RashtreeyaSikshanaSamithi Trust

R.V. College of Engineering

(Autonomous Institution Affiliated to VisvesvarayaTechnologicalUniversity, Belagavi)

Department of Industrial Engineering and Management

Master of Technology (M. Tech.)

Master of Engineering Management

Scheme and Syllabus of Autonomous System w.e.f 2016

R.V. College of Engineering, Bengaluru – 59

(An Autonomous Institution affiliated to VisvesvarayaTechnologicalUniversity,Belagavi)

Department of Industrial Engineering and Management

Vision:

Imparting innovation and value based education in Industrial Engineering and Management for steering organizations to global standards with an emphasis on sustainable and inclusive development.

Mission:

- To impart scientific knowledge, engineering and managerial skills for driving organizations to global excellence.
- To promote culture of training, consultancy, research and entrepreneurship interventions among the students & faculty.
- To institute collaborative academic and research exchange programs with national and globally renowned universities, industries and other organizations.
- To establish and nurture center of excellence in the niche area of Industrial and Systems Engineering.

Program Educational Objectives (PEO)

M. Tech. in Engineering Management Program, graduates will be able to:

PEO 1. Identify problems and successfully apply engineering knowledge and management skills along with appropriate tools to solve them at operational and system levels.

PEO 2. Develop and apply appropriate quantitative and qualitativeapproaches effectively in engineering and managerial decision making situations.

PEO 3. Successfully fit into techno-managerial roles in organizations of various sectors.

Program Outcomes (PO)

M. Tech. in Engineering Management Graduates will be able to:

PO 1. Scholarship of Knowledge: Acquire in-depth knowledge of engineering and management systems in wider and global perspective, with an ability to discriminate, evaluate, analyze and synthesize existing and new knowledge, and integration of the same for enhancementof knowledge.

PO 2. Critical Thinking: Analyze complex engineering and management systems problems critically, apply independent judgment 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: Think laterally and originally, conceptualize and solve technical and management problems, 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.

PO 4. Research Skill: Extract information pertinent to unfamiliar problems through literature survey and experiments, apply appropriate research methodologies, techniques and tools, design, conduct experiments, analyze 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 techno-managerial systems.

PO 5. Usage of Modern Tools: Create, select, learn and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modeling, to complex organisational systemsactivities with an understanding of the limitations.

PO 6. Collaborative and Multidisciplinary Work: Possess knowledge and understanding of group dynamics, recognize opportunities and contribute positively to collaborative-multidisciplinary scientific research, 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 engineering and management 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 engineering and management community, and with society at large, regarding complex management systems 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: Recognize the need for, and have the preparation and ability to engage in lifelonglearning independently, 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 anunderstanding of responsibility to contribute to the community for sustainable development of society.

PO 11. Independent and Reflective Learning: Observe and examine critically the outcomes of one's actions and make corrective measures subsequently, and learn from mistakeswith or without depending on external feedback.

MASTER OF ENGINEERING MANAGEMENT - Program

Program Specific Criteria (PSC)

Lead Society: Institute of Industrial Engineers, USA

1. Curriculum

The curriculum must prepare graduates to understand the engineering relationships between the management tasks of planning, organization, leadership, control, and the human element in production, research, and service organizations; to understand and deal with the stochastic nature of management systems. The curriculum must also prepare graduates to integrate management systems into a series of different technological environments.

2. Faculty

The major professional competence of the faculty must be in engineering, and the faculty should be experienced in the management of engineering and/or technical activities.

Program Specific Outcomes (PSO)

M. Tech. in Engineering Management Graduates will be able to:

PSO 1. Design and Develop management systems by understanding the engineering relationships between the management tasks of planning, organizing, leading, controlling, and the human resource in production, research, and service organizations.

PSO 2. Integrate organizational systems into a series of different technological environments by understanding and modeling their stochastic behavior.

PSO 3. Continually improve systems through problem solving skills and collaborative decision making capabilities.

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Department of Industrial Engineering and Management

M. Tech. in Master of Engineering Management

FIRST SEMESTER								
Sl. No	**Course Code**	**Course Title**	**BoS**	**CREDIT ALLOCATION**				**Total Credits**
				Lecture L	**Tutorial T**	**Practical P**	**Self Study S**	
1	16MEM11P	Project Management	IM	3	1	0	0	4
2	16MEM12	Applied Statistics &Probability	IM	4	0	1	0	5
3	16MEM13	Essentials of Decision Science	IM	4	0	0	1	5
4	16MEM14	Operations Management	IM	4	0	0	0	4
5	16MEM15X	Elective – 1	IM	4	0	0	0	4
6	16MEM16	Professional Skill Development	HSS	0	0	2	0	2
		Total		**19**	**1**	**3**	**1**	**24**

Elective Group 1			
16MEM151	Marketing Management	16MEM152	Computer Integrated Manufacturing

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SECOND SEMESTER								
Sl. No	**Course Code**	**Course Title**	**BoS**	**CREDIT ALLOCATION**				**Total Credits**
				Lecture L	**Tutorial T**	**Practical P**	**Self Study S**	
1	16MEM21R	Research Methodology	IM	3	1	0	0	4
2	16MEM22	Supply Chain & Logistics Management	IM	4	0	1	0	5
3	16MEM23X	Elective – 2	IM	4	0	0	0	4
4	16MEM24X	Elective – 3	IM	4	0	0	0	4
5	16MEM25X	Elective – 4	IM	4	0	0	0	4
6	16MEM26	Minor Project	IM	0	0	5	0	5
		Total		**19**	**1**	**6**	**0**	**26**

Elective Group 2			
16MEM231	Engineering Economy	16MEM232	Product Design and Development
Elective Group 3			
16MEM241	Human Resource Management	16MEM242	Discrete Event Simulation
Elective Group 4			
16MEM251	Lean Manufacturing Systems	16MEM252	Advanced Operations Research

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Department of Industrial Engineering and Management

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THIRD SEMESTER								
Sl. No	**Course Code**	**Course Title**	**BoS**	**CREDIT ALLOCATION**				**Total Credits**
				Lecture L	**Tutorial T**	**Practical P**	**Self Study S**	
1	16MEM31	Total Quality Management	IM	4	0	1	0	5
2	16MEM32X	Elective – 5	IM	4	0	0	0	4
3	16MEM33X	Elective – 6	IM	4	0	0	0	4
4	16MEM34X	Elective – 7	IM	4	0	0	0	4
5	16MEM35	Internship / Industrial Training	IM	0	0	3	0	3
6	16MEM36	Technical Seminar	IM	0	0	2	0	2
		Total		**16**	**0**	**6**	**0**	**22**

Elective Group 5			
16MEM321	E -commerce & Business Analytics	16MEM322	Facilities Design
Elective Group 6			
16MEM331	Financial Management	16MEM332	Design of Experiments
Elective Group 7			
16MEM341	Strategic Management	16MEM342	Principles of Reliability Engineering

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FOURTH SEMESTER									
Sl. No	**Course Code**	**Course Title**	**BoS**	**CREDIT ALLOCATION**				**Total Credits**	**Hours/ Week**
				Lecture L	**Tutorial T**	**Practical P**	**Self Study S**		
1	16MEM41	Major Project	IM	0	0	26	0	26	26
2	16MEM42	Seminar	IM	0	0	2	0	2	2
		Total		**0**	**0**	**28**	**0**	**28**	**28**

III SEMESTER

TOTAL QUALITY MANAGEMENT						
Course Code	**:**	**16MEM31**		**CIE Marks**	**:**	**100 + 50**
Hrs/Week	**:**	**L: T: P: S**	**4:0:1:0**	**SEE Marks**	**:**	**100 + 50**
Credits	**:**	**5**		**SEE Duration**	**:**	**3 + 3 Hours**

Course Learning Objectives: studentis expected to

1. Develop an understanding on the necessary information and skills needed to manage, control and improve quality practices in the organizations through TQM & SIX SIGMA philosophies.
2. Evaluate quality systems and implement in various organizations.
3. Explain principles of statistical process control and control charts.
4. Develop strategy for application of design of experiments for given situation.
5. Perform reliability evaluation of mechanical, electrical, electronics and software technology systems

Unit – I **8 Hrs**

Introduction: Development of four fitness's of quality, Future fitness's, Four revolutions in management thinking, and four levels of practice. Deming's approach, Juran's quality trilogy, Crosby and quality treatment, Imai's Kaizen, Ishikawa's company-wide quality control, and Feigenbaum's theory of TQC

Unit – II **8 Hrs**

Quality Systems: Management commitment, Quality function deployment, Benchmarking, Quality auditing, Tools for continuous quality improvement, 7 QC tools, 7 management and planning tools International standards ISO 9000 and 14000 series, MalcomBaldrige National Quality Award and other international and national award criteria. Quality in Service Sector, Case Studies

Unit – III **12 Hrs**

Statistical Process Control:,Chance and assignable causes of variation. Basic principles of control charts, choice of control limits, sample size and sampling frequency, rational sub groups, Controls charts for $\overline{X}$ (mean) and Range, Control charts for $\overline{X}$ and standard deviation (σ), Control Charts for attribute data, Acceptance Sampling – single sampling plans for attribute data.

Unit – IV **12 Hrs**

Design of Experiments: General model of a process, Examples of designed experiments in process improvement, Guidelines for designing experiments, Factorial experiments – 2^2design,

Reliability: Failure models of components, definition of reliability, MTBF, Failure rate, common failure rate curve, types of failure, Reliability evaluation in simple cases of exponential failures in series, parallel and series-parallel device configurations.

Unit-V **8 Hrs**

Six Sigma: DMAIC Problem Solving Process: Define, Measure, Analyze, Improve, Control steps, Tools used in DMAIC process, Examples of DMAIC, Case studies.

Unit – VI (Lab Components)

1. Goodness of fit test for the given quality characteristic assuming Uniform & Binomial distribution
2. Goodness of fit test for the given quality characteristic assuming Poisson distribution
3. Goodness of fit test for the given quality characteristic assuming Normal distribution
4. Measurement System Analysis**:** Conduction of Repeatability and Reproducibility studies.
5. Designing Attribute sampling Plans-Single/ Double sampling plans

6. Construction of control charts for attributes/variables quality characteristic
7. Assessing Process Capability of the given manufacturing process using Normal probability paper method and process capability indices
8. Introduction to DMAIC Methodology and Mini tab features
9. Process study to identify the critical to quality issues using Define and Measure Phases
10. Quality Companion Software Overview
11. Analyzing the critical to quality issues involved in the process
12. Improve phase and Control Phase: Process characterization using Taguchi's Orthogonal Array technique and DOE software

Course Outcomes:

After going through this course the student will be able to

CO1: Explain the TQM & Six Sigma principles, methodologies, tools, techniques and concepts of quality control and improvement.
CO2: Apply statistical methods for process quality control and improvement.
CO3: Evaluate and select statistical tools and techniques for quality control and improvement
CO4: Select the appropriate strategies for continuous improvement.

Reference Books:

1. AmitavaMitra, Fundamentals of Quality Control and Improvement, Prentice Hall India, 4th Edition,

2. Shoji Shiba, Alan Graham and David Walden, A New American TQM – Four Practical Revolutions in Management, Productivity Press, Portland (USA), 2nd Edition, 1993, ISBN: 9781563270321

3. D C Montgomery "Statistical Quality Control : A Modern Introduction", John Wiley and Sons, 6th Edition, 2009, ISBN 978-81-265-2506-5.

4. Charles E. Ebeling, An Introduction to Reliability and Maintainability Engineering, McGraw-Hill International Editions, 1997, ISBN0070188521

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
CO1	H										
CO2		H		H	M		L				
CO3			H								
CO4											

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

	PSO1	PSO2	PSO3
CO1	H		H
CO2		M	H
CO3			H
CO4			H

INTERNSHIP / INDUSTRIAL TRAINING						
Course Code	**:**	**16MEM35**		**CIE Marks**	**:**	**100**
Hrs/Week	**:**	**L:T:P:S**	**0:0:6:0**	**SEE Marks**	**:**	**100**
Credits	**:**	**3**		**SEE Duration**	**:**	**30 min**

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	PSO3
CO1	H		M
CO2	L	L	M
CO3		M	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 cmmittee 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	PSO3
CO1	H		H
CO2	L	L	
CO3		M	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	PSO3
CO1	H		
CO2	L	L	M
CO3		M	M
CO4	M	H	

TECHNICAL SEMINAR						
Course Code	**:**	**16MEM36**		**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 ofHead 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	PSO3
CO1	H	L	H
CO2	M	H	
CO3	M	L	L
CO4	H	L	M

Elective Group 5

E -COMMERCE& BUSINESS ANALYTICS *(Elective)*						
Course Code	**:**	**16MEM321**		**CIE Marks**	**:**	**100**
Hrs/Week	**:**	**L: T: P: S**	**4:0:0:0**	**SEE Marks**	**:**	**100**
Credits	**:**	**4**		**SEE Duration**	**:**	**3hours**

Course Learning Objectives:

1. Analyse data using statistical and data mining techniques and understand relationships between the underlying business processes of an organization.
2. Use advanced analytical tools to analyse complex problems under uncertainty.
3. Evaluate the role of the major types of information systems in a business environment and their relationship to each other;
4. Assess the impact of the Internet and Internet technology on businesselectronic commerce and electronic business;
5. Identify the major management challenges to building and using information systems and learn how to find appropriate solutions to those challenges

Unit – I	**8 Hr**

Overview: Decision making, Business Analytics defined, Descriptive analytics, predictive analytics, prescriptive analytics, Business Analytics in practice, Supply chain analytics, Healthcare analytics, Web analytics

Data Mining: Data visualization, techniques, Data dashboards, Data tabulation

Unit – II	**10Hr**

Statistical Modeling Techniques : Linear regression, Simple Linear regression, Least squares method, Assessing the fit of the linear regression model, Multiple regression model, Inference & Regression, Categorical independent variables, Modelling nonlinear relationships, Model fitting. **Problems and Cast studies**

Unit – III	**10Hr**

Statistical Modeling Techniques: Factor Analysis, Cluster Analysis , Logistic Regression, Theoretical and Mathematical formulation, Indicator model Fit, Conjoint Analysis, Methodology, Full profile conjoint Analysis, Evolutionary Solver, Examining other forms of conjoint analysis **Problems and Cast studies**

Unit – IV	**10 Hr**

Tracking Business change – History of E-commerce and Transition to E-commerce in India Virtualization: Concept of Extended enterprises and virtual organizations, Globalization: The shop window of the world, Intellectualization: Getting clever with it, commercial use of Internet and growth of internet, Advantages and Disadvantages of E-commerce, Transition to E-commerce in India, E-commerce opportunities for industries in India and E-transition challenges for Indian corporate.

Business Models for E- Commerce: The Birth of Portals, E-business Models based on the relationship of Transaction Parties: B2C, B2B, C2C, C2B, E-business Models based on the relationship of Transaction types.

Unit-V	**10 Hr**

Advancements in E-Commerce: Enabling Technologies of the World Wide Web, E-Marketing, e-security, E-Payment systems, E-CRM, E-SCM, E-Strategy, Mobile Commerce.

Course Outcomes:

After going through this course the student will be able to

CO1: Explain foundations of data science; the role of descriptive, predictive and prescriptive analytics in firms.

CO2: Apply data-analytic concepts to create innovative data-analytic solutions

CO3: Explain the core interactions and dependencies that exist between the key functions of a business

CO4: Appraise the role of information systems in the support of business functions and, particularly, cross-functional business processes

Reference Books:

1. Jeffrey D camm, Essentials of Business Analytics; First edition, South western college Publishing 2015, ISBN-13; 978-1-285-18727-3; ISBN-10;1-285-18727-X
2. Wayne Winston; Marketing Analytics: Data-Driven Techniques with Microsoft Excel; Kindleedition, Wiley Eastern
3. Paul May, "The Business of E-Commerce-From Corporate Strategy to Technology"1st South Asian Edition, the Press Syndicate of the University of Cambridge, 2000, ISBN 0 521 77698 8
4. P. T.Joseph, S.J., "E-Commerce An Indian Perspective", 2ndEdition, PHI, 2005,ISBN-81-203-2788-8

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
CO1	H										
CO2		H	H	H							
CO3	H				M						
CO4					H						

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

	PSO1	PSO2	PSO3
CO1	H		
CO2			
CO3	H	H	
CO4			M

FACILITIES DESIGN *(Elective)*						
Subject Code	**:**	**16MEM322**		**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: studentis expected to

1. Understand the importance of facilities design and material handling process.
2. Define and analyze facilities design problems and their linkages to design of product, process and systems.
3. Solve facilities design problems through analyzing their models.
4. Design and develop an integrated facilities design for various industrial applications.

Unit I	**9 Hrs**

Introduction to facilities design: Introduction, facility layout, types of layout problems, engineering design problem approach.

Process & Material flow analysis: Introduction, data requirement for layout decisions, tools for presenting layout design, guidelines for data development & generation, case study.

Unit II	**9 Hrs**

Group technology & Facility Layout: Introduction, clustering approach, implementation of group technology principles, design & planning issues in cellular manufacturing systems, project on machine grouping & layout, machine grouping and layout case study.

Unit III	**12 Hrs**

Logistics & Location Models: Introduction, logistics, location & supply chain, important factors in location decisions, techniques for discrete space location problem, hybrid analysis, techniques for continuous space location problem, case study.

Unit IV	**9 Hrs**

Modeling of Design Problems in facility Logistics: Models, Algorithms, Generic Modeling Tools, Models for single-row layout problem, models for multi-row layout problem.

Unit V	**9 Hrs**

Advanced Location & Routing Models: Introduction, location models, allocation models, location-allocation models.

Course Outcomes:

After going through this course the student will be able to

CO1	Explain the factors influencing decisions related to plant design and material handling systems.
CO2	Apply facility design models with mathematical and algorithms for organizational situations.
CO3	Evaluate and select alternative facilities design solutions.
CO4	Create an integrated facilities design for various applications.

Reference Books:

1.	SundereshHeragu, "Facilities Design", PWS Publishing Company, 2006, ISBN-0-595 359388.
2.	James A Tompkins, John A White, Yavuz A Bozer, "Facilities Planning", Wiley India, 2009, ISBN- 978-81-265-1781-7.

3.	Francies, R.L. and White, J.A. "Facility layout and Location", Prentice Hall of India, 2nd Edition, 1998, ISBN: 8120314603.
4.	James M Apple, "Plant Layout and Material Handling", Krieger Pub Co., January 1991, ISBN-13: 978-0894645457.

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
CO1	H										
CO2		H									
CO3			H								
CO4				M	M						

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

	PSO1	PSO2	PSO3
CO1	H		
CO2		M	M
CO3			
CO4			

Elective Group 6						
FINANCIAL MANAGEMENT *(Elective)*						
Subject Code	**:**	**16MEM331**		**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:

1. Explain the nature of finance and its interaction with other management functions.
2. Show the use of the present value concept in the valuation of share and bonds.
3. Highlight the utility of financial ratios in credit and competitive analysis.
4. Analyze the difference between operating and financial risk.
5. Explain the factors affecting the composition of working capital.

Unit I	**08 Hrs**

Introduction: financial and relateddiscipline, scope and objectives of financial management, financial manager's role, financial goal, Indian Financial System, emerging role of financial managers in India, Financial Markets – money market, capital market.
Risk & Return: Risk & Return concepts, risk in a portfolio, context, relationship between risk & return.

Unit II	**10 Hrs**

Valuation of Securities: Concept of valuation, equity valuation Dividend: Dividend capitalization approach & ratio approach.
Financial Statement Analysis: Ratio analysis, time series analysis, Du-pont analysis..

Unit III	**10 Hrs**

Leverage: Concept of leverage, opening leverage, financial leverage, total leverage.
Sources of long term finance: Equity capital & preference capital, Debenture capital, term loan & deferred credit, Govt Subsidies, Sales Tax Deferments & Exception, leasing and hire purchase.

Unit IV	**10 Hrs**

Cost of Capital and Capital Structure: Cost of debentures, Term loans, Equity capital & retained earnings, Weighted average cost of capital, Systems of weighing. Introduction to capital structures, factors affecting capital structure, feature of an optimal capital structure, capital structures, Capital Structure theories, tradition position, MM Position and its critique imperfections.
Dividend Policy: Traditional position, water model, golden model, Miller and Moduglianiposition, rational expectations model.

Unit V	**10 Hrs**

Estimation of Working Capital – Objectives of working capital (Conservative Vs Aggressive policies) static Vs Dynamic view of working capital. Factors affecting the composition of working capital, interdependence among Components of working capital, operating cycle approach to working capital

Course Outcomes:

After going through this course the student will be able to

CO 1. Explain the fundamentals, scope and importance of financial management.
CO 2. Identify the balance between liquidity and profitability.
CO 3. Analyze the impact of various financial alternatives of financial goals of the firm.
CO 4. Apply the various tools and techniques to make financial decision under the condition of risk and uncertainty.

Reference Books:

1. Financial Management: Text, Problems and Cases (Sixth Edition) – M.Y. Khan & P.K. Jain - Mcgraw Hill – Tata - ISBN 13: 9780071067850
2. Financial Management (10th Edition)– I.M. Panday – VikasPublishing House Pvt. ISBN 13:

9788125937142
3. Fundamentals of Financial Management (13th Edition) – James C. Van Home - ISBN-13: 978-0273713630.

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
CO1	H										
CO2		H					L				
CO3				M			M				
CO4			H				H				

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

	PSO1	PSO2	PSO3
CO1	H		
CO2		M	
CO3			L
CO4	H		

DESIGN OF EXPERIMENTS *(Elective)*						
Course Code	**:**	**16MEM332**		**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:

After thesuccessful completion of the course, the students will be able to:

1. Explain the terminology and basic principles of design of experiments.
2. Use ANOVA and effect plots to compute significance of factors and reach conclusions about effect of factors involved.
3. Develop factorial and fractional factorial designs for product and process optimization.
4. Use signal to noise ratios to illustrate robust design concepts in process optimization.
5. Select suitable experimental design for engineering applications using orthogonal arrays.

Unit – I **08Hrs**

Introduction: Strategy of experimentation, applications, Basic principles, Terminology, Guidelines, History of statistical design.

Principles of quality engineering - Tools used in robust design, Applications and benefits, Quality loss function, Quadratic loss function, Noise factors, P diagram, Optimization of product & process design, Role of various quality control activities.

Unit - II **10 Hrs**

Factorial Experimentation- The 2^2 design, The 2^3 design, The general 2^k design, A single replicate of the 2^k design, The 3^2 design. Problems.

Unit - III **10 Hrs**

Blocking and Confounding in the 2^k Factorial Design: Blocking a replicated 2^k factorial design, Confounding in the 2^k factorial design, Confounding the 2^k factorial design in 2 & 4 blocks. Problems.

Fractional **Factorial Designs:** The one – half fraction & one – quarter fraction of the 2^k design, Resolution III, IV & V designs. Problems.

Unit - IV **10 Hrs**

Constructing Orthogonal Arrays: Counting degrees or freedom, selecting a standard orthogonal array, dummy level technique, and compound factor method. Linear graphs and interaction assignment, modification of linear graphs, column merging method, branching design. Strategy for constructing an orthogonal array. Problems.

Unit - V **10 Hrs**

Steps In Robust Design Case study discussion illustrating steps in Robust Design.

Signal-To-Noise Ratio: Evaluation of sensitivity to noise. S/N ratios for static problems, S/N ratios for dynamic problems. Analysis of ordered categorical data. Minimizing variability and optimizing averages.

Advanced Techniques: Taguchi Inner and Outer Arrays. Grey Taguchi Methods, Shainin Techniques, Softwa**re** packages for design of Experiments.

Course Outcomes: After thesuccessful completion of the course, the students will be able to:
CO1: Explain principles and concepts of design of experiments and quality engineering. CO2: Apply quality engineering and robust design concepts. CO3: Develop factorial, fractional factorial and orthogonal array designs for product and process optimization. CO4: Conduct experiments and analyse data for product and process improvements.

Reference Books:	
1.	D.C. Montgomery, Design and Analysis of Experiments, Wiley India, 5th Edition, 2006, ISBN – 812651048-X.
2.	Madhav S. Phadke, Quality Engineering Using Robust Design, Prentice Hall PTR, Englewood Cliffs, New Jersey 07632,1989, ISBN: 0137451679.
3.	Robert H. Lochner, Joseph E. Matar, Designing for Quality - an Introduction Best of Taghuchi and Western Methods or Statistical Experimental Design, Chapman and Hall, 1990, ISBN – 0412400200
4.	Philip J. Ross, Taguchi Techniques for Quality Engineering: Loss Function, Orthogonal Experiments, Parameter and Tolerance Design, McGraw-Hill, 2nd Edition, 1996, ISBN: 0070539588

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
CO1	H										
CO2		M		M							
CO3			H								
CO4				H							

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

	PSO1	PSO2	PSO3
CO1	H		
CO2		M	
CO3		M	
CO4			H

Elective Group 7

STRATEGIC MANAGEMENT						
Course Code	**:**	**16MEM341**		**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: Studentis expected to

1. List the broad phases of strategic management under competitive industrial environment.
2. Recognize the needs of changing external environment and accordingly develop the strategic plans.
3. Employ the concept of the strategic plans in realistic environment.
4. Analyze the profitability and durability of competitive advantage.
5. Evaluate and control strategies of Profit and Nonprofit Organizations.

Unit – I **08 Hrs**

Introduction to strategic management: strategic leadership, Industry differences in Performance, Strategy making process, strategy as an emergent process, strategic planning in practice, strategic decision making

External analysis: Defining an industry, Competitive forces model, Strategic groups in industries, Industry life cycle analysis, limitations of models for industry analysis, Micro environment, Case studies.

Unit – II **08 Hrs**

Nature of competitive advantage: Internal analysis; roots of competitive advantage, value chain, building blocks of competitive advantage, analyzing competitive advantage and profitability, durability of competitive advantage, Building competitive advantage through functional level strategy. Case Studies.

Unit – III **10 Hrs**

Strategies: Building competitive advantage through business-level strategy, competitive positioning and business model, business level strategy, generic business level strategies, dynamics of competitive positioning. Business level strategy and the industry environment. Case Studies.

Unit – IV **08 Hrs**

Corporate structure and Implementation: Strategy implementation, Issues in formulation and implementation, analyzing strategic change, building a capable organization, allocating resources, Establishing organization. Case studies.

Unit-V **12 Hrs**

Corporate culture: Installing internal administrative support systems, Exerting strategic leadership, Fulfilling the leadership role.

The control function; Organizational control, financial measurement methods, reporting systems, information systems and vehicles of control.

Strategic management in Profit and Nonprofit Organization; Evolution of nonprofit organizations, strategic objectives. Strategy for multi-primary-mission organizations, Strategic decision making in NFP organization, Evaluation and control. Case studies

Course Outcomes:

After going through this course the student will be able to

CO1: Explain the strategic management process for competitive industrial environment.
CO2: Identify the needs of changing external environment and develop the strategic plans accordingly to solve real time problems.
CO3: Measure the profitability and asses the durability of competitive advantage.
CO4: Develop the strategic management models for profit and nonprofit organizations.

Reference Books:
1. Charles W. L. Hill, Gareth R. Jones, Strategic Management: An Integrated Approach, 10th Edition. Cengage Learning Publishers, ISBN: 13: 978-1 – 111 – 82584 – 3
2. Abbass.F.Alkhafaji, Strategic Management-Formulation, Implementation and Control in a Dynamic Environment, , The Haworth Press,Newyork, ISBN:0-7890-1809-8
3. G. A. Cole, Strategic Management – Theory and Practice,2nd Edition, , Thomson learning publishers, ISBN: 978-1-84480-087-2

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
CO1	H										
CO2		H	H								
CO3						M	M				
CO4				M			M				

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

	PSO1	PSO2	PSO3
CO1	H		
CO2		L	
CO3			M
CO4			

PRINCIPLES OF RELIABILITY ENGINEERING *(Elective)*						
Course Code	**:**	**16MEM342**		**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: studentis expected

1. To apply engineering knowledge and specialist techniques to prevent or to reduce the likelihood or frequency of failures.
2. To identify and correct the causes of failures that do occur, despite the efforts to prevent them.
3. To determine ways of coping with failures that do occur, if their causes have not been corrected.
4. To apply methods for estimating the likely reliability of new designs, and for analyzing reliability data.

Unit – I **08Hrs**

Introduction: Definition of Reliability Engineering, Failures of Engineering Systems, Causes of Failures, Reliability and Quality, Repairable and Non-repairable systems, Reliability Characteristics, The Bathtub Curve, Component Reliability and Hazard Models, Component Reliability from Test data, Reliability Logic diagram, Reliability Evaluation using Markov Model.

Unit – II **10Hrs**

Basic Reliability Models

Failure distribution: The reliability function, Mean time to failure, Hazard rate function, Hazard rate function, Bathtub curve, Conditional reliability

Constant failure rate model: The exponential reliability function, Failure modes, Applications, The Two Parameter Exponential distribution, Poisson process, Redundancy and CFR model exercises

Time dependent failure models: The Weibull distribution, Normal distribution, The Log Normal distribution

Unit – III **10Hrs**

Reliability of Systems: Serial Configuration, Parallel Configuration, Combined Series-Parallel system, System structure function, Minimal cuts and Minimal paths. Common mode failure, Three state devices, State space analysis (Markov analysis), Load sharing systems, Standby systems, Graded systems.

Unit – IV **10Hrs**

Failure Data Analysis: Data Collection, Empirical Methods, Static Life Estimation, Product Testing, Reliability Life Testing, Test Time Calculations, Burn-In Testing, Acceptance Testing, Accelerated Life Testing, Experimental Design, Competing Failure Modes

Software Reliability: Introduction, Software in Engineering systems, Software errors, Preventive errors, Software structure and Modularity, Software testing, Software reliability prediction and measurement.

Unit-V **10 Hrs**

Design for reliability: Reliability specification and systems measurement, Reliability allocation, Design methods, Failure analysis, System safety and Fault tree analysis.

Reliability Management: Corporate policy for reliability, Integrated reliability programs, Reliability and costs, Quality and safety

Course Outcomes:

After going through this course the student will be able to

CO1: Explain the various tools and techniques of Reliability Engineering. CO2: Apply various tools available in reliability engineering to model and predict reliability. CO3: Analyse the causes of failures in engineering systems both at component and system level. CO4: Design reliable systems using specilist techniques to prevent or to reduce the likelihood or frequency of failures.
Reference Books:
1. Charles E. Ebling, An Introduction to Reliability and Maintainability Engineering, Tata McGraw Hill MLM1004, 2000, ISBN: 007 0421382.
2. Patrick D.T. Oconnor, etal - Practical Reliability Engineering, John Wiley and Sons, 2002, 4th Edition, ISBN: 9812-53-045-2.
3. Dr. E. BalaguruSwamy – Reliability Engineering, McGraw Hill, 2003, 4th Edition,.
4. V N A Naikan, Reliability Engineering and Life Testing, PHI learning, 2009, ISBN-978-81-203-3593-6

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
CO1	H										
CO2	H	M									
CO3		M	M								
CO4			M								

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

	PSO1	PSO2	PSO3
CO1	H		
CO2		L	
CO3		M	
CO4			M

IV SEMESTER

MAJOR PROJECT						
Course Code	**:**	**16MEM41**		**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 5^{th} week	Synopsis, Preliminary report for the approval of selected topic along with literature survey, objectives and methodology.	20%
II	Mid-term progress review shall check the compliance with the	

10th week	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
CO1	H	H	H	M	L	M	L				
CO2				L				M	H		
CO3					L	M	M			H	
CO4					L	M	H	M			H

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

	PSO1	PSO2	PSO3
CO1	H	L	H
CO2	L	H	M
CO3	M	H	
CO4	H	H	M

SEMINAR						
Course Code	**:**	**16MEM42**		**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:

- Topic – Technical Relevance, Sustainability and Societal Concerns 15%
- Literature Review 25%
- Presentation Skills 35%
- 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	PSO3
CO1	H	L	H
CO2	M	H	
CO3	M	L	M
CO4	H	L	H