	*Elective G (Global Elective)*	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

Sl.No	Content	Marks
1	Quizzes – Q1 & Q2	20
2	Tests – T1 & T2	40
3	Experiential Learning – EL1 & EL2	40
	Total Marks	100

RUBRIC for SEE

Q. No	Contents	Marks
Each unit consists of TWO questions of 20 Marks each. Answer FIVE full questions selecting ONE from each unit (1 to 5).		
1 & 2	Unit-1: Question 1 or 2	20
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	:	MET331G	**TRACKING AND NAVIGATION SYSTEMS**	CIE Marks	:	100
Credits L-T-P	:	3-0-0		SEE Marks	:	100
Hours	:	42L	*Elective G (Global Elective)*	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

Sl.No	Content	Marks
1	Quizzes – Q1 & Q2	20
2	Tests – T1 & T2	40
3	Experiential Learning – EL1 & EL2	40
	Total Marks	100

RUBRIC for SEE

Q. No	Contents	Marks
Each unit consists of TWO questions of 20 Marks each. Answer FIVE full questions selecting ONE from each unit (1 to 5).		
1 & 2	Unit-1: Question 1 or 2	20
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	:	MIM331G	**PROJECT MANAGEMENT**	CIE Marks	:	100
Credits L-T-P	:	3-0-0		SEE Marks	:	100
Hours	:	42L	*Elective G (Global Elective)*	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	:	MIS331G	**DATABASE AND INFORMATION SYSTEMS**	CIE Marks	:	100
Credits L-T-P	:	3-0-0		SEE Marks	:	100
Hours	:	42L	*Elective G (Global Elective)*	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 .	
	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

Sl.No	Content	Marks
1	Quizzes – Q1 & Q2	20
2	Tests – T1 & T2	40
3	Experiential Learning – EL1 & EL2	40
	Total Marks	100

RUBRIC for SEE

Q. No	Contents	Marks
Each unit consists of TWO questions of 20 Marks each. Answer FIVE full questions selecting ONE from each unit (1 to 5).		
1 & 2	Unit-1: Question 1 or 2	20
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	:	MIS332G	**MANAGEMENT INFORMATION SYSTEMS**	CIE Marks	:	100
Credits L-T-P	:	3-0-0		SEE Marks	:	100
Hours	:	42L	*Elective G (Global Elective)*	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

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		
Sl.No	**Content**	**Marks**
1	Quizzes - Q1 & Q2	20
2	Tests - T1 & T2	40
3	Experiential Learning - EL1 & EL2	40
	Total Marks	100

RUBRIC for SEE		
Q. No	**Contents**	**Marks**
Each unit consists of TWO questions of 20 Marks each. Answer FIVE full questions selecting ONE from each unit (1 to 5).		
1 & 2	Unit-1: Question 1 or 2	20
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	:	MMA331G	**STATISTICAL AND OPTIMIZATION METHODS**	CIE Marks	:	100
Credits L-T-P	:	3-0-0		SEE Marks	:	100
Hours	:	42L	*Elective G (Global Elective)*	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, Defuzzificatiuon, 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

Sl.No	Content	Marks
1	Quizzes - Q1 & Q2	20
2	Tests - T1 & T2	40
3	Experiential Learning - EL1 & EL2	40
	Total Marks	100

RUBRIC for SEE

Q. No	Contents	Marks
Each unit consists of TWO questions of 20 Marks each. Answer FIVE full questions selecting ONE from each unit (1 to 5).		
1 & 2	Unit-1: Question 1 or 2	20
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	:	MME331G	**INDUSTRY 4.0**	CIE Marks	:	100
Credits L-T-P	:	3-0-0		SEE Marks	:	100
Hours	:	42L	*Elective G (Global Elective)*	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.

	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

Sl.No	Content	Marks
1	Quizzes - Q1 & Q2	20
2	Tests - T1 & T2	40
3	Experiential Learning - EL1 & EL2	40
	Total Marks	100

RUBRIC for SEE

Q. No	Contents	Marks
Each unit consists of TWO questions of 20 Marks each. Answer FIVE full questions selecting ONE from each unit (1 to 5).		
1 & 2	Unit-1: Question 1 or 2	20
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	:	MIT438L	**API Development and Integration Lab**	CIE Marks	:	50
Credits L-T-P	:	1 - 0 - 1		SEE Marks	:	50
Hours	:	14L + 28P	*(Coding / Skill Laboratory)*	SEE Durations	:	3 Hrs
Faculty Coordinator:			Dr. G S Mamatha			

Content

Design and develop Java-based RESTful APIs using the latest versions of the Spring MVC and Spring Boot frameworks. This course helps in designing and building a REST application while delving into design principles and best practices for versioning, security, documentation, error handling, paging, and sorting. Also, skills to build sophisticated REST applications using Spring technologies can be developed.

Learnings

- Build Java-based microservices, native cloud, or any applications using Spring REST
- Employ Spring MVC and RESTful Spring
- Build a QuickPoll application example
- Document REST services, as well as versioning, paging, and sorting
- Test, handle errors and secure your application

Examples of API Integration Use Cases Connect
Cloud Apps
Creation of Custom APIs
Ease the Development of Apps
Strategic Team Movement Multiple
Services Management

Building an Application with Spring Boot

Spring Boot offers a fast way to build applications. It gives focus more on business features and less on infrastructure.

References:

• Modern API Development with Spring and Spring Boot: Design highly scalable and maintainable APIs with REST, gRPC, GraphQL, and the reactive paradigm Kindle Edition by Sourabh Sharma.
• Mastering Spring Boot 2.0: Build modern, cloud-native, and distributed systems using Spring Boot , 2018 by Dinesh rajput • Spring REST: Building Java Microservices and Cloud Applications 2nd ed. Edition
by Balaji Varanasi • Learn Microservices with Spring Boot: A Practical Approach to RESTful Services using RabbitMQ, Eureka, Ribbon, Zuul and Cucumber, January 2018

Reference Books

1. Modern API Development with Spring and Spring Boot: Design highly scalable and maintainable APIs with REST, gRPC, GraphQL, and the reactive paradigm Kindle Edition by Sourabh Sharma.
2. Mastering Spring Boot 2.0: Build modern, cloud-native, and distributed systems using Spring Boot , 2018 b Dinesh Rajput
3. Spring REST: Building Java Microservices and Cloud Applications 2nd ed. Edition
by Balaji Varanasi
4. Learn Microservices with Spring Boot: A Practical Approach to RESTful Services using RabbitMQ, Eureka, Ribbon, Zuul and Cucumber, January 2018

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

CO1	:	Learn how to authorize a user with access token
CO2	:	Learn how to configure Auth0 and implement different servlets
CO3	:	Learn how to make a transaction with Stripe
CO4	:	Focus on the unique requirements of an application while outsourcing repetitive complex code to APIs.

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 2. Results, Analysis & Discussions	40
2	Innovative Experiment/Concept Design & Implementation	10		
3	Laboratory Internal	10	Viva Voce	10
	Total Marks	50	Total Marks	50

SEMESTER: II						
Course Code	:	**MHS131T**	**PROFESSIONAL SKILL DEVELOPMENT -I**	CIE Marks	:	50
Credits L-T-P	:	2-0-0		SEE Marks	:	50
Hours	:	28L	*Common Course to all M.Tech Programs*	SEE Durations	:	2 Hrs
Faculty Coordinator:			Dr. C.Bindu Ashwini			

UNIT - I	4 Hrs
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	:	MSE261T	**SOFTWARE QUALITY TESTING AND AUTOMATION**	CIE Marks	:	100
Credits L-T-P	:	3 - 1 - 0		SEE Marks	:	100
Hours	:	42L + 28T	*Professional Core - 5*	SEE Durations	:	3 Hrs
Faculty Coordinator:			Prof.Rashmi R			

UNIT - I — **9 Hrs**

Software Quality : Five Views of Software Quality, McCall's Quality Factors and Criteria, Quality Factors, Quality Criteria, Relationship between Quality Factors and Criteria, Quality Metrics, ISO 9126 Quality Characteristics, ISO 9000:2000 Software Quality Standard, ISO 9000:2000 Fundamentals, ISO 9001:2000 Requirements.

Software Reliability : What is Reliability?, Fault and Failure, Time, Time Interval between Failures, Counting Failures in Periodic Intervals, Failure Intensity, De nitions of Software Reliability, First De nition of Software Reliability, Second De nition of Software Reliability, Comparing the De nitions of Software Reliability, Factors In uencing Software Reliability, Applications of Software Reliability, Comparison of Software Engineering Technologies, Measuring the Progress of System Testing, Controlling the System in Operation, Better Insight into Software Development Process, Operational Pro les, Operation, Representation of Operational Profile.

UNIT - II — **9 Hrs**

A Perspective on Testing : Basic Definitions, Test Cases, Insights from a Venn Diagram, Identifying Test Cases, Errors and Fault Taxonomies, Levels of Testing.

Generalized Pseudocode : The Triangle Problem, The NextDate Function, The Commission Problem, The SATM System, The Currency Converter, Saturn Windshield Wiper Controller Boundary Value Testing, Equivalence Class Testing, Decision Table based Testing. Path Testing, Program Graphs, DD-Paths, Test Coverage Metrics, Basis Path Testing, Guidelines and Observations, Data Flow Testing.

UNIT - III — **8 Hrs**

Life Cycle Based Traditional Waterfall Testing : Testing in Iterative Life Cycles, Agile Testing, Agile Model–Driven Development Model-Based testing, Testing Based on Models, Appropriate Models, Commercial Tool Support for Model-Based Testing. Integration Testing, Decomposition-Based Integration, Call Graph–Based Integration, Path-Based Integration. Example: integration NextDate, Conclusions and Recommendations.

System Testing : Threads, Basis Concepts for Requirements Specification, Model-Based Threads Use Case–Based Threads, Long versus Short Use Cases, How Many Use Cases?, Coverage Metrics for System Testing, Supplemental Approaches to System Testing, Non-functional System Testing Atomic System Function Testing Example.

UNIT - IV — **8 Hrs**

Test Automation and Architecture : Test Architecture Considerations, Understanding the SUT Architecture, Alternatives and Considerations in a Layered Architecture, Real-World Architecture.

Isolation and Test Environments : State, Isolation Problems and Solutions, Isolation Techniques. **The Big Picture:** The Relationships Between Software Architecture and Business Structure, The Relationships Between Software Architecture and Organizational Structure with Test Automation.

UNIT - V — **8 Hrs**

Designing the First Test Case: Choosing the First Test to Automate, The Scientific Method for Designing a Test Case.

Start Coding the First Test: Creating the Project, Write the Pseudo-code, Getting the Code to Compile, Model Code Review.

Completing the First Test: Running the Test to Find What to Implement First, Adding Selenium to the Project, Implementing the MVCForumClient Constructor, Implementing RegisterNewUserAndLogin, Hitting the Isolation Problem, Implementing CreateDiscussion and Analyzing the Failure, Completing the Test.

Course Outcomes: After going through this course the student will be able to:		
CO1	:	Comprehend the concepts of software quality testing and automation.
CO2	:	Apply the software testing methods and approaches to test real-world applications and automate the testing process.
CO3	:	Analyze the test architecture and test environment with respect to business and organizational structure to improve the software quality.
CO4	:	Design, develop and run test-cases using sophisticated software testing tools.

Reference Books:

1. Paul C. Jorgensen, Software Testing, A Craftsman's Approach, 4th Edition, 2016, Auerbach Publications, ISBN:978-1466560680

2. Ksheerasagar Naik and Priyadarshi Tripathy, Software Testing and Quality Assurance, Theory and Practice, Wiley International, 1st Edition, 2010, ISBN 978-81-265-2593-5

3. Arnon Axelrod, Complete Guide to Test Automation, Apress publications, 1st Edition, 2018, ISBN-13: 978-1-4842-3832-5

4. Srinivasan Desikan, Software Testing: Principles and Practices, 1st Edition, 2005 Pearson Education, ISBN-978-81-775-8121-8

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

Sl.No	Content	Marks
1	Quizzes - Q1 & Q2	20
2	Tests - T1 & T2	40
3	Experiential Learning - EL1 & EL2	40
	Total Marks	100

RUBRIC for SEE

Q. No	Contents	Marks
Each unit consists of TWO questions of 20 Marks each. Answer FIVE full questions selecting ONE from each unit (1 to 5).		
1 & 2	Unit-1: Question 1 or 2	20
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	:	MIT362D1	**AUGMENTED REALITY & VIRTUAL REALITY**	CIE Marks	:	100
Credits L-T-P	:	3 - 1 - 0		SEE Marks	:	100
Hours	:	42L+28T	*Elective D (Professional Elective)*	SEE Durations	:	3 Hrs
Faculty Coordinator:			Dr.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, 2019, Cambridge University Press, 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***		
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: III						
Course Code	:	MSE263D2	**DECISION SUPPORT SYSTEMS**	CIE Marks	:	100
Credits L-T-P	:	3-1-0		SEE Marks	:	100
Hours	:	42L+28T	*Elective D (Professional Elective)*	SEE Durations	:	3 Hrs
Faculty Coordinator:			Prof.Poornima Kulkarni			

UNIT - I	**9 Hrs**
An Overview of Business Intelligence, Analytics, and Decision Support: Changing Business Environments and Computerized Decision Support, Managerial Decision Making, Information Systems Support for Decision Making, An Early Framework for Computerized Decision Support, The Concept of Decision Support Systems (DSS), A Framework for Business Intelligence (BI), Business Analytics Overview, Brief Introduction to Big Data Analytics.	
UNIT - II	**9 Hrs**
Foundations and Technologies for Decision Making: Decision Making : Introduction and Definitions, Phases of the Decision-Making Process, Decision Making: The Intelligence Phase, Decision Making: The Design Phase, Decision Making: The Choice Phase, Decision Making: The Implementation Phase, How Decisions Are Supported, Decision Support Systems: Capabilities, DSS Classifications, Components of Decision Support Systems.	
UNIT - III	**8 Hrs**
Data Warehousing : Data Warehousing Definitions and Concepts, Data Warehousing Process Overview, Data Warehousing Architectures, Data Integration and the Extraction, Transformation, and Load (ETL) Processes, Data Warehouse Development, Data Warehousing Implementation Issues, Real-Time Data Warehousing, Data Warehouse Administration, Security Issues, and Future Trends, Resources, Links, and the Teradata University Network Connection.	
UNIT - IV	**8 Hrs**
Business Reporting, Visual Analytics, and Business Performance Management : Business Reporting Definitions and Concepts, Data and Information Visualization, Different Types of Charts and Graphs, The Emergence of Data Visualization and Visual Analytics, Performance Dashboards, Business Performance Management, Performance Measurement, Balanced Scorecards, Six Sigma as a Performance Measurement System	
UNIT - V	**8 Hrs**
Data Mining: Data Mining Concepts and Applications, Data Mining Process, Data Mining Methods, Big Data for Business Analytics Definition of Big Data, Fundamentals of Big Data Analytics, Big Data Technologies, Big Data and Data Warehousing, Big Data and Stream Analytics, Recommendation Engines, Web 2.0 and Online Social Networking	

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

CO1	:	Understand concepts of a Decision Support System (DSS) and its effect on management.
CO2	:	Demonstrate quantitative reasoning skills and critical thinking surrounding the theory of DSS and related systems.
CO3	:	Research the methods and results surrounding the DSS and related systems
CO4	:	Apply and analyze decision making process to the real world case studies.

Reference Books

1. Ramesh Sharda, Dursun Delen, Efraim Turban, Business Intelligence and Analytics Systems for Decision Support, 10th Edition, Pearson Publisher, 2015, ISBN 10: 0-13-305090-4, ISBN 13: 978-0-13-305090-5.

2. Daniel J. Power, Decision Support Systems Concepts and Resources for Managers, 2002, Quorum Books, ISBN 1-56720-497-X.

3. Fundamentals of Business Analytics, R N Prasad, Seema Acharya, 2nd edition, 2016, Wiley India Pvt Ltd, ISBN: 9788126563791, 8126563796

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		
Sl.No	**Content**	**Marks**
1	Quizzes - Q1 & Q2	20
2	Tests - T1 & T2	40
3	Experiential Learning - EL1 & EL2	40
	Total Marks	100

RUBRIC for SEE		
Q. No	**Contents**	**Marks**
Each unit consists of TWO questions of 20 Marks each. Answer FIVE full questions selecting ONE from each unit (1 to 5).		
1 & 2	Unit-1: Question 1 or 2	20
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	:	MSE264D3	**WEB INTELLIGENCE**	CIE Marks	:	100
Credits L-T-P	:	3 - 1 - 0		SEE Marks	:	100
Hours	:	42L+28T	*Elective D (Professional Elective)*	SEE Durations	:	3 Hrs
Faculty Coordinator:			Prof.Merin Meleet			

UNIT - I — **9 Hrs**

Techniques in Web Data Pre-processing and Cleaning: Introduction, The Nature of theWeb Data: General Characteristics and Quality Issues, Transforming Hyperlinks to a Graph Representation,Transforming Web Content into a Feature Vector, Web Session Reconstruction Web Pattern Extraction and Storage: Introduction, Feature Selection for Web Data, Pattern Extraction from Web Data, Web Mining Model Assessment,A Pattern
Webhouse Application

UNIT - II — **9 Hrs**

Web Content Mining Using MicroGenres : Introduction, Web Content Mining Summary, Web Usability Basics, Recent Methods, MicroGenre.
Web Structure Mining: Introduction, The Web as a Graph: Facts, Myths, and Traps, Link Analysis, Structural Clustering and Communities, Algorithmic Issues

UNIT - III — **8 Hrs**

Web Usage Mining: Introduction, Characterizing the Web User Browsing Behaviour, Representing theWeb User Browsing Behaviour and Preferences, Extracting Patterns from Web User Browsing Behaviour, Application ofWeb Usage Mining.
Ontological Engineering and the SemanticWeb: Introduction to Knowledge Representation and Ontology Engineering, A Methodological Approach to Ontology Engineering, Reasoning, Modularization and Costumization, Networked Ontologies, Ontology Development Frameworks, Applications.

UNIT - IV — **8 Hrs**

New Trends inWeb User Behaviour Analysis: The Web Operation, The Big Challenge, Novel Approaches for Modeling the Web User Behaviour, Characterizing the Web User Browsing Behaviour. Web Usage Data Pre-processing:Web Usage Data Sources and Collection, Web Session Reconstruction and User Identification, Profiling and Relevance Data Processing, A Discussion on Privacy in theWorldWideWeb
Cognitive Science for Web Usage Analysis: Introduction, Theories of Preferential Decision Making, Neurocomputing Theories, A Neurocomputing Application to the Web Usage Analysis

UNIT - V — **8 Hrs**

Web Usage Based Adaptive Systems: Introduction,Process Framework, Existing Approaches forWeb Usage Based Systems, Privacy Issues in User Data Collection and Usage, Future Challenges. Recommender Systems: Sources of Knowledge and Evaluation Metrics : Introduction, Classification of Recommender Systems, Sources of Knowledge for Recommender Systems, Evaluation Metrics for Recommender Systems, Web Recommendations

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

CO1	:	Inspect the various models for Web mining
CO2	:	Acquire knowledge on basic concepts of Semantic Web and Recommender systems
CO3	:	Use relevant tools and techniques for web data analysis and mining
CO4	:	Apply concepts on web structure mining, usage mining and content mining on Semantic web and Adaptive systems

Reference Books

1. Advanced Techniques in Web Intelligence – 1, Juan D.Vel´asquez and Lakhmi C. Jain ,2010, Springer, ISBN: 9783642144608, 3642144608

2.Advanced Techniques in Web Intelligence – 2, Juan D.Vel´asquez and Lakhmi C. Jain, 2013, Springer, ISBN:978-3-642-33326-2

3. Building an Intelligent Web: Theory and Practice,Pawan Lingras and Rajendra Akerkar P, 2010, Jones and Bartlett Publishers, Sudbury, Massachusetts. ISBN: 9780763797386

4.Evolution of the Web in Artificial Intelligence Environments, RichiNayak, NikhiI chalkaranje, 2008,Springer, ISBN:978-3540791393

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

Sl.No	Content	Marks
1	Quizzes - Q1 & Q2	20
2	Tests - T1 & T2	40
3	Experiential Learning - EL1 & EL2	40
	Total Marks	100

RUBRIC for SEE

Q. No	Contents	Marks
Each unit consists of TWO questions of 20 Marks each. Answer FIVE full questions selecting ONE from each unit (1 to 5).		
1 & 2	Unit-1: Question 1 or 2	20
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	:	MSE265D4	**MOBILE COMMERCE**	CIE Marks	:	100
Credits L-T-P	:	3- 1 - 0		SEE Marks	:	100
Hours	:	42L + 28T	*Elective D (Professional Elective)*	SEE Durations	:	3 Hrs
Faculty Coordinator:			Prof. Swetha S			

UNIT - I	**9 Hrs**
Introduction to Mobile commerce: Mobile commerce, Mobile commerce framework,Mobile commerce business models, M commerce applications , E commerce vs M commerce. Mobile commerce services: Types of M commerce services ,Mobile portal, Applications of mobile commerce in industry, Mobile application development.	
UNIT - II	**9 Hrs**
Wireless and Mobile Communication: communication systems, wireless communication, satellite communication, mobile communication systems.Digital cellular Technology : Cellular communications , cellular networks, mobile phone cellular networks.**Mobile access technology :** Mobile communcation standards, Evolution of mobile communication systems, 2G and 3G systems	
UNIT - III	**8 Hrs**
4G and 5G systems: 4G features, 4G technologies, IPv6 support, LTE advanced , 4G objectives and Goals, 4G deployment plans, systems, Mobile Devices: Types of Mobile Devices, mobile computers, Mobile Internet Device(MID), Personal Digital Assistant(PDA), Handheld game console, portable media player, pager, Personal Navigation Device, Tablet, Mobile service providers: Mobile network operators, Mobile Virtual network operators, satellite based mobile operators	
UNIT - IV	**8 Hrs**
Mobile Banking: Bank in your mobile , Mobile banking business models, mobile banking technologies, mobile banking services, advantages and challenges of mobile banking , mobile banking applications, Tickets on mobile : Mobile ticketing ,applications of mobile tickets, advantages of mobile tickets, privacy and security issues, mobile ticketing Apps, mobile ticket providers, Mobile Payment: characteristics of mobile payment systems, mobile payment models, types of mobile payments, security issues	
UNIT - V	**8 Hrs**
Mobile computing :Ubiquitous computing ,appications of mobile computing , challenges of mobile computing , mobile computing software platforms, Business applictions of mobile computing, Security and privacy issues: mobile security concepts, mobile security mechanism,Mobile network security, mobile information security, mobile device security, mobile device security arrangements, mobile application security, mobile security management, Legal aspects: mobile device related laws, cell phone freedom act 2010, information technology act 2000 of India, Privacy and Electronic Communication Regulations act 2003.	

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

CO1	:	Describe the value-added attributes, benefits, and fundamental drivers of m-commerce
CO2	:	Apply the mobile computing infrastructure that supports m-commerce (devices, software, and services)
CO3	:	Differentiate m-commerce applications in banking and financial services
CO4	:	Analyze consumer and personal applications of m-commerce, including entertainment,ubiquitous computing and sensory networks

Reference Books

1. Karabi Bandyopadhyay, Mobile commerce,1st edition , PHI Learning, 2013, ISBN-978-81-203-4805-9

2.Nikhilesh Dholakia , Morten Rask, Ruby Roy Dholakia, M-commerce : global experiences and perspectives, 2nd edition Hershey PA : Idea Group Pub., 2006, ISBN-978-1591403159

3.Paul May, Mobile Commerce : Opportunities Applications And Technologies Of Wireless Business, South Asia Edition ,CAMBRIDGE UNIVERSITY PRESS ,2015,ISBN:9781316509968

4. Shiney Chib, M-Commerce, 1st edition, Himalaya Publishing House, 2017,ISBN: 978-93-5024-914-7

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

Sl.No	Content	Marks
1	Quizzes - Q1 & Q2	20
2	Tests - T1 & T2	40
3	Experiential Learning - EL1 & EL2	40
	Total Marks	100

RUBRIC for SEE

Q. No	Contents	Marks
Each unit consists of TWO questions of 20 Marks each. Answer FIVE full questions selecting ONE from each unit (1 to 5).		
1 & 2	Unit-1: Question 1 or 2	20
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	:	MSE461N	**INTERNSHIP**	CIE Marks	:	50
Credits L-T-P	:	0 - 0 - 6		SEE Marks	:	50
Hours	:	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	:	MSE461P	**MINOR PROJECT**	CIE Marks	:	50
Credits L-T-P	:	0 - 0 - 6		SEE Marks	:	50
Hours	:	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: III						
Course Code	:	MSE491P	**MAJOR PROJECT**	CIE Marks	:	100
Credits L-T-P	:	0 - 0 - 18		SEE Marks	:	100
Hours	:	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
3. Students must execute the Major Project individually and not in teams.
4. It is mandatory for the students to present/publish their project work in National/International Conferences or Journals
5. 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.

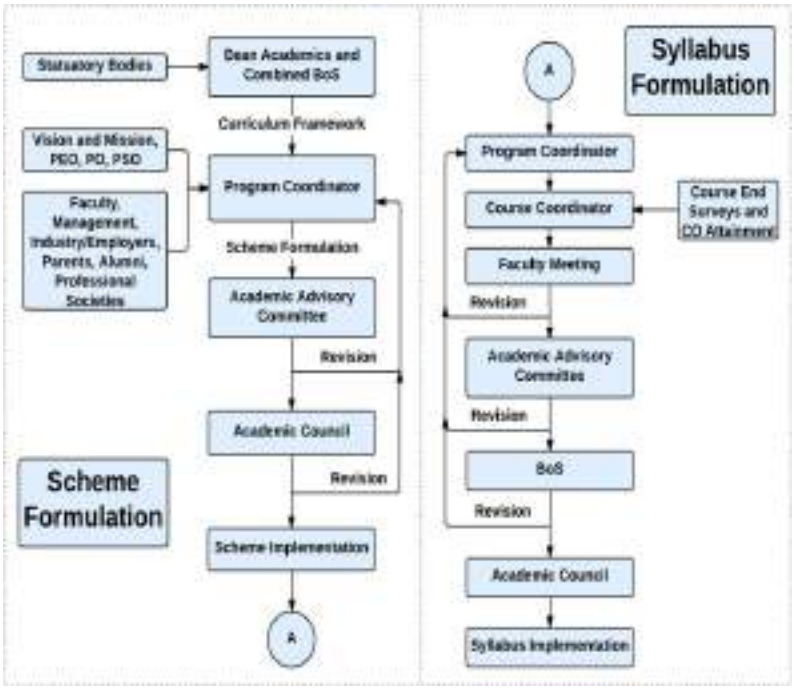
Stage-1 Report Evaluation: Evaluation of Project Report shall be done by the Guide and an External examiner.

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

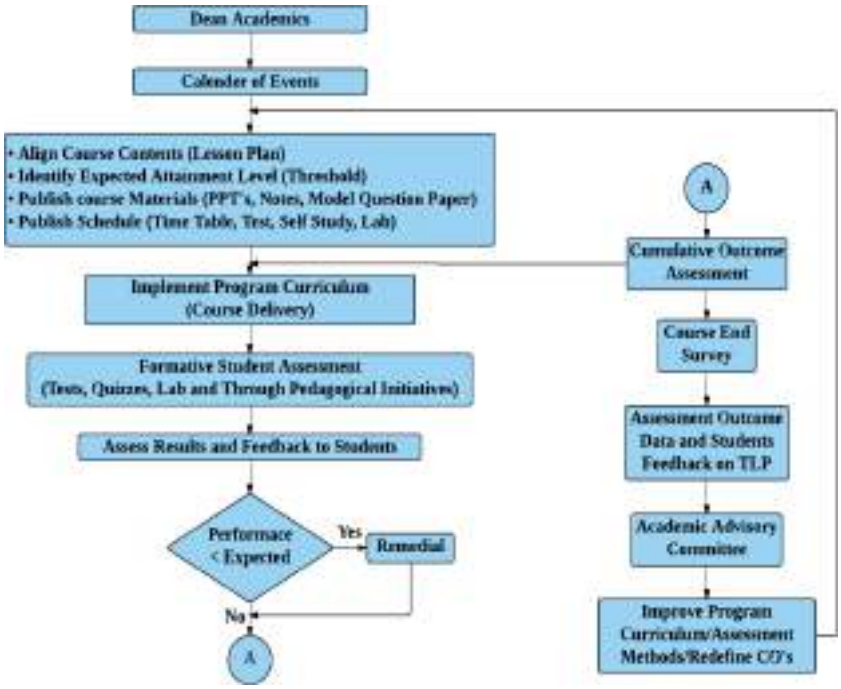
SEE procedure is as follows:

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

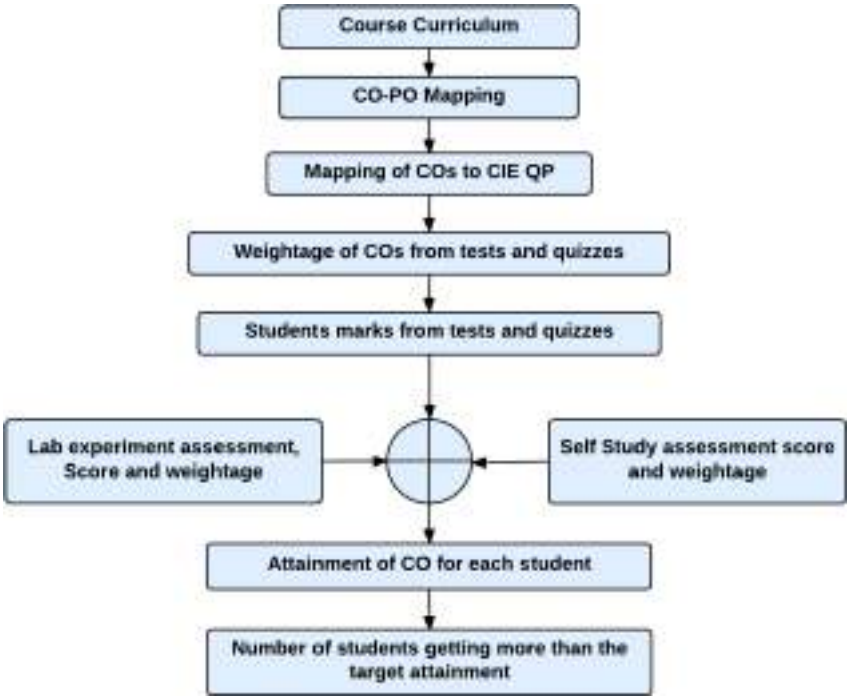
Curriculum Design Process



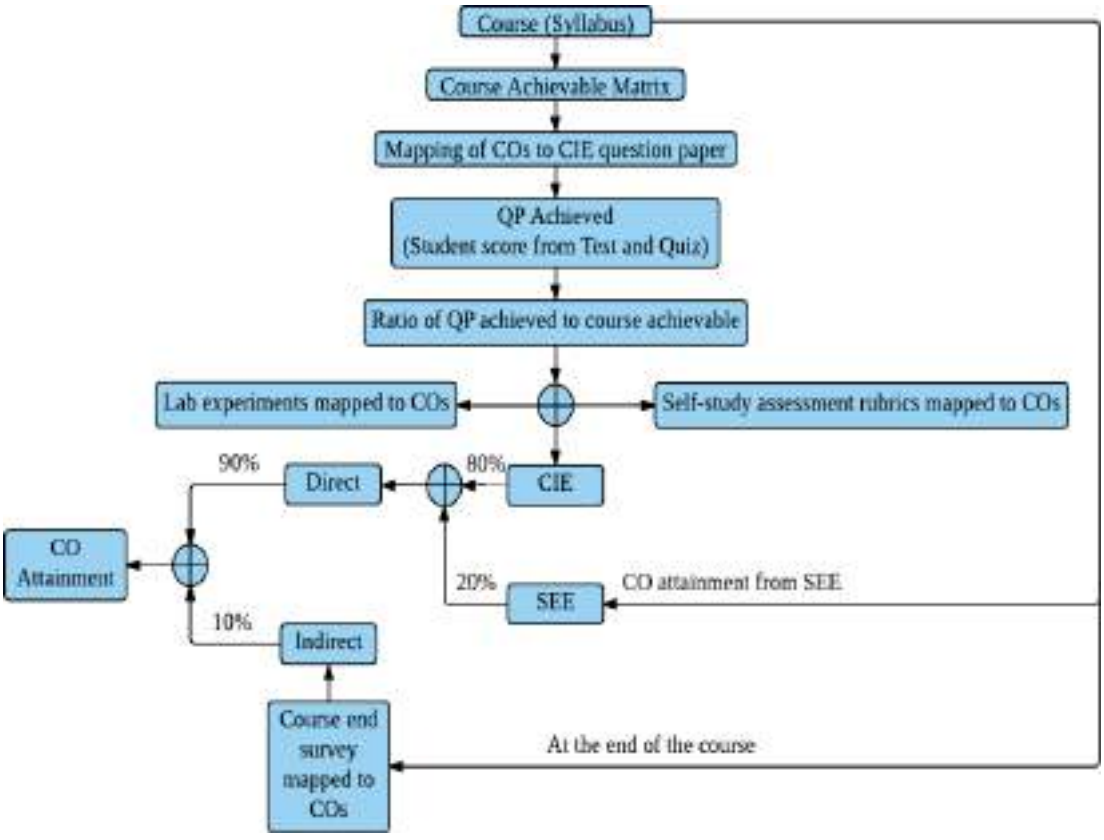
Academic Planning And



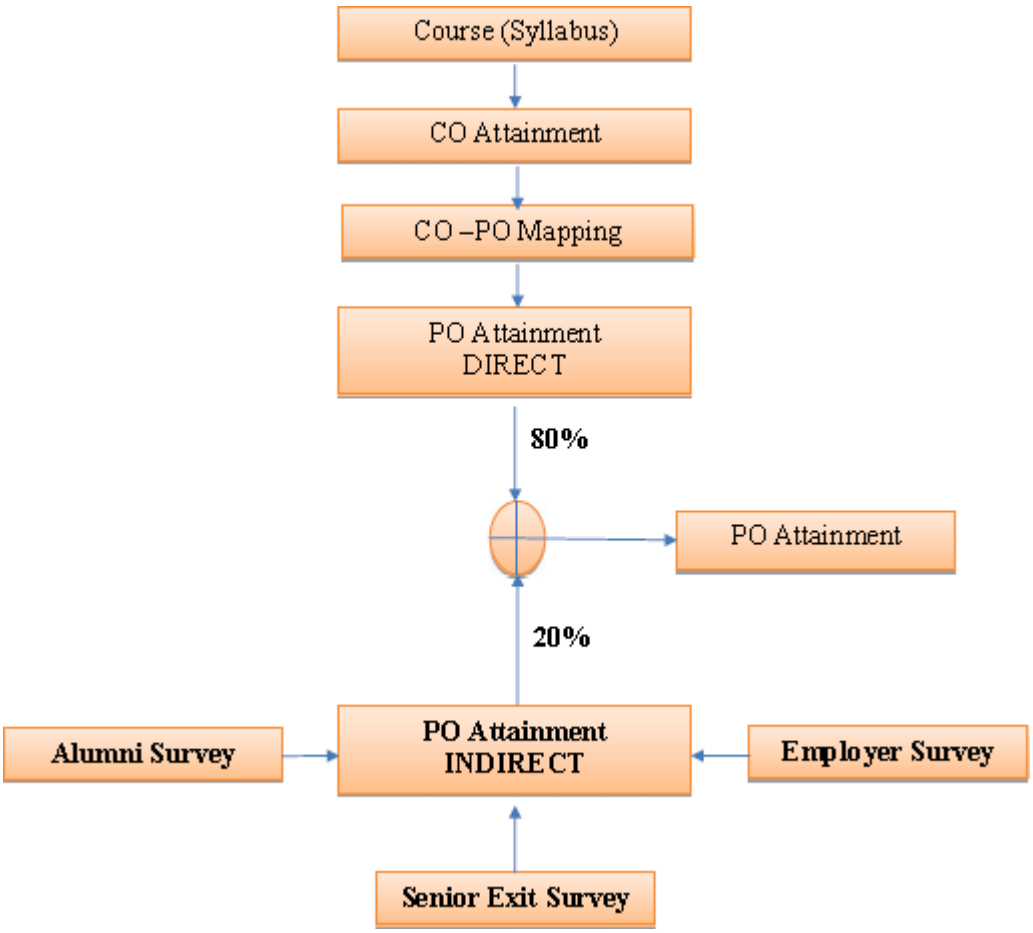
Process For Course Outcome Attainment



Final CO Attainment Process



Program Outcome Attainment Process



INNOVATIVE TEAMS OF RVCE

1. Ashwa Racing : Ashwa Mobility Foundation (AMF) is a student R&D platform that designs and fabricates Formula-themed race cars and future mobility solutions to tackle urban transportation problems.
2. Astra Robotics Team : Involved in the design, fabrication, and building of application-specific robots.
3. Coding Club : To facilitate students in acquiring the skills, confidence, and opportunities to change their world using coding. The club aims to help students 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. The organization possesses a mentor board to help startups grow.
5. Frequency Club Team : This team contributes to both software and hardware domains, mainly focusing on Artificial Intelligence, Machine Learning, and its advances.
6. Team Garuda : Design and development of a supermileage urban concept electric car. Indigenous development of E-mobility products.
7. Team Jatayu : Aims to 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 : Aims to build a roadworthy solar electric vehicle to contribute to a green and sustainable environment.
9. Team Antariksh : A Space Technology Student Club whose goal is to understand, disseminate, and apply engineering skills for innovation in the field of Space technology, including the development of operational rockets of various altitude platforms.
10. Team Chimera : Building a Formula Electric Car through research and development in E-Mobility.Electrifying Formula Racing.
11. Helios Racing Team : Involved in the 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 for various real-world applications such as water purification, solid waste detection and disposal, etc.
13. Team Krushi : Aims to develop low-cost equipment to help farmers in cultivating and harvesting. Uses new technology applications to reduce labor time and cost for farmers. Aims at developing implements for tractors.
14. Team Vyoma : Design, fabrication, and testing of radio-controlled aircraft 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 and 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 during times of natural calamities.

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

NSS of RVCE

NCC of RVCE

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 experientiallearning 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