Rashtreeya Sikshana Samithi Trust

R.V. College of Engineering, Bengaluru

(Autonomous Institution Affiliated to Visvesvaraya Technological University, Belagavi)

Master of Technology (M. Tech.)

Information Technology

Scheme and Syllabus

Autonomous System w.e.f 2016

R.V. College of Engineering, Bengaluru – 59

(Autonomous Institution Affiliated to Visvesvaraya Technological University,, Belagavi)

Department of Information Science and 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 technology.

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 class rooms 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 program, 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 team work through inter-disciplinary projects, co-curricular and social activities.

Program Educational Objectives (PEO)

M. Tech. in Information Technology Program, Students will be able to:

PEO1: Identify and evaluate current and changing information system methodologies and assess their applicability in regulatory demands, strategic goals to address the clients' needs.

PEO2: Solve business-centered problems by analyzing, developing and implementing information system based solutions

PEO3: Configure and operate complex software systems, packages, tools and applications for sustainability in various domains like education, healthcare, business.

Program Outcomes (PO)

Student in M. Tech. in Information Technology will be able to attain :

PO1: **Scholarship of Knowledge**- Acquire in-depth knowledge of Information Technology, including wider and global perspective, with an ability to discriminate, evaluate, analyze and synthesize existing and new knowledge, and integration of the same for enhancement of knowledge.

PO2: Critical Thinking - Analyse complex Information Technology related problems critically, apply independent judgement for synthesizing information to make intellectual and/or creative advances for conducting research in a wider theoretical, practical and policy context.

PO 3: Problem Solving - **T**hink laterally and originally, conceptualise and solve issues related to Information Technology, evaluate a wide range of potential solutions for those problems and arrive at feasible, optimal solutions after considering public health and safety, cultural, societal and environmental factors in the core areas of expertise.

PO4: Research Skill - Extract information pertinent to unfamiliar problems in Information Technology domain through literature survey and experiments, apply appropriate research methodologies, techniques and tools, design, conduct experiments, analyse and interpret data, demonstrate higher order skill and view things in a broader perspective, contribute individually/in group(s) to the development of scientific/technological knowledge in one or more domains of engineering.

PO 5: Usage of modern tools - Create, select, learn and apply appropriate techniques, resources, and modern engineering and IT tools of Information Technology, including prediction and modelling, to complex engineering activities with an understanding of the limitations.

PO 6: Collaborative and Multidisciplinary work - Possess knowledge and understanding of group dynamics, recognise

opportunities and contribute positively to collaborative-multidisciplinary scientific research in Information Technology, demonstrate a capacity for self-management and teamwork, decision-making based on open-mindedness, objectivity and rational analysis in order to achieve common goals and further the learning of themselves as well as others.

PO 7: Project Management and Finance - Demonstrate knowledge and understanding of Information Technology principles and apply the same to one's own work, as a member and leader in a team, manage projects efficiently in respective disciplines and multidisciplinary environments after consideration of economical and financial factors.

PO 8: Communication - Communicate with the Information Technology engineering community, and with society at large, regarding complex engineering activities confidently and effectively, such as, being able to comprehend and write effective reports and design documentation by adhering to appropriate standards, make effective presentations, and give and receive clear instructions.

PO 9: Life-long Learning - Recognise the need for, and have the preparation and ability to engage in life-long learning independently in Information Technology domain, with a high level of enthusiasm and commitment to improve knowledge and competence continuously.

PO 10 : Ethical Practices and Social Responsibility - Acquire professional and intellectual integrity, professional code of conduct, ethics of research and scholarship, consideration of the impact of research outcomes on professional practices and an understanding of responsibility to contribute to the community for sustainable development of society using Information Technology solutions.

PO 11: Independent and Reflective Learning - Observe and examine critically the outcomes of one's actions and make corrective measures subsequently, and learn from mistakes in project and professional practice without depending on external feedback.

Program Specific Outcomes (PSO)

M. Tech. in Information Technology Students will be able to:

PSO 1. Design, integrate and administer IT-based solutions for enterprize, develop mobile applications.

PSO 2. Synthesize and evaluate models for IT management with emphasis on storage management, data engineering & Security.

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M.Tech. in Information Technology

FIRST SEMESTER								
Sl. No	**Course Code**	**Course Title**	**BoS**	**CREDIT ALLOCATION**				**Total Credits**
				Lecture **L**	**Tutorial** **T**	**Practical** **P**	**Experiential Learning/ Self Study** **S**	
1	16MEM11R	Research Methodology	IM	3	1	0	0	4
2	16MIT12/ 16MSE12	Data Engineering	IS	4	0	1	0	5
3	16MIT13	Enterprise Application Development	IS	4	0	0	1	5
4	16MIT14	Information Storage and Management	IS	4	0	0	0	4
5	16MIT15X	Elective – 1	IS	4	0	0	0	4
6	16HSS16	Professional Skill Development		0	0	2	0	2
		Total		**19**	**1**	**3**	**1**	**24**

Elective -1			
16MIT151	Service Oriented Architecture	16MIT152/16MSE152	Human Computer Interaction

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M.Tech. in Information Technology

SECOND SEMESTER								
Sl. No	**Course Code**	**Course Title**	**BoS**	**CREDIT ALLOCATION**				**Total Credits**
				Lecture **L**	**Tutorial** **T**	**Practical** **P**	**Experiential Learning / Self Study** **S**	
1	16MEM21P	Project Management	IM	3	1	0	0	4
2	16MIT22/16MSE22	Cyber Security and Digital Forensics	IS	4	0	1	0	5
3	16MIT23X	Elective – 2	IS	4	0	0	0	4
4	16MIT24X	Elective – 3	IS	4	0	0	0	4
5	16MIT25X	Elective – 4	IS	4	0	0	0	4
6	16MIT26	Minor Project	IS	0	0	5	0	5
		Total		**19**	**1**	**6**	**0**	**26**

Elective -2			
16MIT231	Multimedia communications	16MIT232	Bio Informatics
Elective – 3			
16MCE241/16MIT241	Information Retrieval	16MIT242	Supply Chain Management
Elective – 4			
16MIT251/16MSE251	Advanced Computer Networks	16MIT252/16MSE252	Distributed Computing

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Department of Information Science and Engineering

M.Tech. in Information Technology

THIRD SEMESTER								
Sl. No	**Course Code**	**Course Title**	**BoS**	**CREDIT ALLOCATION**				**Total Credits**
				Lecture L	**Tutorial T**	**Practical P**	**Experiential Learning/ Self Study S**	
1	16MIT31	Mobile Application Development	IS	4	0	1	0	5
2	16MIT32X	Elective – 5	IS	4	0	0	0	4
3	16MIT33X	Elective – 6	IS	4	0	0	0	4
4	16MIT34X	Elective – 7	IS	4	0	0	0	4
5	16MIT35	Internship / Industrial Training	IS	0	0	3	0	3
6	16MIT36	Technical Seminar	IS	0	0	2	0	2
		Total		**16**	**0**	**6**	**0**	**22**

Elective -5			
16MIT321/16MSE321	Soft Computing	16MIT322/16MSE322	Social Network Analysis
Elective – 6			
16MIT331/16MSE331	IoT and Cloud Computing	16MIT332/16MSE332	Big Data Analytics
Elective-7			
16MIT341	Machine Learning	16MCE342/16MIT342	Natural Language Processing &Text Mining

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FOURTH SEMESTER								
Sl. No	**Course Code**	**Course Title**	**BoS**	**CREDIT ALLOCATION**				**Total Credits**
				Lecture	**Tutorial**	**Practical**	**Experiential Learning/ Self Study**	
				L	**T**	**P**	**S**	
1	16MIT41	Major Project	IS	0	0	26	0	26
2	16MIT42	Seminar	IS	0	0	2	0	2
		Total		**0**	**0**	**28**	**0**	**28**

THIRD SEMESTER

Mobile Application Development						
Course Code	**:**	**16MIT31**		**CIE Marks**	**:**	**100+50**
Hrs/Week	**:**	**L:T:P:S 4:0:1:0**		**SEE Marks**	**:**	**100+50**
Credits	**:**	**5**		**SEE Duration**	**:**	**3**

Course Learning Objectives (CLO):

Students shall be able to

1. Comprehend the knowledge on essentials of android application development.
2. Demonstrate the basic and advanced features of android technology.
3. Develop the skills in designing and building mobile applications using android platform.
4. Create debug and publish innovative mobile applications using android Platform.

Unit – I	**10 Hrs**

ESSENTIALS FOR ANDROID APP DEVELOPMENT

Background about mobile technologies, Overview of Android, Android architecture, Android for mobile app 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	**09 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	**10 Hrs**

DATA STORAGE, SERVICES & CONTENT PROVIDERS

Saving Data, Interacting with other Apps, Working with system permissions, Apps 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	**10 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	**09 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.

Unit – VI (Lab Component)	

Exercise 1-Developing Simple Applications for Android
Exercise 2-Creating Applications with Multiple Activities and a Simple Menu using ListView
Exercise 3-Creating Activities for Menu Items and Parsing XML Files
Exercise 4-Writing Multi-Threaded Applications
Exercise 5-Using WebView and Using the Network
Exercise 6-Using Audio Functions in Android
Exercise 7-Graphics Support in Android
Exercise 8-Preferences and Content Providers
Exercise 9-Location Services and Google Maps in Android
Exercise 10-Simulating Sensors

1. Design and develop a Mobile App for smart phones The Easy Unit Converter using Android.
This application should have approximately 20 categories to be used in your daily life. It includes following units: Acceleration, Angle, Area, Circle, Capacitor , Cooking, Data Size, Density, Data Transfer rate, Electric Current, Energy, Flow Rate , Force

2. Design and develop a Mobile App for smart phones Currency Converter. .This applications should synchronize online as you run it and sends you back the latest and most reliable exchange rates possible. This application should support following conversions:
EUR->Euro, GBP->British Pound, USD->United States Dollar
AUD->Australian Dollar, CAD->Canadian Dollar, CHF->Swiss Franc
CNY->Chinese Yuan, HKD->Hong Kong Dollar, IDR->Indonesian Rupiah
INR->Indian Rupee, JPY->Japanese Yen, THB->Thai Baht

3. Design and develop a Mobile App game for smart phones The Tic Tac Toe using Android.

4. Design and develop an Mobile App for smart phones, The Health Monitoring System using Android. This App should record Biochemistry Lab Parameters and if abnormal should send a SMS to doctor for Medications.

5. Design and develop a Mobile App for smart phones The Expense Manager using Android. This is an application for managing your expenses and incomes: Tracking expenses and incomes by week, month and year as well as by categories, Multiple accounts in multiple currencies, Schedule the payments and recurring payments, Take a picture of receipt, Payment alerts, Budget by day, week, month and year, Search and reports, Import and export account activities in CSV for desktop software, Customize expense categories, payer/payer, payment methods, date format, white or black background, button style etc, Account transfer, Convenient tools such calculator, currency converter, tip calculator, sales and tax calculator and credit card calculator.

Mini Project

At this point, Students will be ready to create own app.
This project is about combining various ideas and skills which is being practiced throughout the course. They include:

- Planning app design before coding.

- Taking an app layout from drawing to XML code.
- Creating, positioning, and styling views.
- Creating interactivity through button clicks and Java code.
- Commenting and documenting your code.

Students will complete this project according to these steps:

1. Brainstorm about Target User of the app.
2. Gather Information.
3. Pick an App Idea/ innovative idea.
4. Design a Solution.
5. Read the Project Rubric.
6. Write Code to Build Your App.
7. Test & debug on real device.
8. Publish app.

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: Understand the economics and features of the app, app marketplace by offering the app for download.

Reference Books

1	Phillips, Stewart, Hardy and Marsicano; Android Programming, 2nd edition - Big Nerd Ranch Guide;2015; ISBN-13 978-0134171494
2	Reto Meier; Professional Android 2 Application Development; Wiley India Pvt.ltd; 1st Edition; 2012; ISBN-13: 9788126525898
3	Mark Murphy; Beginning Android 3; Apress Springer India Pvt Ltd. ;1st Edition; 2011;ISBN-13: 978-1-4302-3297-1
4	Eric Hellman; Android Programming – Pushing the limits by Hellman; Wiley; 2013; ISBN 13: 978-1118717370

Scheme of Continuous Internal Evaluation (CIE) for Theory

CIE will consist of TWO Tests, TWO Quizzes and ONE assignment. The test will be for 30 marks each and the quiz for 10 marks each. The assignment will be for 20 marks. The total marks for CIE (Theory) will be 100 marks.

Scheme of Continuous Internal Evaluation (CIE) for Practical

CIE for the practical courses will be based on the performance of the student in the laboratory, every week. The laboratory records will be evaluated for 40 marks. One test will be conducted for 10 marks. The total marks for CIE (Practical) will be for 50 marks.

Scheme of Semester End Examination (SEE) for Theory

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 question from each unit. The total marks for SEE (Theory) will be 100 marks.

Scheme of Semester End Examination (SEE) for Practical

SEE for the practical courses will be based on conducting the experiments and proper results for 40 marks and 10 marks for viva-voce. The total marks for SEE (Practical) will be 50 marks.

Mapping of Course Outcomes (CO) to Program Outcomes (PO)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO 1	M	-	M	-	M	-	-	-	-	-	H
CO 2	H	M	H	H	H	M	-	-	-	-	-
CO 3	-	H	H	M	H	H	-	-	H	-	H
CO 4	H	H	-	H	-	M	M	H	H	H	-

Mapping of Course Outcomes (CO) to Program Specific Outcomes (PSO)

	PSO1	PSO2
CO1	M	H
CO2	H	M
CO3	H	L
CO4	M	H

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Soft Computing						
Course Code	**:**	**16MIT321/16MSE321**		**CIE Marks**	**:**	**100**
Hrs/Week	**:**	**L:T:P:S 4:0:0:0**		**SEE Marks**	**:**	**100**
Credits	**:**	**4**		**SEE Duration**	**:**	**3 Hrs**

Course Learning Objectives (CLO):

Students shall be able to

1. Design learning algorithms using neural networks.
2. Apply Fuzzy logic to solve real world problems.
3. Analyze Fuzzy neuro systems.
4. Apply genetic algorithms to solve optimization problems

Unit – I	**08 Hrs**

Neural Networks: History, overview of biological Neuro-system, Mathematical Models of Neurons, ANN architecture

Unit – II	**09 Hrs**

Learning Processes: Learning rules, Learning Paradigms-Supervised, Unsupervised and reinforcement Learning, ANN training Algorithms-perceptions, Training rules, Delta, Back Propagation Algorithm, Multilayer Perceptron Model, Hopfield Networks, Associative Memories, Applications of Artificial Neural Networks.

Unit – III	**08 Hrs**

Fuzzy Logic: Introduction to Fuzzy Logic, Classical and Fuzzy Sets: Overview of Classical Sets, Membership Function, Fuzzy rule generation.

Unit – IV	**10 Hrs**

Operations on Fuzzy Sets, Fuzzy Arithmetic, Fuzzy Logic, Uncertainty based Information: Complement, Intersections, Unions, Combinations of Operations, Aggregation Operations. Fuzzy Numbers, Linguistic Variables, Arithmetic Operations on Intervals & Numbers, Lattice of Fuzzy Numbers, Fuzzy Equations. Classical Logic, Multivalued Logics, Fuzzy Propositions, Fuzzy Qualifiers, Linguistic Hedges. Information & Uncertainty, Non specificity of Fuzzy & Crisp Sets, Fuzziness of Fuzzy Sets.

Unit – V	**09 Hrs**

Introduction of Neuro-Fuzzy Systems: Architecture of Neuro Fuzzy Networks, Applications of Fuzzy Logic: Medicine, Economics etc. Genetic Algorithms An Overview, Genetic Algorithms in problem solving, Implementation of Genetic Algorithms

Course Outcomes:

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

CO1: Apply fuzzy logic and reasoning to handle uncertainty and solve engineering problems

CO2: Analyze genetic algorithms to combinatorial optimization problems

CO3: Effectively use existing software tools to solve real problems using a soft computing approach

CO4: Evaluate and compare solutions by various soft computing approaches for a given problem.

Reference Books	
1	Anderson, James a., An Introduction to Neural Networks, ISBN: 978-81-203-1351-4,PHI, 2008
2	Hertz J. Krogh, R.G. Palmer - Introduction to the Theory of Neural Computation, AddisonWesley, 1991, ISBN 9780201515602
3	G.J. Klir& B. Yuan - Fuzzy Sets & Fuzzy Logic, PHI, 2006, ISBN: 978-81-203-1136-7
4	Melanie Mitchell - An Introduction to Genetic Algorithm, PHI, 2006 ISBN 9670201785602

Scheme of Continuous Internal Evaluation (CIE)

CIE will consist of TWO Tests, TWO Quizzes and ONE assignment. The test will be for 30 marks each and the quiz for 10 marks each. The assignment will be for 20 marks. The total marks for CIE (Theory) will be 100 marks.

Scheme of Semester End Examination (SEE)

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 question from each unit. The total marks for SEE (Theory) will be 100 marks.

Mapping of Course Outcomes (CO) to Program Outcomes (PO)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO 1	L	-	-	H	-	-	-	M	M	-	-
CO 2	M	M	-	H	-	-	-	-	-	-	-
CO 3	M	M	-	H	-	-	M	-	-	-	-
CO 4	-	-	M	H	H	-	-	-	-	-	-

Mapping of Course Outcomes (CO) to Program Specific Outcomes (PSO)

	PSO1	**PSO2**
CO1	H	M
CO2	M	M
CO3	H	M
CO4	H	H

Social Network Analysis						
Course Code	**:**	**16MSE322/16MIT322**		**CIE Marks**	**:**	**100**
Hrs/Week	**:**	**L:T:P:S 4 :0 :0 :0**		**SEE Marks**	**:**	**100**
Credits	**:**	**4**		**SEE Duration**	**:**	**3 Hrs**

Course Learning Objectives (CLO):

Graduates shall be able to

1. List basic principles behind network analysis algorithms
2. Acquire essential knowledge of network analysis
3. Apply real world data with examples from today's most popular social networks.
4. Engage in critical thinking regarding the applicability of social network theory to various sociological phenomena

Unit – I	**10 Hrs**

Introduction : Overview, Analyzing Social Network, Securing Social Networks . **Social Networks:** Introduction, Survey of Social Networks, Details of Four Popular Social Networks **Analyzing and Securing Social Networks:** Introduction, Applications in Social Media Analytics, Data Mining Techniques for SNA, Security and Privacy .**Semantic Web-Based Social Network Representation and Analysis** : Introduction, Social Network Representation, An approach to Social Network Analysis

Unit – II	**09 Hrs**

Developments and Challenges in Location Mining : Key Aspects of Location Mining, Efforts in Location Mining, Challenges in Location Mining, Geospatial Proximity and Friendship. **TweetHood:** A Social Media Analytics Tool: TweetHood, Experiments and Results. **Tweecalization:** Location Mining Using Semisupervised Learning : Tweecalization, Trustworthiness and Similarity Measure, Experiments and Results .**Tweeque: Identifying Social Cliques for Location Mining :** Effect of Migration, Temporal Data Mining, Social Clique Identification, Experiments and Results, Location Prediction, Agglomerative Hierarchical Clustering, MapIt: Location Mining from Unstructured Text

Unit – III	**10 Hrs**
Classification of Social Networks Incorporating Link Types : Related Work, Learning Methods, Experiments. **Extending Classification of Social Networks through Indirect Friendships:** Introduction., Related Work, Definitions, Approach used, Experiments and Results. **Social Network Classification through Data Partitioning :** Introduction., Related Work, Metrics, Distributed Social Network Classification, Experiments. **Implementation of an Access Control System for Social Networks :** Security in Online Social Networks, Framework Architecture.	
Unit – IV	**10 Hrs**
Social Media Integration and Analytics Systems : Introduction, Entity Extraction and Integration, Ontology-Based Heuristic Reasoning .**Semantic Web-Based Social Network Integration**: Information Integration in Social Networks, Jena–HBase: A Distributed, Scalable, and Efficient RDF Triple Store, StormRider: Harnessing Storm for Social Networks.	
Unit – V	**09 Hrs**
Data Security and Privacy: Security Policies, Policy Enforcement and Related Issues, Data Privacy .**Confidentiality, Privacy, and Trust for Social Media Data :** Trust, Privacy, and Confidentiality, CPT Framework, Privacy for Social Networks, Trust for Social Networks, CPT within the Context of Social Networks. **Attacks on Social Media and Data Analytics Solutions:** Malware and Attacks, Attacks on Social Media, Data Analytics Solutions.	
Course Outcomes: After going through this course the student will be able to: CO1: Comprehend basic notation and terminology used in network science. CO2: Visualize, summarize and compare different networks and its security. CO3: Use tools to analyze real world networks. CO4: Use advanced network analysis methods to perform empirical investigations of network data.	
Reference Books	
1.	Bhavani Thuraisingham, Satyen Abrol, Raymond Heatherly, Vaibhav Khadilka, “Analyzing and Securing Social Networks” , CRC Press, ISBN: 9781482243277
2.	Albert-Laszlo Barabasi. “Linked. The New Science of Networks”, Edition- 2014, ISBN-13: 978-0738206677
3.	Charu C Aggarwal, “ Social Network Data Analytics”, Springer, 2011, ISBN: 13:9781441984616
4.	Robert Kabacoff. “R in action. Data Analysis and graphics with R”, Manning Publications, 2011, ISBN-13: 978-1935182399

Scheme of Continuous Internal Evaluation (CIE)

CIE will consist of TWO Tests, TWO Quizzes and ONE assignment. The test will be for 30 marks each and the quiz for 10 marks each. The assignment will be for 20 marks. The total marks for CIE (Theory) will be 100 marks.

Scheme of Semester End Examination (SEE)

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 question from each unit. The total marks for SEE (Theory) will be 100 marks.

Mapping of Course Outcomes (CO) to Program Outcomes (PO)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO 1	H	M	H	-	M	M	-	M	M	M	M
CO 2	H	H	H	H	H	M	M	M	H	-	M
CO 3	M	H	H	H	H	H	M	H	M	H	M
CO 4	H	H	H	H	H	M	-	H	H	M	H

Mapping of Course Outcomes (CO) to Program Specific Outcomes (PSO)

	PSO1	PSO2
CO1	M	L
CO2	H	M
CO3	H	L
CO4	H	H

IOT and Cloud Computing						
Course Code	**:**	**16MIT331/16MSE331**		**CIE Marks**	**:**	**100**
Hrs/Week	**:**	**L:T:P:S 4 :0 :0 :0**		**SEE Marks**	**:**	**100**
Credits	**:**	**4**		**SEE Duration**	**:**	**3 Hrs**

Course Learning Objectives (CLO):

Students shall be able to

1. Interpret the fundamentals of Internet of Things.
2. Analyze and design a small low cost embedded system using Arduino / Raspberry Pi or equivalent boards.
3. Apply the concept of Internet of Things in the real world scenario
4. Demonstrate the application of cloud technologies to the world of IoT

Unit – I	**10 Hrs**
Fundamentals of IoT: Introduction-Characteristics-Physical design - Protocols – Logical design – Enabling technologies – IoT Levels – Domain Specific IoTs – IoTvs M2M	
Unit – II	**09 Hrs**
IoT Design Methodology: IoT systems management – IoT Design Methodology – Specifications Integration and Application Development.	
Unit – III	**10 Hrs**

IoT Physical Devices & Endpoints: What is an IoT Device , Basic building blocks of an IoT Device Exemplary Device: Raspberry Pi- About the Board Linux on Raspberry Pi Raspberry Pi Interfaces -Serial SPI , I2C, Programming Raspberry Pi with Python , Controlling LED with Raspberry Pi, Interfacing an LED and Switch with Raspberry Pi , Interfacing a Light Sensor (LDR) with Raspberry Pi Other IoT Devices -BeagleBone Black	
Unit – IV	**10 Hrs**
IoT Physical Servers & Cloud Offerings: Designing a RESTful Web API , Amazon Web Services for IoT-Amazon EC2 , Amazon AutoScaling, Amazon S3 , Amazon RDS , Amazon DynamoDB , Amazon Kinesis, Amazon SQS , Amazon EMR, SkyNetIoT Messaging Platform	
Unit – V	**09 Hrs**
Case Studies- IoT Design and Cloud incorporation: Introduction to IOT Design, Home Automation, Smart Lighting , Home Intrusion Detection, Cities , Smart Parking , Environment , Weather Monitoring System , Weather Reporting Bot , Air Pollution Monitoring , Forest Fire Detection, Agriculture, Smart Irrigation, Productivity Applications , IoT Printer.	
Course Outcomes: After going through this course the student will be able to: CO1: Interpret the essentials of IOT CO2: Design a portable IoT using Arduino/ equivalent boards using relevant protocols CO3: Describe the concept of web services to access/control IoT devices CO4: Identify physical devices required to deploy an IoT application and connect to the cloud for real time scenarios.	
Reference Books	
1.	Arshdeep Bahga, Vijay Madisetti, “Internet of Things – A hands-on approach”, Universities Press, 2015, ISBN: 978-81-7371-954-7.
2.	Rajkumar Buyya , James Broberg, Andrzej Goscinski: Cloud Computing Principles and Paradigms, Willey 2014.
3.	Honbo Zhou, “The Internet of Things in the Cloud: A Middleware Perspective” ,CRC Press 2013, ISBN : 978-1-4398-9299-2.
4.	Soyata, Tolga, “Enabling Real-Time Mobile Cloud Computing through Emerging Technologies”, IGI Global, 2015, ISBN: 978-1-4666-8662-5.

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Scheme of Semester End Examination (SEE)

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 question from each unit. The total marks for SEE (Theory) will be 100 marks.

Mapping of Course Outcomes (CO) to Program Outcomes (PO)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11

CO 1	M	L	M	-	-	-	-	-	H	-	-
CO 2	H	M	L	H	H	M	-	M	H	L	M
CO 3	L	M	-	M	M	L	-	-	H	M	M
CO 4	H	L	M	M	H	H	-	M	H	H	M

Mapping of Course Outcomes (CO) to Program Specific Outcomes (PSO)

	PSO1	**PSO2**
CO1	-	M
CO2	H	M
CO3	L	M
CO4	H	M

Big Data Analytics						
Course Code	**:**	**16MIT332/16MSE332**		**CIE Marks**	**:**	100
Hrs/Week	**:**	**L:T:P:S 4 :0 :0 :0**		**SEE Marks**	**:**	100
Credits	**:**	**4**		**SEE Duration**	**:**	**3 Hrs**

Course Learning Objectives (CLO):

Students shall be able to

1. Understand handling huge amount of data using distributed environment.
2. Analyse large sets of data to gain insights of the underlying patterns.
3. Apply techniques to process data streams using in memory operations.
4. Adapt data mining techniques to process massive datasets..

Unit – I	**10 Hrs**

Introduction to Big Data Analytics: Characteristics of Big Data, Importance of Big Data Analytics, Different levels of parallelization, Hadoop architecture, data blocks, speculative execution, HDFS daemons, Hadoop ecosystem, HDFS containers, Introduction to MapReduce, concepts of YARN, MapReduce phases, combiners, Partitioners, program examples.

Unit – II	**09 Hrs**

Introduction to: Introduction to Hive, Hive configuration, HiveQL, Partitions and buckets, user defined functions in Hive. Introduction to Pig, Pig Latin, execution modes, user defined functions in Pig, data processing operators. Concepts of NOSQL databases.

Unit – III	**10 Hrs**

Introduction to Scala: Basics of programming with Scala, classes, collections, options and types, implicits, loops, functions.

Unit – IV	**10 Hrs**

SPARK - I: Programming with RDD's, creating RDD's, RDD operations, passing functions to SPARK, transformations and actions, working of pair RDD's, data partitioning, SPARK SQL.

Unit – V	**09 Hrs**

Machine Learning with SPARK-ML2: Basics of machine learning, working with vectors, feature extraction, regression, classification, clustering, collaborative filtering and recommendation, dimensionality reduction, model evaluation.

Course Outcomes:

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

CO1: Handle data manipulations for massive datasets using distributed environment.

CO2: Gain insights into the patterns by processing massive datasets.

CO3: Implement techniques for real time processing of data streams.

CO4: Extract value out of the data to make important business decisions and accurate predictions.

Reference Books

1.	Tom White, Hadoop: The Definitive Guide, O'Reilly Publications, 4th edition, 2015, ISBN-10: 9352130677, ISBN-13: 978-9352130672
2.	Holden Karau, Andy Konwinski, Patrick Wendell, Matei Zaharia, Learning Spark, O'Reilly Publications, 1st edition, 2015, ISBN-10: 9351109941, ISBN-13: 978-9351109945

3.	Jason Swartz, Learning Scala, O'Reilly Publications, 1st edition, 2014, ISBN-10: 9352132564, ISBN-13: 978-9352132560
4.	Seema Acharya, Subhashini Chellappan, Big Data and analytics, Wiley Publications, 2015, ISBN-10: 8126554789, ISBN-13: 978-8126554782

Scheme of Continuous Internal Evaluation (CIE)

CIE will consist of TWO Tests, TWO Quizzes and ONE assignment. The test will be for 30 marks each and the quiz for 10 marks each. The assignment will be for 20 marks. The total marks for CIE (Theory) will be 100 marks.

Scheme of Semester End Examination (SEE)

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 question from each unit. The total marks for SEE (Theory) will be 100 marks.

Mapping of Course Outcomes (CO) to Program Outcomes (PO)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO 1	H	H	M	H	M	-	-	L	M	H	M
CO 2	M	M	-	H	M	-	-	-	M	-	M
CO 3	M	M	-	M	H	L	-	-	M	-	M
CO 4	M	M	H	H	H	M	L	-	M	M	M

Mapping of Course Outcomes (CO) to Program Specific Outcomes (PSO)

	PSO1	PSO2
CO1	H	L
CO2	M	M
CO3	-	-
CO4	H	-

Machine Learning						
Course Code	**:**	**16MIT341**		**CIE Marks**	**:**	**100**
Hrs/Week	**:**	**L:T:P:S 4:0:0:0**		**SEE Marks**	**:**	**100**
Credits	**:**	**4**		**SEE Duration**	**:**	**3 Hrs**

Course Learning Objectives (CLO):

Students shall be able to

1 Develop skills of using recent machine learning software for solving practical problems

2 Apply machine learning algorithms to solve problems of moderate complexity

3 Formulate machine learning problems corresponding to different applications

4 Evaluate different machine learning techniques (ex: robustness, sensitivity, specificity, advantages, limitation etc.) by comparing and assessing their computational results.

Unit – I	**10 Hrs**

Introduction, Concept Learning and Decision Trees: Learning Problems – Designing Learning systems, Perspectives and Issues – Concept Learning – Version Spaces and Candidate Elimination Algorithm – Decision Tree learning – Representation – Algorithm – Heuristic Space Search in Decision Tree learning

Unit – II	**09 Hrs**

Neural Networks and Genetic Algorithms: Neural Network Representation – Problems – Perceptrons – Multilayer Networks and Back Propagation Algorithms – Advanced Topics – Genetic Algorithms – Hypothesis Space Search – Genetic Programming – Models of Evolution and Learning.

Unit – III	**10 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 – IV	**10 Hrs**

Instant Based Learning And Learning Set of Rules: K- Nearest Neighbor Learning – Locally Weighted Regression – Radial Basis Functions –Case-Based Reasoning – Sequential Covering Algorithms – Learning Rule Sets – Learning First Order Rules – Learning Sets of First Order Rules – Induction as Inverted Deduction – Inverting Resolution

Unit – V	**09 Hrs**

Analytical Learning and Reinforced Learning: Perfect Domain Theories – Explanation Based Learning – Inductive-Analytical Approaches - FOCL Algorithm – Reinforcement Learning – Task – Q-Learning – Temporal Difference Learning

Course Outcomes:

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

CO1: Identify and apply appropriate machine learning techniques to classification , pattern recognition, optimization and decision problems.

CO2: Compare and Apply appropriate algorithms for variety of problems.

CO3: Design hypothesis model for any real life problems

CO4: Evaluate and perform diagnosis of any machine learning system

Reference Books	
1	Tom M. Mitchell, “Machine Learning”, McGraw-Hill Education (INDIAN EDITION), 2013, ISBN:978-1-25-909695-2.
2	Ethem Alpaydin, “Introduction to Machine Learning”, 3rd Ed., PHI Learning Pvt. Ltd., 2015, ISBN: 978-0262-02818-9
3	Trevor Hastie , Robert Tibshirani , Jerome Friedman , “The Elements of Statistical Learning”, Springer; 2nd edition, 2009. Corr. 7th printing 2013 Edition , ISBN: 978-0387848570
4	Bertrand Clarke, Ernest Fokoue, Hao Helen Zhang, “Principles and Theory for Data Mining and Machine Learning ”,Springer; 2009,ISBN : 978-0-387-98134-5

Scheme of Continuous Internal Evaluation (CIE)

CIE will consist of TWO Tests, TWO Quizzes and ONE assignment. The test will be for 30 marks each and the quiz for 10 marks each. The assignment will be for 20 marks. The total marks for CIE (Theory) will be 100 marks.

Scheme of Semester End Examination (SEE)

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 question from each unit. The total marks for SEE (Theory) will be 100 marks.

Mapping of Course Outcomes (CO) to Program Outcomes (PO)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO 1	M	L	L	M	L	L	-	-	-	L	L
CO 2	L	M	L	L	L	M	L	-	-	-	-
CO 3	M	M	L	L	L	-	L	L	L	-	L
CO 4	M	L	L	M	H	M	L	L	L	L	L

Mapping of Course Outcomes (CO) to Program Specific Outcomes (PSO)

	PSO1	**PSO2**
CO1	L	M
CO2	L	M
CO3	H	M
CO4	M	H

Natural Language Processing and Text Mining						
Course Code	**:**	**16MIT342/16MCS342**		**CIE Marks**	**:**	**100**
Hrs/Week	**:**	**L:T:P:S 4:0:0:0**		**SEE Marks**	**:**	**100**
Credits	**:**	**4**		**SEE Duration**	**:**	**3 Hrs**

Course Learning Objectives (CLO):

Students shall be able to

1. Demonstrate sensitivity to linguistic phenomena and an ability to model them with formal grammars.
2. Train and evaluate empirical NLP systems.
3. Manipulate probabilities, construct statistical models over strings and trees, and estimate parameters using supervised and unsupervised training methods.
4. Design, implement, and analyze NLP algorithms

Unit – I	**10 Hrs**

Overview and Language Modeling: Overview: Origins and challenges of NLP-Language and Grammar-Processing Indian Languages- NLP Applications -Information Retrieval. Language Modeling: Various Grammar- based Language Models - Statistical Language Model

Unit – II	**09 Hrs**

Word Level and Syntactic Analysis: Word Level Analysis: Regular Expressions-Finite-State Automata-Morphological Parsing-Spelling Error Detection and correction-Words and Word classes-Part-of Speech Tagging. Syntactic Analysis: Context-free Grammar-Constituency- Parsing-Probabilistic Parsing.

Unit – III	**10 Hrs**

Extracting Relations from Text: From Word Sequences to Dependency Paths: Introduction, Subsequence Kernels for Relation Extraction, A Dependency-Path Kernel for Relation Extraction and Experimental Evaluation.

Mining Diagnostic Text Reports by Learning to Annotate Knowledge Roles: Introduction, Domain Knowledge and Knowledge Roles, Frame Semantics and Semantic Role Labeling, Learning to Annotate Cases with Knowledge Roles and Evaluations. A Case Study in Natural Language Based Web Search: InFact System Overview, The GlobalSecurity.org Experience.

Unit – IV	**10 Hrs**

Evaluating Self-Explanations in iSTART: Word Matching, Latent Semantic Analysis, and Topic Models: Introduction, iSTART: Feedback Systems, iSTART: Evaluation of Feedback Systems. Textual Signatures: Identifying Text-Types Using Latent Semantic Analysis to Measure the Cohesion of Text Structures: Introduction, Cohesion, Coh-Metrix, Approaches to Analyzing Texts, Latent Semantic Analysis, Predictions, Results of Experiments.

Automatic Document Separation: A Combination of Probabilistic Classification and Finite-State Sequence Modeling: Introduction, Related Work, Data Preparation, Document Separation as a Sequence Mapping Problem, Results. Evolving Explanatory Novel Patterns for Semantically - Based Text Mining: Related Work, A Semantically Guided Model for Effective Text Mining

Unit – V	**09 Hrs**

Information Retrieval and Lexical Resources: Information Retrieval: Design features of Information Retrieval Systems-Classical, Non classical, Alternative Models of Information Retrieval – valuation Lexical Resources: World Net-Frame Net- Stemmers-POS Tagger- Research Corpora.

Course Outcomes:

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

CO1: Comprehend and compare different natural language models.
CO2: Analyse spelling errors and error detection techniques.
CO3: Extract dependency, semantics and relations from the text.
CO4: Differentiate various information retrieval models.

Reference Books

1	Tanveer Siddiqui, U.S. Tiwary, "Natural Language Processing and Information Retrieval", OUP India, 2008, ISBN : 9780195692327
2	Anne Kao and Stephen R. Poteet (Eds), "Natural Language Processing and Text Mining", Springer, 2007, ISBN : 9781846281754
3	James Allen, "Natural Language Understanding", 2nd edition, Benjamin / Cummings publishing company, 1995, ISBN : 9788131708958
4	Steven Bird, Ewan Klein, Edward Loper, "Natural Language Processing with Python," Publisher: O'Reilly Media, June 2009, ISBN : 9780596516499

Scheme of Continuous Internal Evaluation (CIE)

CIE will consist of TWO Tests, TWO Quizzes and ONE assignment. The test will be for 30 marks each and the quiz for 10 marks each. The assignment will be for 20 marks. The total marks for CIE (Theory) will be 100 marks.

Scheme of Semester End Examination (SEE)

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 question from each unit. The total marks for SEE (Theory) will be 100 marks.

Mapping of Course Outcomes (CO) to Program Outcomes (PO)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO 1	L	M	-	-	-	-	-	M	-	-	-

CO 2	M	H	M	H	-	-	-	L	M	M	M
CO 3	H	L	L	M	H	-	-	M	L	-	M
CO 4	L	L	-	L	-	-	-	L	L		-

Mapping of Course Outcomes (CO) to Program Specific Outcomes (PSO)

	PSO1	PSO2
CO1	M	M
CO2	M	M
CO3	L	H
CO4	M	H

INTERNSHIP / INDUSTRIAL TRAINING						
Course Code	**:**	**16MIT35**		**CIE Marks**	**:**	**100**
Hrs/Week	**:**	**L:T:P:S**	**0:0:6:0**	**SEE Marks**	**:**	**100**
Credits	**:**	**3**		**SEE Duration**	**:**	**30 mins**

GUIDELINES FOR INTERNSHIP

Course Learning Objectives (CLO):

The students shall be able to:

1. Understand the process of applying engineering knowledge to produce product and provide services.
2. Explain the importance of management and resource utilization
3. Comprehend the importance of team work, protection of environment and sustainable solutions.
4. Imbibe values, professional ethics for life long learning.

1) The duration of the internship shall be for a period of 8 weeks on full time basis between II semester final exams and beginning 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 or the M.Tech program in which the student has enrolled.

4) Students undergoing internship training are advised to use ICT tools such as skype to report their progress and submission of periodic progress reports to the faculty members.

5) Every student has to write and submit his/her own internship report to the designated faculty.
6) Students have to make a presentation on their internship activities in front of the departmental committee and only upon approval of the presentation should the student proceed to prepare

and submit the hard copy of the internship final report. However interim or periodic reports and reports as required by the industry / organization can be submitted as per the format acceptable to the respective industry /organizations.

7) The reports shall be printed on bond paper – 80GSM, back to back print, with soft binding – A4 size with 1.5 spacing and times new roman font size 12.
8) The broad format of the internship final report shall be as follows
    - Cover Page
    - Certificate from College
    - Certificate from Industry / Organization
    - Acknowledgement
    - Synopsis
    - Table of Contents
    - Chapter 1 - Profile of the Organization – Organizational structure, Products, Services, Business Partners, Financials, Manpower, Societal Concerns, Professional Practices,
    - Chapter 2 - Activities of the Department -
    - Chapter 3 – Tasks Performed – summaries the tasks performed during 8 week period
    - Chapter 4 – Reflections – Highlight specific technical and soft skills that you acquired during internship
    - References & Annexure

Course Outcomes:

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

CO1: Apply engineering and management principles
CO2: Analyze real-time problems and suggest alternate solutions
CO3: Communicate effectively and work in teams
CO4: Imbibe the practice of professional ethics and need for lifelong learning.

Scheme of Continuous Internal Evaluation (CIE):

A committee comprising of the Head of the Department / Associate Dean, Associate Professor, Assistant Professor and Guide would review the presentation and the progress reports in two phases. The evaluation criteria shall be as per the rubrics given below:

Scheme for Semester End Evaluation (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.

(1) Explanation of the application of engineering knowledge in industries 35%

(2) Ability to comprehend the functioning of the organization/ departments 20%

(3) Importance of resource management, environment and sustainability 25%

(4) Presentation Skills and Report 20%

Mapping of Course Outcomes (CO) to Program Outcomes (PO)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1		M	H	M		M				L	
CO2				H	M	M		L			
CO3					L		M	H	H		
CO4					L		H			M	H

Mapping of Course Outcomes (CO) to Program Specific Outcomes (PSO)

	PSO1	PSO2
CO1	H	
CO2	L	L
CO3		M
CO4	M	H

GUIDELINES FOR INDUSTRIAL TRAINING

Course Learning Objectives (CLO):

The students shall be able to:

1. Understand the process of applying engineering knowledge to industrial products & processes
2. Explain the importance of skilling, training and resource management.
3. Comprehend the importance of team work, communication and sustainable solutions.
4. Imbibe values, professional ethics for life long learning.

1) The duration of industrial training must be for a minimum of 1 week and maximum of 8 weeks on full time basis.
2) Industrial Training in which students pays a fee to the organization / industry will not be considered.
3) He/she can undergo training in one or more industry /organization.
4) The student must submit letters from the industry clearly specifying his / her name and the duration of the training provided by the company with authorized signatures.
5) Industrial training must be related to the field of specialization or the M.Tech program in which the student has enrolled.
6) Students undergoing industrial training are advised to use ICT tools such as skype to report their progress and submission of periodic progress reports to the faculty members.
7) Every student has to write and submit his/her own industrial training report to the designated faculty.
8) Students have to make a presentation on their industrial training in front of the departmental committee and only upon approval of the presentation should the student proceed to prepare and submit the hard copy of the final report.
9) The reports shall be printed on bond paper – 80GSM, back to back print, with soft binding – A4 size with 1.5 spacing and times new roman font size 12.
10) The broad format of the industrial training report shall be as follows
    - Cover Page
    - Certificate from College
    - Training Certificate from Industry / Organization
    - Acknowledgement
    - Executive Summary
    - Table of Contents
    - Chapter 1 - Profile of the Organization –Organizational structure, Products, Services, Business Partners, Financials, Manpower, Societal Concerns, Professional Practices
    - Chapter 2 – Details of the Training Modules
    - Chapter 3 – Reflections – Highlight specific technical and soft skills that you acquired

    References & Annexure

Course Outcomes:

After going through the industrial training the student will be able to:

CO1: Understand the process of applying engineering knowledge to solve industrial problems

CO2: Develop skills through training relevant to industrial requirement

CO3: Communicate effectively and work in teams

CO4: Imbibe ethical practices and develop it as life skill.

Scheme of Continuous Internal Evaluation (CIE):

A committee comprising of Head of the Department / Associate Dean, Associate Professor, Assistant Professor and Guide would review the presentation and the progress reports in two phases. The evaluation criteria shall be as per the rubrics given below:

Scheme for Semester End Evaluation (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.

(1) Explanation on the application of engineering knowledge 25%

(2) Ability to comprehend the importance of skilling and training 25%

(3) Importance of communication, professional ethics, sustainability 20%

(4) Oral Presentation and Report 30%

Mapping of Course Outcomes (CO) to Program Outcomes (PO)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1		M	H	M		M				L	
CO2				H	M	M		L			
CO3					L		M	H	H		
CO4					L		H			M	H

Mapping of Course Outcomes (CO) to Program Specific Outcomes (PSO)

	PSO1	**PSO2**
CO1	H	
CO2	L	L
CO3		M
CO4	M	H

GUIDELINES FOR INDUSTRIAL VISITS

Course Learning Objectives (CLO):

The students shall be able to:

1. Understand the role of industries and service organization in meeting the demands of the society.
2. Explain the working of different industries and organizations with an engineering perspective
3. Comprehend the importance of team work, communication and sustainable solutions.
4. Imbibe values, professional ethics for life long learning.

1) Student must visit a minimum of THREE organizations/industry. The duration of the visit per organization must be for ONE full day, during which he/she must comprehend the importance of organization structure, function of various departments, application of engineering knowledge, resource management, importance to environment and safety, professional ethics.

2) It is mandatory to visit ONE private multi-national company or public sector industry / organization, ONE medium-small enterprise and ONE rural based or NG organization.

3) The student must submit letter from the industry clearly specifying his / her name and the date of visit to the industry with authorized signatures.

4) Industrial visit must be related to the field of specialization or the M.Tech program in which the student has enrolled.

5) Every student has to write and submit his/her own report on each industrial visit and submit the report to the designated faculty advisor for evaluation.

6) A photograph outside the industry with the name and logo of the industry in the background along with the students and faculty members could be included in the report.

7) Students have to make a presentation on their industrial visit in front of the departmental committee and only upon approval of the presentation should the student proceed to prepare and submit the hard copy of the final report.

8) The reports shall be printed on bond paper – 80GSM, back to back print, with soft binding – A4 size with 1.5 spacing and times new roman font size 12.

9) The broad format of the industrial visit report shall be as follows

   - Cover Page
   - Certificate from College
   - Acknowledgement
   - Synopsis / Executive Summary
   - Table of Contents
   - Chapter 1 - Profile of the PSU or MNC – must include Organizational structure, Products, Services, Financials, Manpower, Societal Concerns, Professional Practices

- Chapter 2 – Profile of the SME – must include Organizational structure, Products, Services, Financials, Manpower, Societal Concerns, Professional Practices
- Chapter 3 - Profile of the NGO – must include Organizational structure, services, Manpower, Societal Concerns, Professional Practices
- Chapter 4 – Comparative Analysis of PSU/MNC – SME – NGO
- References & Annexure (Permission letters from the organizations for the visit & photographs)

Course Outcomes:

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

CO1: Classify the role of different industries and organization in addressing the needs of the society.

CO2: Explain the process of applying engineering knowledge in industries and organizations.

CO3: Describe the importance of communication and team work

CO4: Recognize the importance of practicing professional ethics and need for life skills.

Scheme of Continuous Internal Evaluation (CIE):

A committee comprising of Head of the Department / Associate Dean, Associate Professor, Assistant Professor and Guide would review the presentation and the progress reports in two phases. The evaluation criteria shall be as per the rubrics given below:

Scheme for Semester End Evaluation (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.

(1) Explanation of the application of engineering knowledge in industries 25%

(2) Ability to comprehend the functioning of the organization/ departments 30%

(3) Importance of resource management, environment and sustainability 20%

(4) Presentation Skills and Report 25%

Mapping of Course Outcomes (CO) to Program Outcomes (PO)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1		M	H	M		M				L	
CO2				H	M	M		L			
CO3					L		M	H	H		
CO4					L		H			M	H

Mapping of Course Outcomes (CO) to Program Specific Outcomes (PSO)

	PSO1	**PSO2**
CO1	H	

CO2	L	L
CO3		M
CO4	M	H

TECHNICAL SEMINAR						
Course Code	**:**	**16MIT36**		**CIE Marks**	**:**	**50**
Hrs/Week	**:**	**L:T:P:S**	**0:0:4:0**	**SEE Marks**		**50**
Credits	**:**	**2**		**SEE Duration**		**30 min**

Course Learning Objectives (CLO):

The students shall be able to:

1. Understand the technological developments in their chosen field of interest
2. Explain the scope of work and challenges in the domain area
3. Analyze these engineering developments in the context of sustainability and societal concerns.
4. Improve his/her presentation skills and technical report writing skills

GUIDELINES

1) The presentation will have to be done by individual students.
2) The topic of the seminar must be in one of the thrust areas with in-depth review and analysis on a current topic that is relevant to industry or on-going research.
3) The topic could be an extension or complementary to the project
4) The student must be able to highlight or relate these technological developments with sustainability and societal relevance.
5) Each student must submit both hard and soft copies of the presentation.

Course Outcomes:

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

CO1:Identify topics that are relevant to the present context of the world

CO2: Perform survey and review relevant information to the field of study.

CO3: Enhance presentation skills and report writing skills.

CO4: Develop alternative solutions which are sustainable

Scheme of Continuous Internal Evaluation (CIE): Evaluation would be carried out in TWO phases. The evaluation committee shall comprise of Head of the Department / Associate Dean, Associate Professor, Assistant Professor and Guide. The evaluation criteria shall be as per the rubrics given below:

Scheme for Semester End Evaluation (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.

Rubrics for Evaluation:

1) Topic – Technical Relevance, Sustainability and Societal Concerns 15%
2) Review of literature 25%
3) Presentation Skills 35%
4) Report 25%

Mapping of Course Outcomes (CO) to Program Outcomes (PO)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1		H	M	M	L	H	H	--	---	---	M
CO2	L	M								H	
CO3							L	M	H		
CO4		L	M		H	H					H

Mapping of Course Outcomes (CO) to Program Specific Outcomes (PSO)

	PSO1	PSO2
CO1	H	L
CO2	M	H
CO3	M	L
CO4	H	L

IV SEMESTER

MAJOR PROJECT						
Course Code	**:**	**16MIT41**		**CIE Marks**	**:**	**100**
Hrs/Week	**:**	**L:T:P:S**	**0:0:52:0**	**SEE Marks**	**:**	**100**
Credits	**:**	**26**		**SEE Duration**	**:**	**3 Hours**

Course Learning Objectives:

The students shall be able to

1. Understand the method of applying engineering knowledge to solve specific problems.
2. Apply engineering and management principles while executing the project
3. Demonstrate good verbal presentation and technical report writing skills.
4. Identify and solve complex engineering problems using professionally prescribed standards.

GUIDELINES

1. Major project will have to be done by only one student in his/her area of interest.
2. Each student has to select a contemporary topic that will use the technical knowledge of their program of specialization.
3. Allocation of the guides preferably in accordance with the expertise of the faculty.
4. The number of projects that a faculty can guide would be limited to three.
5. The project can be carried out on-campus or in an industry or an organization with prior approval from the Head of the Department.
6. The standard duration of the project is for 16 weeks, however if the guide and the evaluation committee of the department, after the assessment feel that the work is insufficient and it has to be extended, then the student will have to continue as per the directions of the guide and the committee.
7. It is mandatory for the student to present his/her work in one of the international conferences or publish the research finding in a reputed unpaid journal with impact factor.

Course Outcomes:

After going through this 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, societal concerns

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

Scheme of Continuous Internal Examination (CIE)

Evaluation will be carried out in THREE Phases. The evaluation committee will comprise of: guide, two senior faculty members, one industry member and Head of the Department.

Phase	Activity	Weightage
I 5th week	Synopsis, Preliminary report for the approval of selected topic along with literature survey, objectives and methodology.	20%
II 10th week	Mid-term progress review shall check the compliance with the objectives and methodology presented in Phase I, review the work performed.	40%
III 15th week	Oral presentation, demonstration and submission of project report. After this presentation, the student will have one week time to correct / modify his report to address the issues raised by the committee members.	40%

CIE Evaluation shall be done with marks distribution as follows:

- Selection of the topic & formulation of objectives 10%
- Design and simulation/ algorithm development/experimental setup 25%
- Conducting experiments / implementation / testing / analysis 25%
- Demonstration & Presentation 20%
- Report writing 20%

Scheme for Semester End Evaluation (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.

1. Brief write-up about the project 5%
2. Formulation of Project Objectives & Methodology 20%
3. Experiments / Analysis Performed; Results & Discussion 25%
4. Report 20%
5. Viva Voce 30%

Mapping of Course Outcomes (CO) to Program Outcomes (PO)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO 1	H	H	H	M	L	M	L				
CO 2				L				M	H		
CO 3					L	M	M			H	
CO 4					L	M	H	M			H

Mapping of Course Outcomes (CO) to Program Specific Outcomes (PSO)

	PSO1	PSO2
CO1	H	L

CO2	L	H
CO3	M	H
CO4	H	H

SEMINAR						
Course Code	**:**	**16MIT42**		**CIE Marks**	**:**	**50**
Hrs/Week	**:**	**L:T:P:S**	**0:0:4:0**	**SEE Marks**		**50**
Credits	**:**	**2**		**SEE Duration**		**30 min**

Course Learning Objectives (CLO):

The students shall be able to:

1. Understand the technological developments in their chosen field of interest
2. Explain the scope of work and challenges in the domain area
3. Analyze these engineering developments in the context of sustainability, societal concerns and project management.
4. Improve his/her verbal presentation and report writing skills

GUIDELINES

1) The presentation will have to be done by individual students.
2) The topic of the seminar must be in one of the thrust areas with in-depth review and analysis on a current topic that is relevant to industry or on-going research.
3) The topic could be an extension or complementary to the project topic.
4) Topics could be in multidisciplinary areas and strongly address the technical design issues.
5) The student must be able to highlight or relate these technological developments with sustainability and societal relevance.
6) The students must mandatorily address legal, ethical issues as related to the topic of study.
7) The student shall make an attempt to perform financial / cost analysis or apply project management tools as related to his/her topic of study.
8) Each student must submit both hard and soft copies of the presentation.

Course Outcomes:

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

CO1: Identify topics that are relevant in the present context of the world and relate it to sustainability and societal relevance.
CO2: Perform literature/market/product survey and analyse information to the field of study.
CO3: Enhance presentation and report writing skills.
CO4: Develop creative thinking abilities.

Scheme of Continuous Internal Evaluation (CIE): Evaluation would be carried out in TWO phases. The evaluation committee shall comprise of TWO senior faculty members. The evaluation criteria shall be as per the rubrics given below:

Scheme for Semester End Evaluation (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.

Rubrics for Evaluation:

1) Topic – Technical Relevance, Sustainability and Societal Concerns 15%
2) Literature Review 25%
3) Presentation Skills 35%
4) Report 25%

Mapping of Course Outcomes (CO) to Program Outcomes (PO)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1		H	M	M	L	H	H	--	---	---	M
CO2	L	M								H	
CO3							L	M	H		
CO4		L	M		H	H					H

Mapping of Course Outcomes (CO) to Program Specific Outcomes (PSO)

	PSO1	PSO2
CO1	H	L
CO2	M	H
CO3	M	L
CO4	H	L