VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI.

Scheme of Teaching and Examinations and Syllabus
M.Tech., Master of Engineering Management (MEM)
(Effective from the Academic year 2022-23)

Registrar,
Visvesvaraya Technological University
JnanaSangam, Machhe, Belagavi-590018
eMail: registrar@vtu.ac.in
contact: 0831-2498112

VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI
Scheme of Teaching and Examinations – 2022
M.Tech.,Master of Engineering Management (MEM)
Choice Based Credit System (CBCS) and Outcome-Based Education(OBE)

I SEMESTER

Sl. No	Course	Course Code	Course Title	Teaching Hours per Week			Examination				Credits
				Theory	Practical/Seminar	Tutorial/ Skill Development Activities	Duration in hours	CIE Marks	SEE Marks	Total Marks	
				L	P	T/SDA					
1	BSC	22MEM/MTE/MPD/ MST/MPM/MPY/MSE11	Mathematical Methods In Engineering	03	00	00	03	50	50	100	3
2	IPCC	22MEM12	Marketing Management	03	02	00	03	50	50	100	4
3	PCC	22MEM13	Quantitative Techniques in Decision Making	03	00	02	03	50	50	100	4
4	PCC	22MEM14	Organizational Behaviour	02	00	02	03	50	50	100	3
5	PCC	22MEM15	Managerial Economics	02	00	02	03	50	50	100	3
6	MCC	22RMI16	Research Methodology and IPR	03	00	00	03	50	50	100	3
7	PCCL	22MEML17	Management Tools Lab	01	02	00	03	50	50	100	2
8	AUD/AEC	22AUD18/ 22AEC18	BOS recommended ONLINE courses	Classes and evaluation procedures are as per the policy of the online course providers.							PP
			TOTAL	**17**	**04**	**06**	**21**	**350**	**350**	**700**	**22**

Note: BSC-Basic Science Courses, PCC: Professional core. IPCC-Integrated Professional Core Courses, MCC- MandatoryCredit Course,
AUD/AEC –Audit Course / Ability Enhancement Course(A pass in AUD/AEC is mandatory for the award of the degree), PCCL-Professional Core Course lab, **L-Lecture, P-Practical, T/SDA-Tutorial / Skill Development Activities**(Hours are for Interaction between faculty and students)

Integrated Professional Core Course (IPCC): **Integrated Professional Core Course (IPCC)**: Refers to Professional Theory Core Course Integrated with practical of the same course. The theory part of the IPCC shall be evaluated both by CIE and SEE. The practical part shall be evaluated by only CIE (no SEE). However, questions from the practical part of IPCC shall be included in the SEE question paper.

Audit Courses /Ability Enhancement Courses Suggested by BOS (ONLINE courses): Audit Courses: These are prerequisite courses suggested by the concerned Board of Studies. Ability Enhancement Courses will be suggested by the BoS if prerequisite courses are not required for the programs. **Ability Enhancement Courses**:

- These courses are prescribed to help students to enhance their skills in in fields connected to the field of specialisation as well allied fields that leads toemployable skills. Involving in learning such courses are impetus to lifelong learning.
- The courses under this category are online courses published in advance and approved by the concerned Board of Studies.
- Registration to Audit /Ability Enhancement Course shall be done in consultation with the mentor and is compulsory during the concerned semester.
- In case a candidate fails to appear for the proctored examination or fails to pass the selected online course, he/she can register and appear for the same course if offered during the next session or register for a new course offered during that session, in consultation with the mentor.
- The Audit Ability Enhancement Course carries no credit and is not counted for vertical progression. However, a pass in such a course is mandatory for the award of the degree.

Skill development activities:Under Skill development activities in a concerning course, the students should

1. Interact with industry (small, medium, and large).
2. Involve in research/testing/projects to understand their problems and help creative and innovative methods to solve the problem.
3. Involve in case studies and field visits/ fieldwork.
4. Accustom to the use of standards/codes etc., to narrow the gap between academia and industry.
5. Handle advanced instruments to enhance technical talent.
6. Gain confidence in modelling of systems and algorithms for transient and steady-state operations, thermal study, etc.
7. Work on different software/s (tools) to simulate, analyze and authenticate the output to interpret and conclude.

All activities should enhance student's abilities to employment and/or self-employment opportunities, management skills, Statistical analysis, fiscal expertise, etc.

Students and the course instructor/s to involve either individually or in groups to interact together to enhance the learning and application skills of the study they have undertaken. The students with the help of the course teacher can take up relevant technical –activities which will enhance their skill. The prepared report shall be evaluated for CIE marks.

Semester-I

Mathematical Methods In Engineering **Common to MST/MTE/MPD/MEM/MPM/MPY/MSE**			
Course Code	**22MEM11**	CIE Marks	**50**
Teaching Hours/Week (L:P:SDA)	**3:0:0**	SEE Marks	**50**
Total Hours of Pedagogy	**40**	Total Marks	**100**
Credits	**03**	Exam Hours	**03**

Course Learning objectives:

- To have an insight into solving Linear Algebraic Equations.
- Learn to use the roots of equations.
- To develop proficiency in solving ordinary and partial differential equations arising in engineering applications, using numerical methods.
- To enable learning concepts of Sampling theory, RBD and their implication in Mechanical Engineering.
- To understand the techniques of Simple mathematical models in estimating high accuracy and their applications.

Module-1

Errors and Simple Mathematical modelling: Error definition, round off errors and truncation errors. Mathematical modelling and Engineering problem solving: Simple mathematical model, Conservation Laws of Engineering. Engineering Applications on : i) Deflection of Beams ii) Terminal velocity of a freely falling body (RBT Levels: L1 & L2) (Text Book:1) 8 Hrs

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-2

System of Linear Algebraic Equations And Eigen Value Problems: Gauss-Jordan Method, Cholesky Method, Partition method, Givens method for symmetric matrices, (RBT Levels: L1 & L2) (Text Book:3) 8Hrs

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-3

Roots of Equations: Muller's method, Graeffe's roots squaring method. Numerical solutions of second order ordinary differential equations: Runge Kutta method & Milne's Predictor-corrector method.. (RBT Levels: L2 & L3) (Text Book:3) 8Hrs

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-4

Partial Differential Equations: Numerical solution of one dimensional wave equation, Heat equation,(Schmidt`s explicit formula)& Laplace equation(Gauss-Seidel process) by finite difference schemes. (RBT Levels: L2 & L3) (Text Book:6). 8Hrs

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-5

Sampling theory: Testing of hypothesis (Single mean & single proportion only), Chi square test and F-test. Analysis of Variance (ANOVA): one way classification, Design of experiments, RBD. (RBT Levels: L2 & L3) (Ref. Book:4) 8Hrs

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 50% of the maximum marks. Minimum passing marks in SEE is 40% of the maximum marks of SEE. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 50% (50 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

1. Three Unit Tests each of **20 Marks**
2. Two assignments each of **20 Marks** or **one Skill Development Activity of 40 marks** to attain the COs and POs

The sum of three tests, two assignments/skill Development Activities, will be **scaled down to 50 marks**

CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination:

1. The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
2. The question paper will have ten full questions carrying equal marks.
3. Each full question is for 20 marks. There will be two full questions (with a maximum of four sub-questions) from each module.
4. Each full question will have a sub-question covering all the topics under a module.
5. The students will have to answer five full questions, selecting one full question from each module

Suggested Learning Resources:

Books

1. Steven C Chapra and Raymond P Canale, "Numerical Methods for Engineers," 7th Ed., cGraw-Hill Edition, 2015
2. Theory of ordinary differential equations, Coddington E., Levinson N., McGraw-Hill publishing Company, TMH Edition, 9th Reprint, 1987..
3. M K Jain, S.R.K Iyengar, R K. Jain, Numerical methods for Scientific and engg computation, New Age International, 2003.
4. R.E, Walpole, R.H.Myres, S.L.Myres and Keying Ye, "Probability and Statistics for Engineers and Scientists", 9th Edition, Pearson, 2012
5. Dr. B.S. Grewal, "Numerical Methods in Engineering and Science", Khanna Publishers, 1999
6. K Shankar Rao, "Introduction to Partial Differential Equations" Prentice - Hall of India Pvt. Lt. , 1995 Edition
7. C. Ray Wylie and Louis C Barrett, "Advanced Engineering Mathematics". 6th edition, McGraw-Hill, 1995.

Web links and Video Lectures (e-Resources):

- http://.ac.in/courses.php?disciplineID=111
- http://www.class-central.com/subject/math(MOOCs)
- http://academicearth.org/
- http://www.bookstreet.in.
- VTU e-Shikshana Program
- VTU EDUSAT Program

Skill Development Activities Suggested

- Quizzes
- Assignments
- Seminars

Course outcome (Course Skill Set)

At the end of the course the student will be able to :

Sl. No.	Description	Blooms Level
CO1	Acquire the idea of significant figures, types of errors during numerical computation.	
CO2	Understand statistical and probabilistic concepts required to test the hypothesis and designing the experiments using RBD.	
CO3	Learn various numerical methods to solve system of linear equations.	
CO4	Understand the roots of algebraic/transcendental equations and solve PDE's numerically.	
CO5	Analyze and solve PDE's related to wave equation arising in vibration analysis.	

Program Outcome of this course

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

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

PO3 - Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program

PO4 - Understand contemporary issues in management and develop relationship between engineering and management practices

PO5 – develop the understanding of various quantitative techniques and approaches to solve management problems

PO6 – ability to understand the techniques of marketing management and marketing research

PO7 –familiarization with roles and responsibilities of a manager in engineering practice

Mapping of COS and POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	**2**	**2**	**1**	**2**	**1**	**2**	**2**
CO2	**1**	**2**	**1**	**2**	**2**	**1**	**2**
CO3	**2**	**2**	**1**	**2**	**2**	**2**	**2**
CO4	**2**	**2**	**2**	**2**	**2**	**1**	**2**
CO5	**1**	**2**	**2**	**2**	**2**	**2**	**2**

Note : High - 1, Medium – 2, and Low – 3

Marketing Management			
Course Code	**22MEM12**	CIE Marks	**50**
Teaching Hours/Week (L:P:SDA)	**3:2:0**	SEE Marks	**50**
Total Hours of Pedagogy	**40**	Total Marks	**100**
Credits	**04**	Exam Hours	**03**

Course Learning objectives: To Understand the concept of marketing, its evolution and consumer behaviour along with various types of organisational markets. To inculcate basic knowledge of Product life cycle and new Product development process and product branding and advertisement

Module-1

Introduction: Role of marketing in today's organizations – core concepts of marketing – management – the evolution of marketing management concept
. **Marketing Environment** – Marketing system – actors in the company's Micro and MacroEnvironment.

8 Hrs

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-2

Consumer Markets and Buying Behaviors – a Model of consumer behavior – Major factors influencing consumer behavior – the buying decision process.

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-3

Organizational Markets and Buying Behavior – the industrial market – the reseller market – the government market.
8Hrs

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-4

Market Segmentation – Market testing – market positioning – the marketing plan. Concept of Product life cycle and new Product development process.

8Hrs

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-5

Pricing Decisions and Channel decisions, Product branding, packing and service, advertisement and media management, Communication and promotion mix decision.

8Hrs

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 50% of the maximum marks. Minimum passing marks in SEE is 40% of the maximum marks of SEE. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 50% (50 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

3. Three Unit Tests each of **20 Marks**
4. Two assignments each of **20 Marks** or **one Skill Development Activity of 40 marks** to attain the COs and POs

The sum of three tests, two assignments/skill Development Activities, will be **scaled down to 50 marks**

CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination:

6. The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
7. The question paper will have ten full questions carrying equal marks.
8. Each full question is for 20 marks. There will be two full questions (with a maximum of four sub-questions) from each module.
9. Each full question will have a sub-question covering all the topics under a module.
10. The students will have to answer five full questions, selecting one full question from each module

Suggested Learning Resources:

Text Books

(1)**Marketing Management**, **Analysis, Planning and Control –** Philip Kotler – PHI -1999.

(2) **Marketing Management**– Willam J Stanton – John Wiley – Sales Force Chicago, Irwin – 1993.

Web links and Video Lectures (e-Resources):

- http://.ac.in/courses.php?disciplineID=111
- http://academicearth.org/
- http://www.bookstreet.in.
- VTU e-Shikshana Program
- VTU EDUSAT Program

Skill Development Activities Suggested

- Quizzes
- Assignments
- Seminars

Course outcome (Course Skill Set)

At the end of the course the student will be able to :

Sl. No.	Description	Blooms Level
CO1	Understand the importance of marketing and its evolution	
CO2	Acquire the knowledge on consumer behaviour	
CO3	Familiarization with various types of organisational markets	
CO4	Concept of Product life cycle and new Product development process	
CO5	Knowledge of product branding and advertisement	

Program Outcome of this course

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

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

PO3 - Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program

PO4 - Understand contemporary issues in management and develop relationship between engineering and management practices

PO5 – develop the understanding of various quantitative techniques and approaches to solve management problems

PO6 – ability to understand the techniques of marketing management and marketing research

PO7 –familiarization with roles and responsibilities of a manager in engineering practice

Mapping of COS and POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	1	2	2	2	2	2	2
CO2	1	2	2	2	2	1	2
CO3	2	2	2	2	2	1	2
CO4	1	2	2	2	2	1	2
CO5	2	2	1	2	2	2	1

Note : High - 1, Medium – 2, and Low – 3

QUANTITATIVE TECHNIQUES IN DECISION MAKING			
Course Code	**22MEM13**	CIE Marks	**50**
Teaching Hours/Week (L:P:SDA)	**3:0:0**	SEE Marks	**50**
Total Hours of Pedagogy	**40**	Total Marks	**100**
Credits	**04**	Exam Hours	**03**

Course Learning objectives: To make the students understand the fundamentals of statistics and decision making during uncertainty and familiarize them with techniques to solve assignment and transportation problems. The usage of Net work techniques in the completion of projects along with the simulation of Management systems will be taught.

Module-1

Introduction: Statistics and managerial decisions, statistical data and Operations Research techniques.
Fundamentals of Statistics, probability and probability distributions: Measures of central tendency and location, Measure of dispersion, skewness and kurtosis, Probability and rules of probability, Random variables and probability distributions – Binomial, Poisson, Hyper geometric and Normal.

8 Hrs

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-2

Decision Making under Uncertainty: Alternative criteria for decision under uncertainty, Bayesian approach and Incremental analysis. **Linear Programming Problem:** Formulation of L.P.P., Solution of L.P.P. by graphical method, Solution of L.P.P. by simplex method, Concept of duality and solution of dual problems, Solution of L.P.P. by dual simplex method .

8 Hrs

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-3

.
Transportation and Assignment Problems: Structure of transportation problem and various methods to find LB.F.S, Optimality test of transportation problems by MODI method, Solution of degeneracy and unbalanced transportation problems, Assignment problems and solution by Hungarian method and Traveling Salesman problem

8Hrs

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-4

Two person zero sum game, Minimax & maximin strategies, Solution of game by dominance rules, arithmetic and algebraic methods, Solution of game by graphical method.

8Hrs

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-5

Network Analysis: PERT and CPM, Network construction and determination of critical path, Calculation of ES, EF, LS, LF, TF, FF and IF, Crashing of a project, Scheduling of a project and resource leveling. **Waiting Line**: Basic structure of queuing systems and characteristics, Expressions for M/M/l queuing model.
Simulation of Management systems: Simulation and Monte Carlo method, Waiting line and inventory simulation models.

8Hrs

Teaching-	Chalk and talk method / PowerPoint Presentation

Learning Process	

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 50% of the maximum marks. Minimum passing marks in SEE is 40% of the maximum marks of SEE. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 50% (50 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

5. Three Unit Tests each of **20 Marks**
6. Two assignments each of **20 Marks** or **one Skill Development Activity of 40 marks** to attain the COs and POs

The sum of three tests, two assignments/skill Development Activities, will be **scaled down to 50 marks**

CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination:

11. The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
12. The question paper will have ten full questions carrying equal marks.
13. Each full question is for 20 marks. There will be two full questions (with a maximum of four sub-questions) from each module.
14. Each full question will have a sub-question covering all the topics under a module.
15. The students will have to answer five full questions, selecting one full question from each module

Suggested Learning Resources:

Text Books

1)Quantitative Techniques for managerial decisionsm – SrivastavaU.K. – New Age International Private Limited –ISBN Number:8122401899

2)**Operations Research –** H. Taha– Prentice Hall India – 8 Edition

Reference Books

1) Operations Research: An Introduction – Gupta and Heera – S.Chand and Company – 2002

2) Introduction to Operations Research – Hillier and Liberman– McGraw Hill International. – ISBN 10: 0072321695

Web links and Video Lectures (e-Resources):

- http://.ac.in/courses.php?disciplineID=111
- http://academicearth.org/
- http://www.bookstreet.in.
- VTU e-Shikshana Program
- VTU EDUSAT Program

Skill Development Activities Suggested

- Quizzes
- Assignments
- Seminars

Course outcome (Course Skill Set)

At the end of the course the student will be able to :

Sl. No.	Description	Blooms Level
CO1	Provide greater insight into decision-making processes, with strong fundamentals.	
CO2	Understand better how people perceive and decide about risk and transform domain situation to LPP and solve it.	
CO3	Formulate as Transportation, Assignment, and Travelling salesman problems and derive Optimum solutions	
CO4	Formulate game theory problems and obtain solutions using different methods. Understand the fundamentals of Queues	
CO5	Develop an appropriate network diagram for the given problem and analyse the project using critical path, floats, slacks. Crash the project and obtained minimum cost/time schedule. Develop simulation models using Monte Carlo technique.	

Program Outcome of this course

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

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

PO3 - Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program

PO4 - Understand contemporary issues in management and develop relationship between engineering and management practices

PO5 – develop the understanding of various quantitative techniques and approaches to solve management problems

PO6 – ability to understand the techniques of marketing management and marketing research

PO7 –familiarization with roles and responsibilities of a manager in engineering practice

Mapping of COS and POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	2	2	1	1	2	2	1
CO2	1	3	2	2	2	2	2
CO3	1	2	2	2	2	2	2
CO4	1	2	2	2	2		2
CO5	2	2	1	2	2	2	2

Note : High - 1, Medium – 2, and Low – 3

ORGANIZATIONAL BEHAVIOUR			
Course Code	**22MEM14**	CIE Marks	**50**
Teaching Hours/Week (L:P:SDA)	**2:2:0**	SEE Marks	**50**
Total Hours of Pedagogy	**40**	Total Marks	**100**
Credits	**03**	Exam Hours	**03**

Course Learning objectives: To develop the understanding of the fundamentals of OB and Impart the knowledge on individual and group behaviour. Familiarize the students with various motivational theories and organizational culture.

Module-1

The Foundations of Organizational Behavior: Historical Background, Research Methodology, Theoretical, Frameworks. OB in global context, Role of Information Technology, TQM, Learning Organizations.

8 Hrs

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-2

Individual Behavior: Biographical Characteristics, Ability, Personality, Learning, Implications for Performance and Satisfaction. Perception and Individual Decision –Making Values, Attitudes and Job Satisfaction.

8 Hrs

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-3

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Basic Motivation Concepts: Work Motivation Approaches – Content and Process Theories of Work Motivation – Contemporary Theories of Work Motivation – Motivation through Job Design, Quality of Work Life, Goal Setting.

8Hrs

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-4

Foundations of Group Behavior: Communication and Group Decision Making – Leadership Styles and Skills – Power and Politics – Conflict and Inter –group behavior.

8Hrs

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-5

Organization Culture: Organizational Change – Organizational Development Organizational Climate –Work Stress.

8Hrs

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 50% of the maximum marks. Minimum passing marks in SEE is 40% of the maximum marks of SEE. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 50% (50 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

7. Three Unit Tests each of **20 Marks**
8. Two assignments each of **20 Marks** or **one Skill Development Activity of 40 marks** to attain the COs and POs

The sum of three tests, two assignments/skill Development Activities, will be **scaled down to 50 marks**

CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination:

16. The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
17. The question paper will have ten full questions carrying equal marks.
18. Each full question is for 20 marks. There will be two full questions (with a maximum of four sub-questions) from each module.
19. Each full question will have a sub-question covering all the topics under a module.
20. The students will have to answer five full questions, selecting one full question from each module

Suggested Learning Resources:

Text Books

1) Organizational Behavior – Stephen. P. Robbins – Prentice Hall, India. - 9th edition 2001.

(2) **Organizational Behavior** – Fred Luthans – McGraw Hill – 1997

Reference Books

(1) **Human Behavior at work**– Keith Davis – Prentice Hall India – 2007.

(2) **Organizational Psychology** – Robin, Kolb, etc – 1996

Web links and Video Lectures (e-Resources):

- http://.ac.in/courses.php?disciplineID=111
- http://academicearth.org/
- http://www.bookstreet.in.
- VTU e-Shikshana Program
- VTU EDUSAT Program

Skill Development Activities Suggested

- Quizzes
- Assignments
- Seminars

Course outcome (Course Skill Set)

At the end of the course the student will be able to :

Sl. No.	Description	Blooms Level
CO1	Define organisational behaviour, analyse discipline and area of application in business.	
CO2	Understand personality, interpersonal and intergroup behaviour	
CO3	Understand group types, norms and decision making	
CO4	Understand nature and development of leadership and types of power.	
CO5	Learn the management of conflict, development, effectiveness and cross cultural management	

Program Outcome of this course

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

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

PO3 - Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program

PO4 - Understand contemporary issues in management and develop relationship between engineering and management practices

PO5 – develop the understanding of various quantitative techniques and approaches to solve management problems

PO6 – ability to understand the techniques of marketing management and marketing research

PO7 –familiarization with roles and responsibilities of a manager in engineering practice

Mapping of COS and POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	2	2	1	2	2	2	1
CO2	2	3	2	2	2	3	1
CO3	3	2	2	2	2	3	2
CO4	3	2	1	1	3	3	2
CO5	2	2	1	2	2	2	1

Note : High - 1, Medium – 2, and Low – 3

MANAGERIAL ECONOMICS			
Course Code	**22MEM15**	CIE Marks	**50**
Teaching Hours/Week (L:P:SDA)	**2:2:0**	SEE Marks	**50**
Total Hours of Pedagogy	**40**	Total Marks	**100**
Credits	**03**	Exam Hours	**03**

Course Learning objectives: To develop the understanding of demand, production and cost components.
To familiarize the students with Concepts of market structure with emphasis on competition, monopoly and oligopoly.
To impart the in-depth knowledge in Pricing and capital budgeting

Module-1

Demand Analysis: Demand Theory, Preference and Choice, Empirical Demand Curves, Goods Characteristics Approach. **Production & Cost:** Production Theory and Estimation: Organization of Production and the Production Function, Production Function with two variable inputs, optimal combination of inputs returns to scale. Empirical production functions. Cost Components – Cost functions, Empirical Cost functions

8 Hrs

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-2

Market Structures: Perfect Competition: Meaning characteristics and importance, price and output determination in the short run and long run. Derived demand for inputs, shortcomings of perfect competition

8 Hrs

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-3

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Monopoly: Meaning, characteristics and importance, comparison with perfect competition, short run and long run analysis evaluation. Monopolistic Competition: Meaning, Characteristics and Importance short run and long run analysis. **Oligopoly**: Meaning, characteristics and importance, Non-Collusive Oligopoly and the kinked demand curve, Collusive Oligopoly, efficiency implications of oligopoly.

8Hrs

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-4

Pricing in Practice: Cost-plus pricing, Evaluation of cost plus pricing, Incremental Analysis in pricing.

8Hrs

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-5

Capital Budgeting: Meaning and Importance, Protecting Cash Flows, Present Value and Internal Rate of Return, Comparison of NPV and IRR. Economic Growth, Development and planning economic aggregates and economic relationships.

8Hrs

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 50% of the maximum marks. Minimum passing marks in SEE is 40% of the maximum marks of SEE. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 50% (50 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

9. Three Unit Tests each of **20 Marks**
10. Two assignments each of **20 Marks** or **one Skill Development Activity of 40 marks** to attain the COs and POs

The sum of three tests, two assignments/skill Development Activities, will be **scaled down to 50 marks**

CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination:

21. The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
22. The question paper will have ten full questions carrying equal marks.
23. Each full question is for 20 marks. There will be two full questions (with a maximum of four sub-questions) from each module.
24. Each full question will have a sub-question covering all the topics under a module.
25. The students will have to answer five full questions, selecting one full question from each module

Suggested Learning Resources:

Textbooks

1) Economics: Principles, Problems and Policies – Campbell R. McConnell – McGraw Hill – 2005

(2)**Theory and Problems of Micro Economic Theory** – Dominic Salvator, McGraw Hill – 1991

Reference Books

(1.) **Managerial Economics** – Joel Dean – PHI – 2005.

(2) **Managerial Economics** – Dominic Salvator, McGraw Hill – 1995

Web links and Video Lectures (e-Resources):

- http://.ac.in/courses.php?disciplineID=111
- http://academicearth.org/
- http://www.bookstreet.in.
- VTU e-Shikshana Program
- VTU EDUSAT Program

Skill Development Activities Suggested

- Quizzes
- Assignments
- Seminars

Course outcome (Course Skill Set)

At the end of the course the student will be able to :

Sl. No.	Description	Blooms Level
CO1	Understand concept like flow of economic activity, profit and demand and price elasticity	
CO2	Estimate production functions with one and two input variables	
CO3	Find optimistic cost considering all relevant factors	
CO4	Compare monopoly and oligopoly competition in market and barriers to enter.	
CO5	Understand pricing on multiple product and employment ofinput	

Program Outcome of this course

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

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

PO3 - Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program

PO4 - Understand contemporary issues in management and develop relationship between engineering and management practices

PO5 – develop the understanding of various quantitative techniques and approaches to solve management problems

PO6 – ability to understand the techniques of marketing management and marketing research

PO7 –familiarization with roles and responsibilities of a manager in engineering practice

Mapping of COS and POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	2	1	2	1	1	2
CO2	2	2	1	2	1	2	2
CO3	2	2	2	2	2	2	2
CO4	2	3	2	2	3	2	2
CO5	2	3	2	2	3	2	2

Note : High - 1, Medium – 2, and Low – 3

RESEARCH METHODOLOGY AND IPR			
Course Code	**22RMI16**	CIE Marks	**50**
Teaching Hours/Week (L:P:SDA)	**3:0:0**	SEE Marks	**50**
Total Hours of Pedagogy	**40**	Total Marks	**100**
Credits	**03**	Exam Hours	**03**

Course Learning objectives:

1. To make the student understand the basic concepts such as research, research problem, defining the research problem etc.
2. To impart the knowledge to conduct literature survey and evolve research design independently.
3. To familiarize the student with sample survey, data collection, hypothesis and it's testing.
4. To make the student understand the standard and scientific way of preparing the report

Module-1

Research Methodology: Introduction, Meaning of Research, Objectives of Research, Motivation in Research, Types of Research, Research Approaches, Significance of Research, Research Methods versus Methodology, Research and Scientific Method, Importance of Knowing How Research is Done, Research Process, Criteria of Good Research, and Problems Encountered by Researchers in India. Defining the Research Problem: Research Problem, Selecting the Problem, Necessity of Defining the Problem, Technique Involved in Defining a Problem, An Illustration. **10Hrs**

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-2

Reviewing the literature: Place of the literature review in research, Bringing clarity and focus to your research problem, Improving research methodology, Broadening knowledge base in research area, Enabling contextual findings, How to review the literature, searching the existing literature, reviewing the selected literature, Developing a theoretical framework, Developing a conceptual framework, Writing about the literature reviewed.

Research Design: Meaning of Research Design, Need for Research Design, Features of a Good Design, Important Concepts Relating to Research.

Design, Different Research Designs, Basic Principles of Experimental Designs, Important Experimental Designs. **10Hrs**

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-3

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Design of Sampling: Introduction, Sample Design, Sampling and Non-sampling Errors, Sample Survey versus Census Survey, Types of Sampling Designs.

Measurement and Scaling: Qualitative and Quantitative Data, Classifications of Measurement Scales, Goodness of Measurement Scales, Sources of Error in Measurement Tools, Scaling, Scale Classification Bases, Scaling Techniques, Multidimensional Scaling, Deciding the Scale.

Data Collection: Experimental and Surveys, Collection of Primary Data, Collection of Secondary Data, Selection of Appropriate Method for Data Collection, Case Study Method. **10Hrs**

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-4

Testing of Hypotheses: Hypothesis, Basic Concepts Concerning Testing of Hypotheses, Testing of Hypothesis, Test Statistics and Critical Region, Critical Value and Decision Rule, Procedure for Hypothesis Testing, Hypothesis Testing for Mean, Proportion, Variance, for Difference of Two Mean, for Difference of Two Proportions, for Difference of Two Variances, P-Value approach, Power of Test, Limitations of the Tests of Hypothesis. Chi-square Test: Test of Difference of more than Two Proportions, Test of Independence of Attributes, Test of Goodness of Fit, Cautions in Using Chi Square Tests. **10Hrs**

Teaching-Learning	Chalk and talk method / PowerPoint Presentation

Process	

Module-5

Interpretation and Report Writing: Meaning of Interpretation, Technique of Interpretation, Precaution in Interpretation, Significance of Report Writing, Different Steps in Writing Report, Layout of the Research Report, Types of Reports, Oral Presentation, Mechanics of Writing a Research Report, Precautions for Writing Research Reports.

Intellectual Property: The Concept, Intellectual Property System in India, Development of TRIPS Complied Regime in India, Patents Act, 1970, Trade Mark Act, 1999,The Designs Act, 2000, The Geographical Indications of Goods (Registration and Protection) Act1999, Copyright Act,1957,The Protection of Plant Varieties and Farmers‟ Rights Act, 2001,The Semi-Conductor Integrated Circuits Layout Design Act, 2000, Trade Secrets, Utility Models, IPR and Biodiversity, The Convention on Biological Diversity (CBD) 1992, Competing Rationales for Protection of IPRs, Leading International Instruments Concerning IPR, World Intellectual Property Organisation(WIPO),WIPO and WTO, Paris Convention for the Protection of Industrial Property, National Treatment, Right of Priority, Common Rules,Patents,Marks, Industrial Designs, Trade Names, Indications of Source, Unfair Competition, Patent Cooperation Treaty (PCT), Advantages of PCT Filing, Berne Convention for the Protection of Literary and Artistic Works, Basic Principles, Duration of Protection, Trade Related Aspects of Intellectual Property Rights(TRIPS) Agreement, Covered under TRIPS Agreement, Features of the Agreement, Protection of Intellectual Property under TRIPS, Copyright and Related Rights, Trademarks, Geographical indications, Industrial Designs, Patents, Patentable Subject Matter, Rights Conferred, Exceptions, Term of protection, Conditions on Patent Applicants, Process Patents, Other Use without Authorization of the RightHolder, Layout-Designs of Integrated Circuits, Protection of Undisclosed Information, Enforcement of Intellectual Property Rights, UNSECO**.** **10Hrs**

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 50% of the maximum marks. Minimum passing marks in SEE is 40% of the maximum marks of SEE. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 50% (50 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

11. Three Unit Tests each of **20 Marks**
12. Two assignments each of **20 Marks** or **one Skill Development Activity of 40 marks** to attain the COs and POs

The sum of three tests, two assignments/skill Development Activities, will be **scaled down to 50 marks**

CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination:

26. The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
27. The question paper will have ten full questions carrying equal marks.
28. Each full question is for 20 marks. There will be two full questions (with a maximum of four sub-questions) from each module.
29. Each full question will have a sub-question covering all the topics under a module.
30. The students will have to answer five full questions, selecting one full question from each module

Suggested Learning Resources:

Books

- Research Methodology: Methods and Techniques, C.R. Kothari, Gaurav Garg,New Age International,4th Edition, 2018.
- Research Methodology a step-by-step guide for beginners. (For the topic Reviewing the literature under module 2), RanjitKumar,SAGE Publications,3rd Edition, 2011.
- Study Material (For the topic Intellectual Property under module 5), Professional Programme Intellectual Property Rights, Law and Practice, The Institute of Company Secretaries of India, Statutory Body Under an Act of Parliament, September2013.
- Research Methods: the concise knowledge base, Trochim, Atomic Dog Publishing, 2005.

Conducting Research Literature Reviews: From the Internet to Paper, Fink A, Sage Publications, 2009.

Web links and Video Lectures (e-Resources):
VTU e-Shikshana Program
VTU EDUSAT

Skill Development Activities Suggested

- Quizzes
- Assignments
- Seminars

Course outcomes

Sl. No.	Description	Blooms Level
CO1	Discuss research methodology and the technique of defining a research problem	
CO2	Explain the functions of the literature review in research, carrying out a literature search, developing theoretical and conceptual frameworks and writing a review	
CO3	Explain various research designs, sampling designs, measurement and scaling techniques and also different methods of data collections	
CO4	Explain several parametric tests of hypotheses, Chi-square test, art of interpretation and writing research reports	
CO5	Discuss various forms of the intellectual property, its relevance and business impact in the changing global business environment and leading International Instruments concerning IPR	

Program Outcome of this course

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

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

PO3 - Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program

PO4 - Understand contemporary issues in management and develop relationship between engineering and management practices

PO5 – develop the understanding of various quantitative techniques and approaches to solve management problems

PO6 – ability to understand the techniques of marketing management and marketing research

PO7 –familiarization with roles and responsibilities of a manager in engineering practice

Mapping of COS and POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	1	2	1	2	2	2	3
CO2	1	2	2	3	2	1	3
CO3	1	1	2	2	1	1	3
CO4	1	2	2	2	2	2	3
CO5	3	2	1	2	2	2	3

Note : High - 1, Medium – 2, and Low – 3

MANAGEMENT TOOLS LAB			
Course Code	**22MEML17**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	**01:02:00**	SEE Marks	50
Credits	**2**	Exam Hours	03

Course objectives:

To make the students familiarize with simple management tools such as OR packages and Simulation models.

Sl.NO	Experiments
1	Introduction to OR Packages
2	Building Linear Programming Models (Formulation of LPP) and performing sensitivity analysis.
3	Building Transportation Models
4	Exercise on Assignment and Traveling salesman problems
5	Building network models Construction of PERT/CPM networks CPM –Determination of critical path, Time duration and floats PERT –Determination of project duration and variance
6	Building simulation model for Inventory Layout Banking transactions Simple manufacturing system

Course outcomes (Course Skill Set):

At the end of the course the student will be able to:

1. Understand the OR packages
2. Understand and Building Transportation Models
3. Understand the PERT/CPM networks.
4. Building different simulation models .

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 50% of the maximum marks. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course. The student has to secure not less than 40% of maximum marks in the semester-end examination(SEE). In total of CIE and SEE student has to secure 50% maximum marks of the course.

Continuous Internal Evaluation (CIE):

CIE marks for the practical course is **50 Marks**.

The split-up of CIE marks for record/ journal and test are in the ratio **60:40**.

- Each experiment to be evaluated for conduction with observation sheet and record write-up. Rubrics for the evaluation of the journal/write-up for hardware/software experiments designed by the faculty who is handling the laboratory session and is made known to students at the beginning of the practical session.
- Record should contain all the specified experiments in the syllabus and each experiment write-up will be evaluated for 10 marks.
- Total marks scored by the students are scaled downed to 30 marks (60% of maximum marks).
- Weightage to be given for neatness and submission of record/write-up on time.
- Department shall conduct 02 tests for 100 marks, the first test shall be conducted after the 8th week of the semester and the second test shall be conducted after the 14th week of the semester.
- In each test, test write-up, conduction of experiment, acceptable result, and procedural knowledge will carry a weightage of 60% and the rest 40% for viva-voce.
- The suitable rubrics can be designed to evaluate each student's performance and learning ability.
- The average of 02 tests is scaled down to **20 marks** (40% of the maximum marks).

The Sum of **scaled-down** marks scored in the report write-up/journal and average marks of two tests is the total CIE marks scored by the student.

Semester End Evaluation (SEE):

SEE marks for the practical course is 50 Marks.

SEE shall be conducted jointly by the two examiners of the same institute, examiners are appointed by the University.

All laboratory experiments are to be included for practical examination.

(Rubrics) Breakup of marks and the instructions printed on the cover page of the answer script to be strictly adhered to by the examiners. **OR** based on the course requirement evaluation rubrics shall be decided jointly by examiners.

Students can pick one question (experiment) from the questions lot prepared by the internal /external examiners jointly.

Evaluation of test write-up/ conduction procedure and result/viva will be conducted jointly by examiners.

General rubrics suggested for SEE are mentioned here, writeup-20%, Conduction procedure and result in -60%, Viva-voce 20% of maximum marks. SEE for practical shall be evaluated for 100 marks and scored marks shall be scaled down to 50 marks (however, based on course type, rubrics shall be decided by the examiners)

Change of experiment is allowed only once and 10% Marks allotted to the procedure part to be made zero. The duration of SEE is 03 hours
Suggested Learning Resources: LINDO / Quantitative System Analysis (QSA)/ TORA software / M.S. Projects/ARENA

VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI.

Scheme of Teaching and Examinations and Syllabus
M.Tech., Master of Engineering Management (MEM)
(Effective from the Academic year 2022-23)

Registrar,
Visvesvaraya Technological University
JnanaSangam, Machhe, Belagavi-590018
eMail: registrar@vtu.ac.in
contact: 0831-2498112

VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI
Scheme of Teaching and Examinations – 2022
M.Tech.,Master of Engineering Management (MEM)
Choice Based Credit System (CBCS) and Outcome Based Education(OBE)

II SEMESTER

Sl. No	Course	Course Code	Course Title	Teaching Hours /Week			Examination				Credits
				Theory	Practical/ Seminar	Tutorial/ Skill Development Activities	Duration in hours	CIE Marks	SEE Marks	Total Marks	
				L	P	T/SDA					
1	PCC	22MEM21	Product Planning and Marketing	02	00	02	03	50	50	100	3
2	IPCC	22MEM22	Human Resources Management	03	02	00	03	50	50	100	4
3	PEC	22MEM23x	Professional elective 1	02	00	02	03	50	50	100	3
4	PEC	22MEM24x	Professional elective 2	02	00	02	03	50	50	100	3
5	MPS	22MEM25	Mini Project with Seminar	00	04	02	--	100	--	100	3
6	PCCL	22MEML26	Statistical Tools Lab	01	02	00	03	50	50	100	02
7	AUD/ AEC	22AUD27	Suggested ONLINE courses	Classes and evaluation procedures are as per the policy of the online course providers.							PP
TOTAL				**10**	**08**	**08**	**15**	**350**	**250**	**600**	**18**

Note: PCC: Professional core courses,PEC: Professional Elective Courses, IPCC-Integrated Professional Core Courses. MPS-Mini Project With Seminar; AUD/AEC; Audit Courses / Ability Enhancement Courses (Mandatory), PCCL-Professional Core Course lab,
L-Lecture, P-Practical, T/SDA-Tutorial / Skill Development Activities(Hours are for Interaction between faculty and students)

Professional Elective 1		**Professional Elective 2**	
Course Code under 22MEM24X	**Course title**	**Course Code under 22MEM25X**	**Course title**
22MEM/MPM/MPT/ MTE/MSE221	Operations Management	22MEM/MPM/MIA/ MPX/MPT/MTE/MSE	Agile Manufacturing
22MEM/MPM232	Advanced Fluid Power Systems	22MEM242	Product Life Cycle Management
22MEM233	Knowledge Management	22MEM243	Cross Cultural management
22MEM234	Strategic management	22MEM244	Simulation Modelling & Analysis
22MEM 235	Technology management	22MEM245	Robust Design

Note:

1 Mini Project with Seminar: This may be hands-on practice**,** survey report, data collection and analysis, coding, mobile app development, field visit and report preparation, modelling of system, simulation, analysing and authenticating, case studies, etc.
CIE marks shall be awarded by a committee comprising of HoD as Chairman, Guide/co-guide, if any, and a senior faculty of the department. Students can present the seminar based on the completed mini-project. Participation in the seminar by all postgraduate students of the program shall be mandatory.
The CIE marks awarded for Mini-Project work and Seminar, shall be based on the evaluation of Mini Project work and Report, Presentation skill and performance in Question and Answer session in the ratio 50:25:25. Mini-Project with Seminar shall be considered as a head of passing and shall be considered for vertical progression as well as for the award of degree. Those, who do not take-up/complete the Mini Project and Seminar shall be declared as fail in that course and have to complete the same during the subsequent semester. There is no SEE for this course.

2. Internship: All the students shall have to undergo a mandatory internship of **06 weeks** during the vacation of II and III semesters. A University examination shall be conducted during III semester and the prescribed internship credit shall be counted in the same semester. The internship shall be considered as a head of passing and shall be consideredfor vertical progression as well asfor the award of degree. Those, who do not take-up/complete the internship shall be declared as fail in the internship course and have to complete the same during the subsequent University examination after satisfying the internship requirements.

emester-II

Semester-II

PRODUCT PLANNING AND MARKETING			
Course Code	**22MEM21**	CIE Marks	**50**
Teaching Hours/Week (L:P:SDA)	**3:0:0**	SEE Marks	**50**
Total Hours of Pedagogy	**40**	Total Marks	**100**
Credits	**03**	Exam Hours	**03**

Course Learning objectives: Identify major tasks facing today's product mangers: analyzing the market, developing objectives and strategies for the product or service in question, and making decisions about price, advertising, promotion, channels of distribution and service.

Module-1

Product strategy and planning product - market evolution, successful product development process, characteristics of successful product development **New Product Strategy:** Strategic response, reactive verses proactive strategies, marketing verses Research and Development, Comprehensive strategy. **08HRs**

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-2

Proactive new product development process - Sequential decision process, reasons for product failure and strategies to avoid failures, cost, time, risk and expected benefit in new product development. **. .. . 08HRs**

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-3

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Opportunity Identification - Market definition and entry strategy, desirable characteristics of markets, market profile analysis, methods for market definition, target group selection through market segmentation, market selection, idea generation – idea sources, method of generating ideas ,idea management. **08HRs**

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-4

Consumer measurement and Perceptual mapping – Consumer measurement process**,** research methods ,sampling, measuring instruments, attitude scaling, Consumers perceptions of new and existing products: Perceptual positioning, Perceptual maps, Analytic Methods used to produce Perceptual maps, Managerial review of maps. **Product positioning – Preference analysis and benefits, segmentation-** Role of preference in product positioning, proactive product positioning, Analytic preference models and estimation methods, Benefit segmentation, managerial use of preference models. **08HRs**

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-5

Forecasting sales potential – Role of purchase potential in design process, models of purchase potential, models of sales formation, managerial use of purchase models. **Launching the products and Strategy for Testing new products** – Planning and tracking launch of durable and industrial products, advertising testing and product qualitytesting. **08HRs**

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Assessment Details (both CIE and SEE)

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Continuous Internal Evaluation:

1. Three Unit Tests each of **20 Marks**
2. Two assignments each of **20 Marks** or **one Skill Development Activity of 40 marks** to attain the COs and POs

The sum of three tests, two assignments/skill Development Activities, will be **scaled down to 50 marks**

CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination:

1. The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
2. The question paper will have ten full questions carrying equal marks.
3. Each full question is for 20 marks. There will be two full questions (with a maximum of four sub-questions) from each module.
4. Each full question will have a sub-question covering all the topics under a module.
5. The students will have to answer five full questions, selecting one full question from each module

Suggested Learning Resources:

(1) Glen L. Urban. .John R. Hauser, "**Design and Marketing of New products"** A Prentice Hall, Englewood cliffs, New Jersey, 1993

(2) William L. Moore &Edgar, "**Product Planning and Management**", A.Pessemier

Web links and Video Lectures (e-Resources):

- http://.ac.in/courses.php?disciplineID=111
- http://academicearth.org/
- http://www.bookstreet.in.
- VTU e-Shikshana Program
- VTU EDUSAT Program

Skill Development Activities Suggested

- Quizzes
- Assignments
- Seminars

Course outcome (Course Skill Set)

At the end of the course the student will be able to :

Sl. No.	Description	Blooms Level
CO1	Understand the concept of Product strategy and planning product.	
CO2	Analyse the Proactive new product development process	
CO3	Understand the concept ofOpportunity Identification.	
CO4	Understand the concept of Product positioning – Preference analysis and benefits, segmentation	
CO5	Understand the concept of Launching the products and Strategy for Testing new	

Program Outcome of this course

Programme Outcome:

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

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

PO3 - Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program

PO4 - Understand contemporary issues in management and develop relationship between engineering and management practices

PO5 – develop the understanding of various quantitative techniques and approaches to solve management problems

PO6 – ability to understand the techniques of marketing management and marketing research

PO7 –familiarization with roles and responsibilities of a manager in engineering practice

Mapping of COS and POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	2	3	2	2	2	3	3
CO2	2	2	3	3	3	2	3
CO3	2	1	2	3	2	3	3
CO4	1	1	1	2	3	3	2
CO5	2	2	3	2	2	2	2

HUMAN RESOURCES MANAGEMENT			
Course Code	**22MEM22**	CIE Marks	**50**
Teaching Hours/Week (L:P:SDA)	**2:0:0**	SEE Marks	**50**
Total Hours of Pedagogy	**40**	Total Marks	**100**
Credits	**04**	Exam Hours	**03**

Course Learning objectives:

- To understand the HRM concepts and theory.
- To obtain an overview of various HRM functions and practices.
- To gain an insight into the various statutory provisions

Module-1

HRM in perspective, competitive challenges, uses of HR information, Demographics and employee concerns, social issues, diversity in. HRM, **Relationship of Job Requirements and HRM functions**, Job Analysis, Job Description, Job Design, Designing work for groups, flexible work schedules, Industrial engineering and ergonomic consideration, HR Planning, Effective HRP, Forecasting and balancing supply and demand of HR, recruiting from inside and outside, Recruiting protected class, Recruiting older people. 8 Hrs

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-2

Selection, Matching people and job, sources of information about job candidate, The US Employee Polygraph Protection Act, graphology, Medical examination, Drug test, Interview methods Guidelines for interviewers, appropriate and inappropriate interview questions, selection decision. 8Hrs

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-3

Developing effectiveness in HR, Investment in Training, System approach, Conducting the .needs assessment, designing training programs, trainee readiness and motivation, principles of learning, characteristics of trainees, training methods for non-managerial employees, OJT, Technology for training, training methods for MDP, Evaluating, benchmarking HR training. 8Hrs

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-4

Career development and Appraisal, identifying career opportunity and requirements, gauging employee potential, career development initiative, Mentor check list, career development for women and minorities, dual career couples, personal career development, Behavioural methods of appraisal, balanced score card, personal score card appraisal interviews; performance diagnosis. 8Hrs

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-5

International HRM, Managing across borders, International staffing, Skills of a global manager, content of training program. Non-verbal communications, developing local resources, compensation of host country employees, managers and expatriate managers. Case studies on appraisal system, developing a training session, evaluating a given training program. Preparation of structured and unstructured interviews. 8Hrs

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 50% of the maximum marks. Minimum passing marks in SEE is 40% of the maximum marks of SEE. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 50% (50 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

3. Three Unit Tests each of **20 Marks**
4. Two assignments each of **20 Marks** or **one Skill Development Activity of 40 marks** to attain the COs and POs

The sum of three tests, two assignments/skill Development Activities, will be **scaled down to 50 marks**

CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination:

6. The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
7. The question paper will have ten full questions carrying equal marks.
8. Each full question is for 20 marks. There will be two full questions (with a maximum of four sub-questions) from each module.
9. Each full question will have a sub-question covering all the topics under a module.
10. The students will have to answer five full questions, selecting one full question from each module

Suggested Learning Resources:

Books

(1)Managing Human Resources - Wayne F Cascio - Tata McGraw Hill, New Delhi
(2)Managing Human Resources - George Bohlander and Scot Snell - Thompson South western

Reference Books

(1)Human Resource Management - BiswajeetPattanayak - Prentice Hall of India Pvt. Ltd.
(2)Human Resource Management - K. Ashwathappa,
(3)Personnel Management - C.B.Memoria - Himalaya Publishing.

Skill Development Activities Suggested

- Quizzes
- Assignments
- Seminars

Course outcome (Course Skill Set)

At the end of the course the student will be able to :

CO1: Synthesize information regarding the effectiveness of recruiting methods & selection procedures.

CO2: Identify the various training methods and design a training program.

CO3: Design a job description and job specification for various levels of employees.

CO4: List out the regulations governing employee benefit practices.

CO5: Identify the required skill set for a global manger.

Program Outcome of this course

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

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

PO3 - Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program.

PO4 - Understand contemporary issues in management and develop relationship between engineering and management practices.

PO5 – develop the understanding of various quantitative techniques and approaches to solve management problems.

PO6 – ability to understand the techniques of marketing management and marketing research.

PO7 –familiarization with roles and responsibilities of a manager in engineering practice.

Mapping of COS and Pos

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	1	1	2	2	2	2	2
CO2	2	2	2	2	2	2	3
CO3	3	3	1	3	2	3	1
CO4	3	3	1	3	2	3	1
CO5	2	3	2	1	3	2	1

Note : High - 1, Medium – 2, and Low – 3

OPERATIONS MANAGEMENT			
Course Code	**22MEM/MPM/MPT/MTE/MSE231**	CIE Marks	**50**
Teaching Hours/Week (L:P:SDA)	**2:0:0**	SEE Marks	**50**
Total Hours of Pedagogy	**40**	Total Marks	**100**
Credits	**03**	Exam Hours	**03**

Course Learning objectives:

- To get acquainted with the basic aspects of Production Management.
- The expose the students to various aspects of planning, organising and controlling operations Management.
- To understand different operational issues in manufacturing and services organisations.
- To understand different problem-solving methodologies and Production Management techniques.

Module-1

Operations Planning Concepts: Introduction, Operations Functions in Organizations, Historical development, Framework for managing operations, The trend: Information and Non-manufacturing systems, Operations management, Factors affecting productivity, International dimensions of productivity, The environment of operations, Production systems decisions- a look ahead. Introduction to ERP. 8 Hrs

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-2

Operations Decision Making : Introduction, Management as a science, Characteristics of decisions, Framework for decision making, Decision methodology, Decision Tree Problems, Economic models- Break Analysis in operations, P/V ratio, Statistical models.

System Design and Capacity: Introduction, Manufacturing and service systems, Design and systems capacity, Capacity planning.

8Hrs

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-3

Forecasting Demand: Forecasting objectives and uses, Forecasting variables, Opinion and Judgmental methods, Time series methods, Moving Average methods, Exponential smoothing, Trend adjusted Exponential Smoothing, Regression and correlation methods.

8Hrs

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-4

Aggregate Planning and Master Scheduling: Introduction- planning and scheduling, Objectives of aggregate planning, Three Pure Strategies, Aggregate planning methods, Master scheduling objectives, Master scheduling methods.

Material and Capacity Requirements Planning: Overview: MRP and CRP, MRP: Underlying concepts, System parameters, MRP logic, System refinements, Capacity management, CRP activities. 8Hrs

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-5

Scheduling and Controlling Production Activities: Introduction, PAC, Objectives and Data requirements, Loading – Finite and Infinite Scheduling methodology, priority sequencing, capacity control

Single Machine Scheduling: Concept, measures of performance, SPT rule, Weighted SPT rule, EDD rule.

8Hrs

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 50% of the maximum marks. Minimum passing marks in SEE is 40% of the maximum marks of SEE. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 50% (50 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

5. Three Unit Tests each of **20 Marks**
6. Two assignments each of **20 Marks** or **one Skill Development Activity of 40 marks** to attain the COs and POs

The sum of three tests, two assignments/skill Development Activities, will be **scaled down to 50 marks**

CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination:

11. The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
12. The question paper will have ten full questions carrying equal marks.
13. Each full question is for 20 marks. There will be two full questions (with a maximum of four sub-questions) from each module.
14. Each full question will have a sub-question covering all the topics under a module.
15. The students will have to answer five full questions, selecting one full question from each module

Suggested Learning Resources:

Books

(1) Monks, J.G., Operations Management, McGraw-Hill International Editions, 1987
(2) Productions & operations management by Adam & Ebert.
(3)Pannerselvam. R., Production and Operations Management, PHI.
(4) Chase Jacobs Aquilano, Operations Management for Competitive

Reference Books

(1)Buffa, Modern Production/Operations Management, Wiely Eastern L.
(2) Chary, S.N., Production and Operations Management, Tata- McGraw Hill.
(3) Operations management by James Dilworth.
(4) Lee J Karjewski and Larry P Ritzman, Operations Management – strategy and Analysis, 6thEdn, Pearson Education Asia.

Skill Development Activities Suggested

- Quizzes
- Assignments
- Seminars

Course outcome (Course Skill Set)

At the end of the course the student will be able to :

CO1: Explain the concept and scope of operations management in a business context.
CO2: Recognize the role of Operations management among various business functions and its role in the organizations" strategic planning and gaining competitive advantage.
CO3: Analyze the appropriateness and applicability of a range of operations management systems/models in decision making.
CO4: Assess a range of strategies for improving the efficiency and effectiveness of organizational operations.
CO5: Evaluate a selection of frameworks used in the design and delivery of operations.

Program Outcome of this course

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

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

PO3 - Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program.

PO4 - Understand contemporary issues in management and develop relationship between engineering and management practices.

PO5 – develop the understanding of various quantitative techniques and approaches to solve management problems.

PO6 – ability to understand the techniques of marketing management and marketing research.

PO7 –familiarization with roles and responsibilities of a manager in engineering practice.

Mapping of COS and POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	2	1	2	2	3	3	2
CO2	1	1	2	2	3	2	2
CO3	1	2	2	2	2	3	3
CO4	2	2	3	3	2	2	3
CO5	2	2	3	3	3	3	3

Note : High - 1, Medium – 2, and Low – 3

ADVANCED FLUID POWER SYSTEMS

Course Code	**22MEM/MPM232**	CIE Marks	**50**
Teaching Hours/Week (L:P:SDA)	**3:0:0**	SEE Marks	**50**
Total Hours of Pedagogy	**40**	Total Marks	**100**
Credits	**03**	Exam Hours	**03**

Course Learning objectives:

To analyze and discuss fluid power systems in terms of performance, power consumption, controllability and dynamic properties. be able to model and implement dynamic analyses of fluid power systems. be able to create and apply calculation basis for component selection and system design. be able to explain component functions and component characteristics in
the field of fluid power. be able to consider environmental aspects and ergonomically suitable solutions.

Module-1

Introduction: Pascal Law, Advantages of Fluid Power, Applications of Fluid Power, Components of a FluidPower. **Hydraulic Power Unit:** Introduction, Pumping Theory, Pump Classification, Gear Pumps, (Vane Pumps- simple, balanced & pressure compensated vane pump, Vane design) Piston Pumps- Radial, Axial (Bent axis & Swash plate), Pump Performance, Pump Noise, Ripple in pumps. **Hydraulic Actuators:** Linear actuator- cylinders, Mechanics of Hydraulic cylinder loading, limited rotation hydraulic actuator, cylinder cushioning, Gear, Vane & Piston motor, Motor performance, Hydrostatictransmission**.. 08HRs**

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-2

Power Controlling Elements – Valves :

i) Directional Control Valves – Classification, 2/2, 3/2,4/2 & 4/3 ways Dcv's, Different Centre configurations in 4/3 way valves, actuation of DCV's, Indirect actuation, Valve Lap – Lap during Stationary and during switching.

ii) Pressure Control Valves: Classification, opening & Closing Pressure difference, Cracking Pressure, Pressure Relief Valve – Simple & Compound type, Pressure reducing valve, sequence, unloading &Counter balance valve, Pressureswitches

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-3

Hydraulic Circuit Design & Analysis: Control of Single & double acting cylinder, Regeneration circuit, cylinder sequencing & Synchronizing circuit. Speed control of cylinder & Motors, Analysis of Hydraulic system with frictional losses, Accumulators &accumulator circuits. **Pneumatic System:** Introduction, – Generation of compressed air, air receiver, servicing FRL unit, Air filter, pressure regulation, lubricator, Pneumatic cylinder & air motor – different types of cylinder, cushion assembly. Cylinder performance. **Pneumatic Valve:** Directional control valves, impulse valve, Quick exhaust valve, shuttle valve, Twin pressure valve, Time delay valve. . **08HRs**

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-4

Pneumatic Circuit & Logic Circuits:- Control of single and double acting cylinder, impulse operation, speed control, sequencing, Pneumatic Vacuum system AND,OR, NOT, NAND, NOR, YES Function, Logic circuits design using shuttle valve & twin pressure

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-5

Electrical Control in Fluid Power: Contactors, &Switches, Relays, Limit switch, Electro hydraulic & Electro Pneumatic Circuits, Simple Cylinder reciprocation, interlocking using relays, Proximity switches, application of proximity switches, Time dependent will dependent and travel dependent circuits**. . . 08HRs**

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 50% of the maximum marks. Minimum passing marks in SEE is 40% of the maximum marks of SEE. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 50% (50 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

7. Three Unit Tests each of **20 Marks**
8. Two assignments each of **20 Marks** or **one Skill Development Activity of 40 marks** to attain the COs and POs

The sum of three tests, two assignments/skill Development Activities, will be **scaled down to 50 marks**

CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination:

16. The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
17. The question paper will have ten full questions carrying equal marks.
18. Each full question is for 20 marks. There will be two full questions (with a maximum of four sub-questions) from each module.
19. Each full question will have a sub-question covering all the topics under a module.
20. The students will have to answer five full questions, selecting one full question from each module

Suggested Learning Resources:

Textbooks

1)Fluid Power with Application - Anthony Esposito - Peason Education - 5th edition.

(2)Oil hydraulics -Principles & maintenance - S.R. Majumdar - Tata M C Graw Hill

Reference Books

(1)Components & Application - Bosch Rexroth didactic - Hydraulics Trainer - vol 1. Publication

(2)Pneumatic System, Principles and Maintenance - S.R. Majumdar - Tata M C GrawHillPublication.

(3)Pneumatics: Theory and Applications - Bosch Rexroth didactic - Publication

(4) Electro Pneumatics - Bosch Rexroth didactic -Vol. 2, Publication

Web links and Video Lectures (e-Resources):

- http://.ac.in/courses.php?disciplineID=111
- http://academicearth.org/
- http://www.bookstreet.in.
- VTU e-Shikshana Program
- VTU EDUSAT Program

Skill Development Activities Suggested

- Quizzes
- Assignments
- Seminars

Course outcome (Course Skill Set)

At the end of the course the student will be able to :

Sl. No.	Description	Blooms Level
CO1	Understand the basic concepts of fluid power and applications like pump and actuators.	
CO2	Obtain the knowledge of appropriate selection of control for specific application.	
CO3	Design hydraulic and pneumatic circuital system.	
CO4	Design the pneumatic and logic circuits based on mathematical technique.	
CO5	Understand the application of electric elements in controlling the fluid power.	

Program Outcome of this course
Programme Outcome:

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

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

PO3 - Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program

PO4 - Understand contemporary issues in management and develop relationship between engineering and management practices

PO5 – develop the understanding of various quantitative techniques and approaches to solve management problems

PO6 – ability to understand the techniques of marketing management and marketing research

PO7 –familiarization with roles and responsibilities of a manager in engineering practice

Mapping of COS and POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	**2**	**2**	**2**	**3**	**3**	**3**	**3**
CO2	**1**	**2**	**2**	**2**	**3**	**2**	**3**
CO3	**2**	**3**	**2**	**3**	**2**	**3**	**3**
CO4	**1**	**2**	**1**	**2**	**3**	**3**	**2**
CO5	**2**	**3**	**3**	**2**	**2**	**3**	**2**

KNOWLEDGE MANAGEMENT			
Course Code	**22MEM233**	CIE Marks	**50**
Teaching Hours/Week (L:P:SDA)	**2:0:0**	SEE Marks	**50**
Total Hours of Pedagogy	**40**	Total Marks	**100**
Credits	**03**	Exam Hours	**03**

Course Learning objectives:

The objective of this course is to understand the current theories, practices, tools and techniques in knowledge management to deal with the challenges with the organization and management of knowledge.

Module-1

Knowledge Management: -KM Myths–KM Life Cycle– Understanding Knowledge–Knowledge, intelligence – Experience – Common Sense – Cognition and KM – Types of Knowledge – Expert Knowledge – Human Thinking and Learning, Knowledge society-from data to information to knowledge- Drivers of knowledge management Intellectual capital-KM and learning organizations- case studies. Strategic alignment- creating awareness-articulation- Evaluation and strategic alignment Infrastructural development and deployment- Leadership, measurement and refinement- Role of CKO 8 Hrs

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-2

Knowledge Management System Life Cycle: - Challenges in Building KM Systems–Conventional Versus KM System Life Cycle (KMSLS), Knowledge Creation and Knowledge Architecture – Nonaka's Model of Knowledge Creation and Transformation. Knowledge Architecture Analyzing business environment-knowledge audit and analysis – designing KM team – creating KM system blue print- implementation- capture –store and sharing, Technology components –Internet, Intranet and Groupware solutions- tools for collaborative intelligence package choices, implementing security. 8Hrs

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-3

Capturing Knowledge: Evaluating the Expert–Developing a Relationship with Experts–Fuzzy Reasoning and the Quality of Knowledge – Knowledge Capturing Techniques, Brain Storming – Protocol - Analysis – Consensus Decision Making – Repertory Grid- Concept Mapping –Definition – Computer based user machine system – Integrated system – Need for a database – Utilization of models – Evolution – Subsystems – Organizational subsystems – Activities subsystems. 8Hrs

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-4

Knowledge Codification: - Modes of Knowledge Conversion– Codification Tools and Procedures – Knowledge, Developer's Skill Sets – System Testing and Deployment – Knowledge Testing– Approaches to Logical Testing, User Acceptance Testing – KM System Deployment Issues – User Training – Post implementation, Operating elements – Physical components – Processing functions – Outputs – MIS support for decision making – Structured programmable decisions – Unstructured non-programmable decisions – MIS structure based on management activity and Organizational functions– Synthesis of MIS structure. 8Hrs

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-5

Knowledge Transfer And Sharing: -Transfer Methods–Role of the Internet–Knowledge Transfer in e-world, KM System Tools – Neural Network– Association Rules – Classification Trees – Data mining and Business Intelligence – Decision Making Architecture – Data Management – Knowledge Management Protocols – Managing Knowledge Workers. Data Presentation – Communication Network – Distributed systems – Logical data concepts – Physical storage devices – File organizations – Database organization – Transaction processing. 8Hrs

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 50% of the maximum marks. Minimum passing marks in SEE is 40% of the maximum marks of SEE. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 50% (50 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

9. Three Unit Tests each of **20 Marks**
10. Two assignments each of **20 Marks** or **one Skill Development Activity of 40 marks** to attain the COs and POs

The sum of three tests, two assignments/skill Development Activities, will be **scaled down to 50 marks**

CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination:

21. The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
22. The question paper will have ten full questions carrying equal marks.
23. Each full question is for 20 marks. There will be two full questions (with a maximum of four sub-questions) from each module.
24. Each full question will have a sub-question covering all the topics under a module.
25. The students will have to answer five full questions, selecting one full question from each module

Suggested Learning Resources:

Books

(1) Knowledge Management - Elias. M. Award & Hassan M. Ghaziri – Pearson Education-2003.
(2) The essential guide to knowledge management, -AmritTiwana,' Pearson education-2001
(3)Knowledge Management – Sudhir Warier, Vikas Publishing House, ISBN:81-259-1363-7. 1st Edition

Reference Books

(1) Hand book on Knowledge Management – C W Holsapple, Springer, 2003 Porter M Competitive Advantage, Free Press,1985
(2) Knowledge Engineering and Management - Gus Schreiber, Hans Akkermans, AnjoAnjewierden, Robert de Hoog, Nigel, Shadbolt, Walter Van de Velde and Bob Wielinga, Universities Press, 2001.

Skill Development Activities Suggested

- Quizzes
- Assignments
- Seminars

Course outcome (Course Skill Set)

At the end of the course the student will be able to :

CO1: Apply complex theories and practice of knowledge and intellectual capital management.

CO2: Apply theories to a wide range of scenarios.

CO3: Formulate action plans for knowledge intensive organisations;

CO4: Distinguish aspects of industrial era management that may be inappropriate for knowledge intensive organisations and provide alternatives;

CO5: Formulate a framework for thinking about knowledge intensive organisations;.

Program Outcome of this course

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

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

PO3 - Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program.

PO4 - Understand contemporary issues in management and develop relationship between engineering and management practices.

PO5 – develop the understanding of various quantitative techniques and approaches to solve management problems.

PO6 – ability to understand the techniques of marketing management and marketing research.

PO7 –familiarization with roles and responsibilities of a manager in engineering practice.

Mapping of COS and POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	1	2	3	3	3	3	2
CO2	1	2	2	2	2	2	3
CO3	3	3	1	2	2	2	3
CO4	2	2	2	3	2	3	3
CO5	2	3	3	3	3	3	2

Note : High - 1, Medium – 2, and Low – 3

STRATEGIC MANAGEMENT			
Course Code	**22MEM234**	CIE Marks	**50**
Teaching Hours/Week (L:P:SDA)	**3:0:0**	SEE Marks	**50**
Total Hours of Pedagogy	**40**	Total Marks	**100**
Credits	**03**	Exam Hours	**03**

Course Learning objectives: To provide a Strategic orientation in conduct of the business.

Module-1

Introduction - Concepts in Strategic Management, Strategic Management Process, developing a strategic vision, Mission, Objectives, Policies – Factors that shape a company's strategy, Environmental Scanning: Industry and Competitive Analysis – Methods. Evaluating company resources and competitive capabilities – SWOT Analysis – Value Chain Analysis and Competitive advantage.

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-2

Tools and Techniques for Strategic Analysis - Porter's Five Force Model, BCG Matrix, GE Model, TOWS Matrix, IE Matrix, The Grand Strategy Matrix. Market Life Cycle Model - and Organizational Learning, Impact Matrix and the Experience Curve, Generic Strategies- Strategy Formulation - Types of Strategies – offensive strategy, defensive strategy, Exit and entry barriers - Tailoring strategy to fit specific industry and company situations.

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-3

Strategy Implementation: Strategy and Structure, Strategy and Leadership, Strategy and culture connection - Operationalizing and institutionalizing strategy - Strategies for competing in Global markets and internet economy - Organizational Values and their impact on Strategy – Resource Allocation as a vital part of strategy – Planning systems for implementation.

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-4

Turnaround and Diversification Strategies: Turnaround strategy - Management of Strategic Change, strategies for Mergers, Acquisitions, Takeovers and Joint Ventures, Alliances and cooperative - Diversification Strategy: firms diversify, different types of diversification strategies, the concept of core competence, strategies and competitive advantage in diversified companies and its evaluation. International Strategies.

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-5

Strategy Evaluation and control – Establishing strategic controls for Measuring performance – appropriate measures- Role of the strategist – using qualitative and quantitative benchmarking to evaluate performance - strategic information systems – problems in measuring performance – Guidelines for proper control- Strategic surveillance -strategic audit - Strategy and Corporate Evaluation and feedback in the Indian and international context.

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 50% of the maximum marks. Minimum passing marks in SEE is 40% of the maximum marks of SEE. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 50% (50 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

11. Three Unit Tests each of **20 Marks**
12. Two assignments each of **20 Marks** or **one Skill Development Activity of 40 marks** to attain the COs and POs

The sum of three tests, two assignments/skill Development Activities, will be **scaled down to 50 marks**

CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination:

26. The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
27. The question paper will have ten full questions carrying equal marks.
28. Each full question is for 20 marks. There will be two full questions (with a maximum of four sub-questions) from each module.
29. Each full question will have a sub-question covering all the topics under a module.
30. The students will have to answer five full questions, selecting one full question from each module

Suggested Learning Resources:

Textbooks

- Hitt & Ireland el al., Strategic Management: A South Asian Perspective, Cengage Learning, 9e, 2013.
- Gregory Dess and G.T. Lumpkin: Strategic Management – Creating Competitive Advantage, TMH, 2009.
- Mason A.Carpenter, Wm Gerard Sanders, Prashant Salwan: Strategic Management A Dynamic Perspective, Pearson, 2e, 2017
- V.S.P. Rao, V. Hari Krishna; Strategic Management, 1e, Excel Books, 2012

Web links and Video Lectures (e-Resources):

- http://.ac.in/courses.php?disciplineID=111
- http://academicearth.org/
- http://www.bookstreet.in.
- VTU e-Shikshana Program
- VTU EDUSAT Program

Skill Development Activities Suggested

- Quizzes
- Assignments
- Seminars

Course outcome (Course Skill Set)

At the end of the course the student will be able to :

Sl. No.	Description	Blooms Level
CO1	Strategic management concepts	
CO2	Tools and Techniques for Strategic analysis	
CO3	Strategies for competing in globalised markets	
CO4	Turnaround and Diversification Strategies	
CO5	Strategy Evaluation and control	

Program Outcome of this course
Programme Outcome:

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

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

PO3 - Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program

PO4 - Understand contemporary issues in management and develop relationship between engineering and management practices

PO5 – develop the understanding of various quantitative techniques and approaches to solve management problems

PO6 – ability to understand the techniques of marketing management and marketing research

PO7 –familiarization with roles and responsibilities of a manager in engineering practice

Mapping of COS and POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	2	3	2	3	3	3
CO2	3	3	2	2	3	2	3
CO3	2	3	3	3	3	3	3
CO4	2	2	1	3	3	3	2
CO5	2	3	3	2	2	3	2

TECHNOLOGY MANAGEMENT			
Course Code	**22MEM235**	CIE Marks	**50**
Teaching Hours/Week (L:P:SDA)	**2:0:0**	SEE Marks	**50**
Total Hours of Pedagogy	**40**	Total Marks	**100**
Credits	**03**	Exam Hours	**03**

Course Learning objectives: To understand the importance of technology in conduct of business, with emphasis on strategies R&D, transfer,etc.

Module-1

The Process of Technological Innovation: The need for a Conceptual Approach, Technological Innovation as a Conversion Process, Factors Contributing to Successful Technological Innovation, Characteristics of Innovative firms, Dynamics of diffusion, A model of Innovation Adoption, Factors that drive the process of diffusion. 8 Hrs

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-2

Technology Strategy: Collaborative Arrangements in domains of Technology Strategy, Risks of Collaborative Activity, Evolution of Technology Appropriation principles, External Sourcing of Technological Capability, Productivity of in-house R& D, influence of Environmental Trends. 8Hrs

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-3

Research and Development: Programme Planning and Control, Portfolio Planning, Project Planning and Control, Project Termination, Resource Allocation and Management.
New Product Development: New Product Development as a Competitive Strategy, Market Research For Developing New Products, Commercialization of Research Outcomes, Industrial Design, Product Architecture and Design For Manufacture, Developing Indigenous Substitute For Raw Materials. 8Hrs

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-4

Technological Forecasting for Decision Making: Technological Forecasting, Forecasting System Inputs and Outputs, Classification of Forecasting Techniques, Organization for Technological Forecasting.
Transfer of Technology: Modes of technology transfer, Price of technology transfer, Negotiation for price of MOT. 8Hrs

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-5

Technological Intelligence: Levels of Technological Intelligence, External Vs Internal Technological Intelligence, Mapping Technological Environment, Mechanism for Data Collection, Analytic Tools, Managing Environmental Analysis in organizations, Contemporary challenges in mapping the technology environment. 8Hrs

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 50% of the maximum marks. Minimum passing marks in SEE is 40% of the maximum marks of SEE. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 50% (50 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

13. Three Unit Tests each of **20 Marks**
14. Two assignments each of **20 Marks** or **one Skill Development Activity of 40 marks** to attain the COs and POs

The sum of three tests, two assignments/skill Development Activities, will be **scaled down to 50 marks**

CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination:

31. The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
32. The question paper will have ten full questions carrying equal marks.
33. Each full question is for 20 marks. There will be two full questions (with a maximum of four sub-questions) from each module.
34. Each full question will have a sub-question covering all the topics under a module.
35. The students will have to answer five full questions, selecting one full question from each module

Suggested Learning Resources:

Books

(1)Tarek Khalil, Management of Technology -The Key to Competitiveness and Wealth, Tata McGraw Hill, Boston, 2015.
(2) V. K. Narayanan, Managing Technology and Innovation for Competitive Advantage, Pearson Education, 2015.
(3) Norma Harison and Samson, Technology management – Text and cases, TMH, 2015.

Reference Books

(1) Shane, Technology Strategy for Managers and Entrepreneurs, Pearson, 2015.
(2) Khandwala, Corporate Creativity, TMH, 2015.
(3) Lucy C. Morse, Daniel L. Babcock: Managing Engineering and Technology,6e, Pearson.

Skill Development Activities Suggested

- Quizzes
- Assignments
- Seminars

Course outcome (Course Skill Set)

At the end of the course the student will be able to :

CO1	Importance of Technological Innovation.	
CO2	Importance of Research and development in technology management.	
CO3	Forecasting of Technology	
CO4	Understand the nature and extent of technological change and innovation.	
CO5	Critically assess and explain key current issues in our understanding of innovation as a field of study.	

Program Outcome of this course

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

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

PO3 - Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program.

PO4 - Understand contemporary issues in management and develop relationship between engineering and management practices.

PO5 – develop the understanding of various quantitative techniques and approaches to solve management problems.

PO6 – ability to understand the techniques of marketing management and marketing research.

PO7 –familiarization with roles and responsibilities of a manager in engineering practice.

Mapping of COS and POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	1	2	12	3	2	2	2
CO2	1	1	2	2	2	2	3
CO3	2	3	1	2	2	2	3
CO4	3	2	2	3	2	3	3
CO5	2	2	3	3	3	3	2

Note : High - 1, Medium – 2, and Low – 3

AGILE MANUFACTURING			
Course Code	**22MEM/MPM/MIA/MPY/MPT/MTE/MSE241**	CIE Marks	**50**
Teaching Hours/Week (L:P:SDA)	**3:0:0**	SEE Marks	**50**
Total Hours of Pedagogy	**40**	Total Marks	**100**
Credits	**03**	Exam Hours	**03**

Course Learning objectives: An intuitive and agile manufacturing plan *focuses on creating and executing an idea while gauging whether it is right for the business*.

Module-1	
Introduction - What is agile Manufacturing? - Competitive environment of the future the business case for agile manufacturing conceptual frame work foragile manufacturing. **08HRs**	
Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-2	
Four Core Concepts: Strategy driven approach - integrating organization, people technology Interdisciplinary design methodology. **08HRs**	
Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-3	
. Agile Manufacturing and Change Management: The change implications. Post failures in advanced manufacturing, changes on the way, traditional management accounting, paradigm, investment appraisal, product costing - performance, measurement and control systems, Traditional, control technological and design paradigms traditional problems in workplace organizational issues - role of technology. **08HRs**	
Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-4	
Agile Manufacturing Enterprise Design: Agile manufacturing - enterprise design. System concepts as the basic manufacturing theory - joint technical & organizational design and model for the design of agile manufacturing enterprise, enterprise design process insights into design processes, what is interdisciplinary design, Main issues - simple design example. **08HRs**	
Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-5	
Skill & Knowledge Enhancing Technologies for Agile Manufacturing: Skill and Knowledge enhancing Technologies - scheduling - technology design strategic-Design Concepts. Design and Skill of Knowledge enhancing Technologies for machine tool systems – Historical overview, Lessons, problems and Future development. **. 08HRs**	
Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Assessment Details (both CIE and SEE)

The weight age of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 50% of the maximum marks. Minimum passing marks in SEE is 40% of the maximum marks of SEE. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 50% (50 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

15. Three Unit Tests each of **20 Marks**
16. Two assignments each of **20 Marks** or **one Skill Development Activity of 40 marks** to attain the COs and POs

The sum of three tests, two assignments/skill Development Activities, will be **scaled down to 50 marks**

CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination:

36. The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
37. The question paper will have ten full questions carrying equal marks.
38. Each full question is for 20 marks. There will be two full questions (with a maximum of four sub-questions) from each module.
39. Each full question will have a sub-question covering all the topics under a module.
40. The students will have to answer five full questions, selecting one full question from each module

Suggested Learning Resources:

(1) 1. Agile manufacturing - Forging new Frontiers - Paul T. Kidd - Addison Wesley Publication1994.

(2) 2. Agile Manufacturing – Proceedings of International Conference - Dr. M.P Chowdiah (Editor)–Tata McGraw Hill Publications - 1996.

(3) 3. on agile manufacturing - Tata McGraw Hill Publications -1996

Web links and Video Lectures (e-Resources):

- http://.ac.in/courses.php?disciplineID=111
- http://academicearth.org/
- http://www.bookstreet.in.
- VTU e-Shikshana Program
- VTU EDUSAT Program

Skill Development Activities Suggested

- Quizzes
- Assignments
- Seminars

Course outcome (Course Skill Set)

At the end of the course the student will be able to :

Sl. No.	Description	Blooms Level
CO1	Understand the agile manufacturing and conceptual framework.	
CO2	Analyse the four core concept of agile manufacturing.	
CO3	Study the implication of advanced manufacturing system.	
CO4	Understand and design the agile manufacturing enterprises.	
CO5	Design skill and knowledge enhancing technology for agile manufacturing.	

Program Outcome of this course

Programme Outcome:

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

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

PO3 - Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program

PO4 - Understand contemporary issues in management and develop relationship between engineering and management practices

PO5 – develop the understanding of various quantitative techniques and approaches to solve management problems

PO6 – ability to understand the techniques of marketing management and marketing research

PO7 –familiarization with roles and responsibilities of a manager in engineering practice

Mapping of COS and POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	2	2	2	3	3	3	3
CO2	2	3	2	3	2	2	2
CO3	3	2	2	3	2	3	2
CO4	2	1	1	2	3	3	2
CO5	2	2	3	2	2	3	2

PRODUCT LIFE CYCLE MANAGEMENT			
Course Code	**22MEM242**	CIE Marks	**50**
Teaching Hours/Week (L:P:SDA)	**2:0:0**	SEE Marks	**50**
Total Hours of Pedagogy	**40**	Total Marks	**100**
Credits	**03**	Exam Hours	**03**

Course Learning objectives:

- Familiarize with various strategies of PLM
- Understand the concept of product design and simulation.
- Develop New product development, product structure and supporting systems
- Interpret the technology forecasting and product innovation and development in business processes.
- Understand product building and Product Configuration.

Module-1

Product life cycle management – Need for PLM, Components of PLM, Product Data and Product workflow, Drivers for Change, The PLM Strategy, Developing a PLM Strategy, a Five-step Process. 8 Hrs

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-2

Strategy Identification and Selection, Strategy Elements, Implications of Strategy Elements, Policies, Strategy Analysis, Communicating the Strategy. 8Hrs

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-3

Change Management for PLM, Configuration management, and cost of design changes, schemes for concurrent engineering, Design for manufacturing and assembly, robust design. 8Hrs

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-4

Modeling, Current concepts, part design, sketching, use of datum's construction features, free ovulation, pattering, copying, and modifying features, reference standards for datum specification, Standards for Engineering data exchange. 8Hrs

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-5

Tolerance mass property calculations, rapid prototyping and tooling, finite modeling and analysis, general procedure, analysis techniques, Finite element modeling. Applicability of FEM, Static analysis, dynamic analysis. 8Hrs

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 50% of the maximum marks. Minimum passing marks in SEE is 40% of the maximum marks of SEE. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 50% (50 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

17. Three Unit Tests each of **20 Marks**
18. Two assignments each of **20 Marks** or **one Skill Development Activity of 40 marks** to attain the COs and POs

The sum of three tests, two assignments/skill Development Activities, will be **scaled down to 50 marks**

CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination:

41. The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
42. The question paper will have ten full questions carrying equal marks.
43. Each full question is for 20 marks. There will be two full questions (with a maximum of four sub-questions) from each module.
44. Each full question will have a sub-question covering all the topics under a module.
45. The students will have to answer five full questions, selecting one full question from each module

Suggested Learning Resources:

Books

(1) **Product Lifecycle Management Paradigm for century Product Realization -** John Stark, Springer-Verlag, **21st**, London, 3rd printing - 2006. 441 pp., ISBN: 1-85033-810-5.
(2) **CAD/CAM Theory and Practice -**Zeid, McGraw Hill.- 1991.

Reference Books

(1) **Computer Integrated Design and Manufacturing**, - Mark Henderson & Philip Wolfe, Bedworth McGraw hill inc.- 1991.
(2) **Part modeling Users Guide**, Engineer - I998.

Skill Development Activities Suggested

- Quizzes
- Assignments
- Seminars

Course outcome (Course Skill Set)

At the end of the course the student will be able to :

Sl. No.	Description	Blooms Level
CO1	Gain knowledge about phases of PLM, PLM strategies and methodology for PLM feasibility study and PDM implementation.	
CO2	Illustrate various approaches and techniques for designing and developing products.	
CO3	Apply product engineering guidelines / thumb rules in designing products for molding, machining, sheet metal working etc.	
CO4	Acquire knowledge in applying virtual product development tools for components, machining and manufacturing plan.	
CO5	Understand the Tolerance mass property calculations.	

Program Outcome of this course

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

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

PO3 - Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program.

PO4 - Understand contemporary issues in management and develop relationship between engineering and management practices.

PO5 – develop the understanding of various quantitative techniques and approaches to solve management problems.

PO6 – ability to understand the techniques of marketing management and marketing research.

PO7 –familiarization with roles and responsibilities of a manager in engineering practice.

Mapping of COS and POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	2	2	2	3	3	3	2
CO2	1	2	2	2	2	2	3
CO3	1	3	1	2	2	2	3
CO4	1	1	2	2	2	3	2
CO5	2	2	3	3	3	3	2

Note : High - 1, Medium – 2, and Low – 3

CROSS CULTURAL MANAGEMENT			
Course Code	**22MEM243**	CIE Marks	**50**
Teaching Hours/Week (L:P:SDA)	**2:0:0**	SEE Marks	**50**
Total Hours of Pedagogy	**40**	Total Marks	**100**
Credits	**03**	Exam Hours	**03**

Course Learning objectives:

- To understand the importance of cross culture in conduct of business.
- To understand the influence of culture on different functions of management including communication, negotiation, marketing, leadership, motivation, human resource management and teams.

Module-1

Introduction: Determinants of Culture – Facets of culture – Levels of Culture – National Cultural dimensions in the business context – The influence of National Culture on business culture. Business Cultures: East and West. 8 Hrs

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-2

Cultural Dimensions and Dilemmas: Value orientations and Dimensions – Reconciling cultural dilemmas – Culture and Styles of Management: Management tasks and cultural values. 8Hrs

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-3

Culture and Organizations: Culture and corporate structures – Culture and Leadership – Culture and Strategy – Cultural change in Organizations- Culture and marketing – Cultural Diversity. 8Hrs

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-4

Culture and Communications: Business communication across cultures – Barriers to intercultural communication – Negotiating Internationally. 8Hrs

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-5

Cross Cultural Team Management: Working with International teams – Groups processes during international encounters – Conflicts and cultural difference – Understanding and dealing with conflicts – Developing Intercultural relationships. 8Hrs

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 50% of the maximum marks. Minimum passing marks in SEE is 40% of the maximum marks of SEE. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 50% (50 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

19. Three Unit Tests each of **20 Marks**
20. Two assignments each of **20 Marks** or **one Skill Development Activity of 40 marks** to attain the COs and POs

The sum of three tests, two assignments/skill Development Activities, will be **scaled down to 50 marks**

CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination:

46. The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
47. The question paper will have ten full questions carrying equal marks.
48. Each full question is for 20 marks. There will be two full questions (with a maximum of four sub-questions) from each module.
49. Each full question will have a sub-question covering all the topics under a module.
50. The students will have to answer five full questions, selecting one full question from each module

Suggested Learning Resources:

Books

(1) Marie-Joelle Browaeys and Roger Price: Understanding Cross-Cultural Management, Pearson, 2015.
(2) David C.Thomas: Cross Cultural Management, 2/e, Sage Publications, 2014.
(3) Nigel Holdon, Cross Cultural Management: Knowledge Management Perspective, Pentice Hall, 2012.

Reference Books

(1) Parissa Haghirian: Multinational and Cross-Cultural Management, Routledge, 2012.
(2) Richard Mead: International Management-Cross cultural Dimension, 3/e, Blackwell, 2015.
(3) Jerome Dumetz -Cross-cultural management textbook: Lessons from the world leading experts in cross-cultural management, Create Space Independent Publishing Platform; Student edition (September 5, 2012), Oakland, USA.

Skill Development Activities Suggested

- Quizzes
- Assignments
- Seminars

Course outcome (Course Skill Set)

At the end of the course the student will be able to :

Sl. No.	Description	Blooms Level
CO1	Importance of culture	
CO2	Importance of values	
CO3	Culture and styles of Management	
CO4	Communication in different cultures	
CO5	Cross cultural team management	

Program Outcome of this course

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

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

PO3 - Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program.

PO4 - Understand contemporary issues in management and develop relationship between engineering and management practices.

PO5 – develop the understanding of various quantitative techniques and approaches to solve management problems.

PO6 – ability to understand the techniques of marketing management and marketing research.

PO7 –familiarization with roles and responsibilities of a manager in engineering practice.

Mapping of COS and POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	1	2	2	2	2	3	1
CO2	2	1	2	2	2	2	3
CO3	2	3	1	2	2	2	3
CO4	1	2	2	3	2	3	3
CO5	1	2	3	3	3	3	2

Note : High - 1, Medium – 2, and Low – 3

SIMULATION MODELLING AND ANALYSIS			
Course Code	**22MEM244**	CIE Marks	**50**
Teaching Hours/Week (L:P:SDA)	**2:0:0**	SEE Marks	**50**
Total Hours of Pedagogy	**40**	Total Marks	**100**
Credits	**03**	Exam Hours	**03**

Course Learning objectives:

- Define the basics of simulation modeling and replicating the practical situations in organizations.
- Generate random numbers and random variates using different techniques.
- Develop simulation model using heuristic methods.
- Analysis of Simulation models using input analyzer, and output analyzer.
- Explain Verification and Validation of simulation model.

Module-1

Introduction to Simulation: Appropriateness of simulation tool, Advantages, Disadvantages and Application areas of simulation, System and System Environment, Components of a system, Discrete and continuous systems, Model of a system, Types of models, Steps in a simulation study. 8 Hrs

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-2

Discrete Event Simulation: Concepts in discrete-event simulation, Event-driven hand simulation – Examples on single channel queue, two server queue, and inventorysystems.
Statistical Models in Simulation: Terminology and concepts, Useful statistical models, discrete distributions, Continuous distributions.

8Hrs

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-3

Random Number Generation: Properties of random numbers, Techniques for generating random numbers- Linear congruential method –Combined linear congruential method; Tests for random numbers -The Kolmogorov-Smirnov test, the Chi-square test. 8Hrs

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-4

Random Variate Generation: Inverse Transforms technique- Exponential distribution, Uniform distribution, Weibull distribution, Triangular distribution, Empirical continuous distributions, Continuous distribution without a closed-form inverse, Discrete distribution, Generating approximate normal variate - Erlang distribution.
Empirical Discrete Distribution: Acceptance -Rejection technique - Poisson distribution, Gamma distribution.

8Hrs

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-5

Design and Evaluation of Simulation Experiments: Variance reduction techniques -antithetic variables, Verification and validation of simulation models.
Simulation Software: Need for simulation software, Selection of simulation software, Simulation packages (a brief note of software packages such as ARENA, AutoMod, Extend, Flexsim, WITNESS, ProMODEL, etc.). 8Hrs

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 50% of the maximum marks. Minimum passing marks in SEE is 40% of the maximum marks of SEE. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 50% (50 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

21. Three Unit Tests each of **20 Marks**
22. Two assignments each of **20 Marks** or **one Skill Development Activity of 40 marks** to attain the COs and POs

The sum of three tests, two assignments/skill Development Activities, will be **scaled down to 50 marks**

CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination:

51. The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
52. The question paper will have ten full questions carrying equal marks.
53. Each full question is for 20 marks. There will be two full questions (with a maximum of four sub-questions) from each module.
54. Each full question will have a sub-question covering all the topics under a module.
55. The students will have to answer five full questions, selecting one full question from each module

Suggested Learning Resources:

Books

(1) **Discrete-Event Simulation** – Jerry Banks, John S Carson, Barry S. Nelson, David M. Nicol, P Shahabudeen, Pearson, Latest Edition.

(2) **Handbook of Simulation** – Jerry Banks, Ed. John Wiley & Sons.

Reference Books

(1) **Simulation with Arena –** David Kelton, Sadowski, and Sturrock **,** McGraw Hill,Latest Edition.

Skill Development Activities Suggested

- Quizzes
- Assignments
- Seminars

Course outcome (Course Skill Set)

At the end of the course the student will be able to :

CO1: Students will understand the techniques of modeling in the context of hierarchy of knowledge about a system.

CO2: Able to learn different mathematical model and their application in simulation.2

CO3: Develop the capability to apply the same to study systems through available software.

CO4: Students will learn different types of simulation techniques.

CO5: Students will learn to simulate the models for the purpose of optimum control by using software.

Program Outcome of this course

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

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

PO3 - Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program.

PO4 - Understand contemporary issues in management and develop relationship between engineering and management practices.

PO5 – develop the understanding of various quantitative techniques and approaches to solve management problems.

PO6 – ability to understand the techniques of marketing management and marketing research.

PO7 –familiarization with roles and responsibilities of a manager in engineering practice.

Mapping of COS and POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	1	2	2	3	3	2	2
CO2	1	2	2	2	2	2	2
CO3	1	2	1	2	2	1	2
CO4	2	1	2	3	2	3	3
CO5	1	2	3	3	3	3	2

Note : High - 1, Medium – 2, and Low – 3

ROBUST DESIGN			
Course Code	**22MEM245**	CIE Marks	**50**
Teaching Hours/Week (L:P:SDA)	**2:0:0**	SEE Marks	**50**
Total Hours of Pedagogy	**40**	Total Marks	**100**
Credits	**03**	Exam Hours	**03**

Course Learning objectives:

- To impart a holistic view of the fundamentals of experimental designs, analysis tools and techniques, interpretation and applications.
- To understand Taguchi's orthogonal array techniques which are predominantly used in optimization of parameters.
- To understand the applications of statistical models in analysing experimental data.

Module-1

Quality by Experimental Design: Quality, western and Taguchi quality philosophy, Elements of cost, Noise factors causes of variation, Quadratic loss function and variation of quadratic loss functions.
Robust Design: Steps in robust design: parameter design and tolerance design, reliability improvement through experiments, illustration through numerical examples. 8 Hrs

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-2

Experimental Design: Classical experiments: factorial experiments, terminology, factors. Levels, Interactions, Treatment combination, randomization, 2-level experimental design for two factors and three factors. 3-level experiment deigns for two factors and three factors, factor effects, factor interactions, Fractional factorial design, Saturated design, Central composite designs, Illustration through numerical examples. 8Hrs

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-3

Measures of Variability : Measures of variability, Concept of confidence level, Statistical distributions : normal, log normal and Weibull distributions. Hipothesis testing, Probability plots, choice of sample size illustration through numerical examples.
Analysis and interpretation of experimental data: Measures of variability, Ranking method, column effect method and ploting method, Analysis of variance (ANOVA), in factorial experiments: YATE's algorithm for ANOVA, Regression analysis, Mathematical models from experimental data, illustration through numerical examples.
8Hrs

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-4

Taguchi's Orthogonal Arrays : Types orthogonal arrays, Selection of standard orthogonal arrays, Linear graphs and interaction assignment, dummy level technique, Compound factor method, modification of linear graphs, Column merging method, Branching design, Strategies for constructing orthogonal arrays.
Signal to Noise ratio (S-N Ratios) : Evaluation of sensitivity to noise, Signal to noise ratios for static problems, Smaller – the – better types, Nominal – the – better – type, larger – the- better – type. Signal to noise ratios for dynamic problems, Illustrations through numerical examples.
8Hrs

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-5

Parameter Design and Tolerance Design : Parameter and tolerance design concepts, Taguchi's inner and outer arrays, Parameter design strategy, Tolerance deign strategy, Illustrations through numerical examples.
Reliability Improvement Through Robust Design : Role of S-N ratios in reliability improvement ; Case study; Illustrating the reliability improvement of routing process of a printed wiring boards using robust design concepts**.**
8Hrs

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 50% of the maximum marks. Minimum passing marks in SEE is 40% of the maximum marks of SEE. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 50% (50 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

23. Three Unit Tests each of **20 Marks**
24. Two assignments each of **20 Marks** or **one Skill Development Activity of 40 marks** to attain the COs and POs

The sum of three tests, two assignments/skill Development Activities, will be **scaled down to 50 marks**

CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination:

56. The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
57. The question paper will have ten full questions carrying equal marks.
58. Each full question is for 20 marks. There will be two full questions (with a maximum of four sub-questions) from each module.
59. Each full question will have a sub-question covering all the topics under a module.
60. The students will have to answer five full questions, selecting one full question from each module

Suggested Learning Resources:

Books

(1)Quality Engineering using Robust Design - Madhav S. Phadake: Prentice Hall, Englewood Clifts, New Jersey 07632, 1989.
(2)Design and analysis of experiments - Douglas Montgomery: Willey India Pvt. Ltd., V Ed., 2007.
(3)Techniques for Quality Engineering - Phillip J. Ross: Taguchi 2nd edition. McGraw Hill Int. Ed., 1996

Reference Books

(1)Quality by Experimental Design - Thomas B. Barker - Marcel Dekker Inc ASQC Quality Press, 1985.
(2)Experiments planning, analysis and parameter design optimization - C.F. Jeff Wu, Michael Hamada - John Willey Ed., 2002.
(3)Reliability improvement by Experiments - W.L. Condra, - Marcel Dekker Inc ASQC Quality Press, 1985.

Skill Development Activities Suggested

- Quizzes
- Assignments
- Seminars

Course outcome (Course Skill Set)

At the end of the course the student will be able to :

Sl. No.	Description	Blooms Level
CO1	Create designs that have a minimal sensitivity to input variation.	
CO2	Reduce design costs.	
CO3	Determine which design parameters have the largest impact on variation.	
CO4	Optimize designs with multiple outputs.	
CO5	Understand the Parameter Design and Tolerance Design. .	

Program Outcome of this course

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

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

PO3 - Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program.

PO4 - Understand contemporary issues in management and develop relationship between engineering and management practices.

PO5 – develop the understanding of various quantitative techniques and approaches to solve management problems.

PO6 – ability to understand the techniques of marketing management and marketing research.

PO7 –familiarization with roles and responsibilities of a manager in engineering practice.

Mapping of COS and POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	1	1	2	3	2	3	2
CO2	1	1	2	2	2	2	3
CO3	2	3	1	2	2	2	3
CO4	1	2	2	3	3	2	3
CO5	2	2	3	3	3	3	2

Note : High - 1, Medium – 2, and Low – 3

MINI PROJECT WITH SEMINAR			
Course Code	**22MEM25**	CIE Marks	100
Number of contact Hours/Week	**0-4-2**	SEE Marks	--
Credits	**03**	Exam Hours/Batch	--

Course objectives:

- To support independent learning and innovative attitude.
- To guide to select and utilize adequate information from varied resources upholding ethics.
- To guide to organize the work in the appropriate manner and present information (acknowledging the sources) clearly.
- To develop interactive, communication, organisation, time management, and presentation skills.
- To impart flexibility and adaptability.
- To inspire independent and team working.
- To expand intellectual capacity, credibility, judgement, intuition.
- To adhere to punctuality, setting and meeting deadlines.
- To instil responsibilities to oneself and others.
- To train students to present the topic of project work in a seminar without any fear, face audience confidently, enhance communication skill, involve in group discussion to present and exchange ideas.

Mini-Project with seminar: This may be hands-on practice**,** survey report, data collection and analysis, coding, mobile app development, field visit and report preparation, modelling of system, simulation, analysing and authenticating, case studies, etc.

CIE marks shall be awarded by a committee comprising of HoD as Chairman, Guide/co-guide, if any, and a senior faculty of the department. Students can present the seminar based on the completed mini-project. Participation in the seminar by all postgraduate students of the program shall be mandatory.

The CIE marks awarded for Mini-Project work and Seminar, shall be based on the evaluation of Mini Project work and Report, Presentation skill and performance in Question-and-Answer session in the ratio 50:25:25. Mini-Project with Seminar shall be considered as a head of passing and shall be considered for vertical progression as well as for the award of degree. Those, who do not take-up/complete the Mini Project and Seminar shall be declared as fail in that course and have to complete the same during the subsequent semester.

There is **no SEE** for this course.

Course outcomes:

At the end of the course the student will be able to:

- Present the mini-project and be able to defend it.
- Make links across different areas of knowledge and to generate, develop and evaluate ideas and information to apply these skills to the project task.
- Habituated to critical thinking and use problem solving skills.
- Communicate effectively and to present ideas clearly and coherently in both the written and oral forms.
- Work in a team to achieve common goal.
- Learn on their own, reflect on their learning and take appropriate actions to improve it.

STATISTICAL TOOLS LAB			
Course Code	**22MEML26**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	**01:02:00**	SEE Marks	50
Credits	**2**	Exam Hours	03

Course objectives:

To impart practical knowledge in the usage of Basic Statistical tools useful in management practice.

Sl.NO	Experiments
1	Creation of a database and presentation of data sets.
2	Exploring Data Introduction and Describing Data - Relationships Among Variables.
3	Probability Distributions Probability and Distributions -Normal and Binomial Distributions
4	Statistical Inference Sampling and Sampling Distributions
5	Statistical Inference - Confidence Intervals
6	Statistical Inference - Hypothesis Testing
7	Analysis of Variance (ANOVA)
8	Factor Analysis
9	Regression Modelling and Analysis
10	Bivariate and Multivariate Analysis

Course outcomes (Course Skill Set):

At the end of the course the student will be able to:

1. Understand Creation of a database and presentation of data sets.
2. Understand the Probability Distributions- Normal and Binomial Distribution.
3. Understand the Statistical Inference - Confidence Intervals, Hypothesis Testing .
4. Understand the Analysis of Variance (ANOVA).

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 50% of the maximum marks. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course. The student has to secure not less than 40% of maximum marks in the semester-end examination(SEE). In total of CIE and SEE student has to secure 50% maximum marks of the course.

Continuous Internal Evaluation (CIE):

CIE marks for the practical course is **50 Marks**.

The split-up of CIE marks for record/ journal and test are in the ratio **60:40**.

- Each experiment to be evaluated for conduction with observation sheet and record write-up. Rubrics for the evaluation of the journal/write-up for hardware/software experiments designed by the faculty who is handling the laboratory session and is made known to students at the beginning of the practical session.
- Record should contain all the specified experiments in the syllabus and each experiment write-up will be evaluated for 10 marks.
- Total marks scored by the students are scaled downed to 30 marks (60% of maximum marks).
- Weightage to be given for neatness and submission of record/write-up on time.
- Department shall conduct 02 tests for 100 marks, the first test shall be conducted after the 8th week of the semester and the second test shall be conducted after the 14th week of the semester.
- In each test, test write-up, conduction of experiment, acceptable result, and procedural knowledge will carry a weightage of 60% and the rest 40% for viva-voce.
- The suitable rubrics can be designed to evaluate each student's performance and learning ability.
- The average of 02 tests is scaled down to **20 marks** (40% of the maximum marks).

The Sum of **scaled-down** marks scored in the report write-up/journal and average marks of two tests is the total CIE marks scored by the student.

Semester End Evaluation (SEE):

SEE marks for the practical course is 50 Marks.

SEE shall be conducted jointly by the two examiners of the same institute, examiners are appointed by the University.

All laboratory experiments are to be included for practical examination.

(Rubrics) Breakup of marks and the instructions printed on the cover page of the answer script to be strictly adhered to by the examiners. **OR** based on the course requirement evaluation rubrics shall be decided jointly by examiners.

Students can pick one question (experiment) from the questions lot prepared by the internal /external examiners jointly.

Evaluation of test write-up/ conduction procedure and result/viva will be conducted jointly by examiners.

General rubrics suggested for SEE are mentioned here, writeup-20%, Conduction procedure and result in -60%, Viva-voce 20% of maximum marks. SEE for practical shall be evaluated for 100 marks and scored marks shall be scaled down to 50 marks (however, based on course type, rubrics shall be decided by the examiners)

Change of experiment is allowed only once and 10% Marks allotted to the procedure part to be made zero. The duration of SEE is 03 hours
Suggested Learning Resources: LINDO / Quantitative System Analysis (QSA)/ TORA software / M.S. Projects/ARENA

VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI.

Scheme of Teaching and Examinations and Syllabus
M.Tech., Master of Engineering Management (MEM)
(Effective from the Academic year 2022-23)

Registrar,
Visvesvaraya Technological University
JnanaSangam, Machhe, Belagavi-590018
eMail: registrar@vtu.ac.in
contact: 0831-2498112

VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI
Scheme of Teaching and Examinations – 2022
M.Tech.,Master of Engineering Management (MEM)
Choice Based Credit System (CBCS) and Outcome Based Education(OBE)

III SEMESTER

Sl. No	Course	Course Code	Course Title	Teaching Hours /Week			Examination				Credits
				Theory	Practical/ Mini–Project/ Internship	Tutorial/ Skill Development Activities	Duration in hours	CIE Marks	SEE Marks	Total Marks	
				L	P	SDA					
1	PCC	22MEM31	Modern Trends in Management	03	00	02	03	50	50	100	4
2	PEC	22MEM32X	Professional elective 3	03	00	00	03	50	50	100	3
3	OEC	22MEM33X	**Professional Elective 4**	03	00	00	03	50	50	100	3
4	PROJ	22MEM34	Project Work phase -1	00	06	00	--	100	--	100	3
5	SP	22MEM35	Societal Project	00	06	00	--	100	--	100	3
6	INT	22MEMI36	Internship	(06 weeks Internship Completed during the intervening vacation of II and III semesters.)			03	50	50	100	6
TOTAL				**09**	**12**	**03**	**12**	**400**	**200**	**600**	**22**

Note: PCC: Professional core courses, PEC: Professional Elective Courses, IPCC-Integrated Professional Core Courses. MPS-Mini Project With Seminar; AUD/AEC; Audit Courses / Ability Enhancement Courses (Mandatory), PCCL-Professional Core Course lab, **L-Lecture, P-Practical, T/SDA-Tutorial / Skill Development Activities**(Hours are for Interaction between faculty and students)

Professional elective 3		**Professional Elective 4**	
Course Code under 22MEM31X	**Course title**	**Course Code under 22MEM32X**	**Course title**
22MEM321	Advertising and Publicity	22MEM331	International marketing
22MEM322	Quality and Reliability Engineering	22MEM332	Product Data Management
22MEM/MSE/MPY/MPE/MAU323	Composite Materials	22MEM333	Project Management
22MEM324	Industrial Marketing	22MEM334/CAE235	Industrial Design and Ergonomics
22MEM325	Industrial Robotics	22MEM/MTR335	Product Design and Development

Note:

1. Project Work Phase-1: The project work shall be carried out individually. However, in case a disciplinary or interdisciplinary project requires more participants, then a group consisting of not more than three shall be permitted.

Students in consultation with the guide/co-guide (if any) in disciplinary project or guides/co-guides (if any) of all departments in case of multidisciplinary projects, shall pursue a literature survey and complete the preliminary requirements of the selected Project work. Each student shall prepare a relevant introductory project document, and present a seminar.

CIE marks shall be awarded by a committee comprising of HoD as Chairman, all Guide/s and co-guide/s (if any) and a senior faculty of the concerned departments. The CIE marks awarded for project work phase -1, shall be based on the evaluation of Project Report, Project Presentation skill, and performance in the Question and Answer session in the ratio of 50:25:25.

2. Societal Project: Students in consultation with the internal guide as well as with external guide (much preferable) shall involve in applying technology toworkout/proposing viable solutions for societal problems.

CIE marks shall be awarded by a committee comprising of HoD as Chairman, Guide/co-guide if any, and a senior faculty of the department. The CIE marks awarded, shall be based on the evaluation of Project Report, Project Presentation skill, and performance in the Question and Answer session in the ratio of 50:25:25.

Those, who have not pursued /completed the Societal Project, shall be declared as fail in the course and have to complete the same during subsequent semester/s after satisfying the Societal Project requirements. There is no SEE (University examination) for this course.

3. Internship: Those, who have not pursued /completed the internship, shall be declared as fail in the internship course and have to complete the same during subsequent University examinations after satisfying the internship requirements. Internship SEE (University examination) shall be as per the University norms.

CIE marks shall be awarded by a committee comprising of HoD as Chairman, Guide/co-guide if any, and a senior faculty of the department. The CIE marks awarded for project work phase -1, shall be based on the evaluation of Project Report, Project Presentation skill, and performance in the Question and Answer session in the ratio of 50:25:25.

VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI
Scheme of Teaching and Examinations – 2022
M.Tech.,Master of Engineering Management (MEM)
Choice Based Credit System (CBCS) and Outcome Based Education(OBE)

IV SEMESTER

Sl. No	Course	Course Code	Course Title	Teaching Hours /Week		Examination				Credits
				Theory	Practical/ Field work	Duration in hours	CIE Marks	SEE Marks Viva voce	Total Marks	
				L	P					
1	Project	22MEM41	Project work phase -2	--	08	03	100	100	200	18
			TOTAL	--	**08**	**03**	**100**	**100**	**200**	**18**

Note:

1. Project Work Phase-2:

Students in consultation with the guide/co-guide (if any) in disciplinary project or guides/co-guides (if any) of all departments in case of multidisciplinary projects, shall continue to work of Project Work phase -1to complete the Project work. Each student / batch of students shall prepare project document, and present a seminar.

CIE marks shall be awarded by a committee comprising of HoD as Chairman, all Guide/s and co-guide/s (if any) and a senior faculty of the concerned departments. The CIE marks awarded for project work phase -2, shall be based on the evaluation of Project Report, Project Presentation skill, and performance in the Question and Answer session in the ratio of 50:25:25.

SEE shall be at the end of IV semester. Project work evaluation and Viva-Voce examination (SEE), after satisfying the plagiarism check, shall be as per the University norms.

Total Credits 22+18+22+18 =**80**

Semester-III

Semester-III

MODERN TRENDS IN MANAGEMENT			
Course Code	**22MEM31**	CIE Marks	**50**
Teaching Hours/Week (L:P:SDA)	**3:0:2**	SEE Marks	**50**
Total Hours of Pedagogy	**40**	Total Marks	**100**
Credits	**04**	Exam Hours	**03**

Course Learning objectives: *Describe current trends and challenges in* global business management. · Describe current trends in global business.

Module-1

Just in Time ideas Introduction of JIT Concepts, Difference between Conventional Material Control technique and lIT, Steps in implementing JIT, J.I.T. as a management Kaizen concept. Feasibility of JIT concepts to Indian Industries. 8 Hrs

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-2

Implementing a Program for continuous Improvement: Japanese concept of continuous Improvement. (KAIZEN mean continuous Improvement), Innovation concept of Improvement, Need for continuous improvement, Steps in implementing continuous improvement. 8Hrs

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-3

Quality Circles: Definition of quality circles, Quality circles as a tool for problem solving, Q.C. as a group oriented KAIZEN. 8Hrs

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-4

Kanban System: Definition of KANBAN, Difference between PULL & PUSH Systems of Material Control, KANBAN as a Push System, KANBAN asJIT concept. 8Hrs

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-5

Concurrent Engineering: Definition of Concurrent Engineering. Design for Manufacturing and Assembly (DFMA), Concurrent Engineering, Team, Advantages of concurrent Engineering. 8Hrs

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Assessment Details (both CIE and SEE)

The weight age of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 50% of the maximum marks. Minimum passing marks in SEE is 40% of the maximum marks of SEE. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 50% (50 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

1. Three Unit Tests each of **20 Marks**
2. Two assignments each of **20 Marks** or **one Skill Development Activity of 40 marks** to attain the COs and POs

The sum of three tests, two assignments/skill Development Activities, will be **scaled down to 50 marks**

CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination:

1. The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
2. The question paper will have ten full questions carrying equal marks.
3. Each full question is for 20 marks. There will be two full questions (with a maximum of four sub-questions) from each module.
4. Each full question will have a sub-question covering all the topics under a module.
5. The students will have to answer five full questions, selecting one full question from each module

Suggested Learning Resources:

Books

1. **Just in Time Manufacturing** - Amaldo Hernandez - PH International
2. **Just in Time - Productivity Process** - David Hutehins - Jaco

Web links and Video Lectures (e-Resources):

- http://.ac.in/courses.php?disciplineID=111
- http://academicearth.org/
- http://www.bookstreet.in.
- VTU e-Shikshana Program
- VTU EDUSAT Program

Skill Development Activities Suggested

- Quizzes
- Assignments
- Seminars

Course outcome (Course Skill Set)

At the end of the course the student will be able to :

Sl. No.	Description	Blooms Level
CO1	Understand the concept of Just in Time concept Ideas	
CO2	Understand the Japanese concept of continuous Improvement. (KAIZEN mean continuous Improvement	
CO3	Understand the Definition of quality circles, Quality circles as a tool for problem solving, Q.C. as a group orientedKAIZEN	
CO4	Understand theKanban System	
CO5	Understand the concept of Concurrent Engineering.	

Program Outcome of this course

Programme Outcome:

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

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

PO3 - Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program

PO4 - Understand contemporary issues in management and develop relationship between engineering and management practices

PO5 – develop the understanding of various quantitative techniques and approaches to solve management problems

PO6 – ability to understand the techniques of marketing management and marketing research

PO7 –familiarization with roles and responsibilities of a manager in engineering practice

Mapping of COS and Pos

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	1	2	2	3	3	3	2
CO2	2	3	2	3	3	2	3
CO3	2	3	2	3	2	2	2
CO4	2	3	1	2	3	3	2
CO5	2	3	2	2	1	2	2

ADVERTISING AND PUBLICITY			
Course Code	**22MEM321**	CIE Marks	**50**
Teaching Hours/Week (L:P:SDA)	**2:0:0**	SEE Marks	**50**
Total Hours of Pedagogy	**40**	Total Marks	**100**
Credits	**03**	Exam Hours	**03**

Course Learning objectives:

- Understand and analyze the relevant research in advertising and marketing communication.
- Design effective visual communication for various advertising approaches that combine the use of print, online/digital, and other multimedia communication.
- Develop advertising media buying and planning strategies.
- Create and defend the strategy and execution of an ad campaign for clients.

Module-1

Need, Importance and Scope: Advertisibility, advertisibility goals, legal, ethical and social aspects of advertising and public relations.
Types of advertising and communications in advertising.

8 Hrs

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-2

Advertisement Design: Copy Design, mechanics of copy preparations, essentials of a good copy, layout design and visualization effects, advertising theme.
Media Decisions: Types of media, Media mix decisions, Criteria for evaluation of media effectiveness.

8Hrs

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-3

Rural Advertising: Characteristics, Problems and Prospects.
Advertising Aids: Trade Marks, Slogan package, point of purchase, displays etc.

8Hrs

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-4

Measurement of Advertising Effectiveness: Methods and problems.
Advertising Agency: Functions and Usefulness, Types, Dealing with agency, advertising Agency versus own, advertising department, advertising agencies in India.

8Hrs

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-5

Industrial and consumer goods and services advertising.
Advertising Planning: Timing and Scheduling, Advertisement Budget, Types and sizes. Approaches to determining advertising budgets, limitations, advertising research 8Hrs

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 50% of the maximum marks. Minimum passing marks in SEE is 40% of the maximum marks of SEE. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 50% (50 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

3. Three Unit Tests each of **20 Marks**
4. Two assignments each of **20 Marks** or **one Skill Development Activity of 40 marks** to attain the COs and POs

The sum of three tests, two assignments/skill Development Activities, will be **scaled down to 50 marks**

CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination:

6. The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
7. The question paper will have ten full questions carrying equal marks.
8. Each full question is for 20 marks. There will be two full questions (with a maximum of four sub-questions) from each module.
9. Each full question will have a sub-question covering all the topics under a module.
10. The students will have to answer five full questions, selecting one full question from each module

Suggested Learning Resources:

Books

(1) **Advertising Management** – David A. Aaker
(2) **Advertising in Business and Society** – William M, Weil Bacher.

Reference Books

(1) **The Systematic Approach to Advertising Creativity** – Bake.
(2) **Advertising: The Process and Practice** – Engel.

Skill Development Activities Suggested

- Quizzes
- Assignments
- Seminars

Course outcome (Course Skill Set)

At the end of the course the student will be able to :

Sl. No.	Description	Blooms Level
CO1	Understand the Advertisibility, advertisibility goals, legal, ethical and social aspects of advertising and public relations.	
CO2	Analyse the Advertisement Design & Media Decisions.	
CO3	Understand the concept of Rural Advertising Trade Marks, Slogan package, point of purchase, displays.	
CO4	Analyse the Measurement of Advertising Effectiveness.	
CO5	Analyse the Advertising Planning.	

Program Outcome of this course

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

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

PO3 - Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program.

PO4 - Understand contemporary issues in management and develop relationship between engineering and management practices.

PO5 – develop the understanding of various quantitative techniques and approaches to solve management problems.

PO6 – ability to understand the techniques of marketing management and marketing research.

PO7 –familiarization with roles and responsibilities of a manager in engineering practice.

Mapping of COS and POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	2	3	2	3	3	3	2
CO2	2	3	2	2	3	2	2
CO3	1	2	1	2	3	3	2
CO4	2	2	3	3	2	3	3
CO5	2	2	3	3	3	3	3

Note : High - 1, Medium – 2, and Low – 3

QUALITY AND RELIABILITY ENGINEERING			
Course Code	**22MEM322**	CIE Marks	**50**
Teaching Hours/Week (L:P:SDA)	**3:2:0**	SEE Marks	**50**
Total Hours of Pedagogy	**40**	Total Marks	**100**
Credits	**03**	Exam Hours	**03**

Course Learning objectives:

Demonstrate the approaches and techniques to assess and improve process and/or product quality and reliability.

Introduce the principles and techniques of Statistical Quality Control and their practical uses in product and/or process design and monitoring

Illustrate the basic concepts and techniques of modern reliability engineering tools.

Module-1

Basic Concepts: Definitions of quality and Reliability, Parameters and Characteristics, Quality control, statistical Quality Control, Reliability concepts. **Concepts in Probability and Statistics** : Events, Sample Space, Probability rules, Conditional probability, Dependent and Independent Events, Application of Probability concepts in Quality Control, Problems. **08HRs**

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-2

Introduction to Probability Distributions: Normal, Poisson and Binomial distribution. Control Charts: Variable Chart – X Bar chart, R-chart and Sigma chart. Attribute Chart : P – Chart, nP Chart, C- Chart and U – Chart. **08HRs**

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-3

Acceptance Sampling: Fundamentals of acceptance sampling, types of acceptance sampling, O.C Curve, AQL, LTPD,AOQL. **Failure Data Analysis :** Introduction, Failure Data, Quantitative measures, MTTF, MTBF, Bathtub Curve, Mean Life, Life Testing, Problems, Introduction to Failure Mode and Effect Analysis. **08HRs**

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-4

System Reliability: Series, parallel and mixed configuration, Block diagram concept, r- out- of-n structure solving problems using mathematical models. **Reliability Improvement and Allocation :** Difficulty in achieving reliability, Methods for improving reliability during design, Different techniques available to improve reliability. **08HRs**

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-5

Maintainability and Availability: Introduction, Formulas, Techniques available to improve maintainability and availability trade- off among reliability, maintainability and availability, Simple problems.**08HRs**

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Assessment Details (both CIE and SEE)

The weight age of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 50% of the maximum marks. Minimum passing marks in SEE is 40% of the maximum marks of SEE. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 50% (50 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

5. Three Unit Tests each of **20 Marks**
6. Two assignments each of **20 Marks** or **one Skill Development Activity of 40 marks** to attain the COs and POs

The sum of three tests, two assignments/skill Development Activities, will be **scaled down to 50 marks**

CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination:

11. The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
12. The question paper will have ten full questions carrying equal marks.
13. Each full question is for 20 marks. There will be two full questions (with a maximum of four sub-questions) from each module.
14. Each full question will have a sub-question covering all the topics under a module.
15. The students will have to answer five full questions, selecting one full question from each module

Suggested Learning Resources:

Text Books

1)Quality Planning and Analysis - Tata McGraw - Juran, J.M and Gryna, F.M. - Hill publishing Company Ltd., New Delhi, India –1982.

(2) Maintainability and Reliability Handbook of Reliability Engineering and Management - Editors –Ireson. W.G. andCooms- C.F. McGraw - Hill Book Company Inc. –1988.

(3) Concepts in Reliability Engineering- Srinath L S - Affiliated East- West Press Private Limited, New Delhi, India. – 1985.

(4) An Introduction to Reliability and Maintainability Engineering - TMH Charles Ebeling - Tata Mcgraw Hill – 2000.

(5) Reliability Engineering - A K Govil - Prentice Hall –1981

Web links and Video Lectures (e-Resources):

- http://.ac.in/courses.php?disciplineID=111
- http://academicearth.org/
- http://www.bookstreet.in.
- VTU e-Shikshana Program
- VTU EDUSAT Program

Skill Development Activities Suggested

- Quizzes
- Assignments
- Seminars

Course outcome (Course Skill Set)

At the end of the course the student will be able to :

Sl. No.	Description	Blooms Level
CO1	Understand the quality and basic probability concept.	
CO2	Construct the control chart for variables	
CO3	Construct the control chart for attributes and analyse failure data	
CO4	Construct OC curve for determining the probability of lot acceptance.	
CO5	Understand the basic concept of reliability and calculate maintainability and availability of	

Program Outcome of this course
Programme Outcome:

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

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

PO3 - Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program

PO4 - Understand contemporary issues in management and develop relationship between engineering and management practices

PO5 – develop the understanding of various quantitative techniques and approaches to solve management problems

PO6 – ability to understand the techniques of marketing management and marketing research

PO7 –familiarization with roles and responsibilities of a manager in engineering practice

Mapping of COS and POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	**1**	**2**	**2**	**3**	**3**	**3**	**3**
CO2	**2**	**3**	**2**	**3**	**3**	**2**	**3**
CO3	**2**	**3**	**2**	**3**	**2**	**3**	**3**
CO4	**2**	**3**	**1**	**2**	**3**	**3**	**2**
CO5	**21**	**3**	**3**	**2**	**2**	**3**	**2**

COMPOSITE MATERIALS			
Course Code	**22MEM/MSE/MPY/MPE/MAU323**	CIE Marks	**50**
Teaching Hours/Week (L:P:SDA)	**2:0:0**	SEE Marks	**50**
Total Hours of Pedagogy	**40**	Total Marks	**100**
Credits	**03**	Exam Hours	**03**

Course Learning objectives:

- Explain the behaviour of constituents in the composite materials
- Enlighten the students in different types of reinforcement
- Develop the student's skills in understanding the different manufacturing methods available for composite material.
- Illuminate the knowledge and analysis skills in applying basic laws in mechanics to the composite materials.

Module-1

Introduction to composite materials: Definition, Classification, Types of matrices & reinforcements, characteristics & selection, Fiber composites, laminated composites, particulate composites, pre pegs, sandwich construction. 8 Hrs

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-2

Micro mechanical analysis of a lamina: Introduction, Evaluation of the four elastic moduli – Rule of mixture, Macro mechanics of a lamina: Hooke's law for different types of materials, number of elastic constants, Laminate code, Failure criterion. 8Hrs

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-3

Manufacturing: Lay up and curing – open and closed mould processing – Hand layup techniques Bag moulding and filament winding. Pultrusion, Pulforming, Thermoforming, Injection moulding, Cutting, Machining and joining, tooling, Quality assurance Introduction, material qualification, types of defects, NDT methods. 8Hrs

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-4

Fabrication of Composites: Cutting, machining, drilling, mechanical fasteners & adhesive bonding joining computer aided design manufacturing tooling fabrication equipment Design of Fibre Reinforced Composite structures: Introduction, Composite structural design, Design criteria, Laminate design, Mathematical analysis of the laminate, Design of composite stiffeners. 8Hrs

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-5

Application developments – Aircrafts, missiles, space hardware, automobile, electrical and electronics, marine, recreational and sports equipment-future potential of composites. Metal matrix composites: Reinforcement materials, types, Characteristics & Selection, base metals-selection, applications. Powder metallurgy technique, liquid metallurgy technique. 8Hrs

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 50% of the maximum marks. Minimum passing marks in SEE is 40% of the maximum marks of SEE. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 50% (50 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

7. Three Unit Tests each of **20 Marks**
8. Two assignments each of **20 Marks** or **one Skill Development Activity of 40 marks** to attain the COs and POs

The sum of three tests, two assignments/skill Development Activities, will be **scaled down to 50 marks**

CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination:

16. The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
17. The question paper will have ten full questions carrying equal marks.
18. Each full question is for 20 marks. There will be two full questions (with a maximum of four sub-questions) from each module.
19. Each full question will have a sub-question covering all the topics under a module.
20. The students will have to answer five full questions, selecting one full question from each module

Suggested Learning Resources:

Books

(1)Composite Materials Handbook - Mein Schwartz - McGraw Hill Book Company - 1984.
(2)Mechanics of Composite Materials - AutarK.Kaw - CRC Press New York - 1stedi, 1997.

Reference Books

(1)Composite Materials hand book - MeingSchwaitz - McGraw Hill Book Company
(2) Forming Metal hand book, ASM handbook, V15, 1988, P327-338.
(3)Composite Science and Engineering - K.K.Chawla – Springer.

Skill Development Activities Suggested

- Quizzes
- Assignments
- Seminars

Course outcome (Course Skill Set)

At the end of the course the student will be able to :

Sl. No.	Description	Blooms Level
CO1	Identify, describe and evaluate the properties of fibre reinforcements, polymer matrix materials and commercial composites.	
CO2	Identify, describe rule of mixture and failure criteria for composites.	
CO3	Develop competency in one or more common composite manufacturing techniques, and be able to select the appropriate technique for manufacture of composite materials.	
CO4	Understand and analyse fabrication of composites and design of structure of composites.	
CO5	Understand and recommend composites for different applications and MMCs.	

Program Outcome of this course

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

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

PO3 - Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program.

PO4 - Understand contemporary issues in management and develop relationship between engineering and management practices.

PO5 – develop the understanding of various quantitative techniques and approaches to solve management problems.

PO6 – ability to understand the techniques of marketing management and marketing research.

PO7 –familiarization with roles and responsibilities of a manager in engineering practice.

Mapping of COS and POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	2	1	2	3	3	3	2
CO2	2	1	2	2	2	2	3
CO3	2	3	1	2	2	2	3
CO4	2	2	2	3	2	3	3
CO5	2	2	3	3	3	3	2

Note : High - 1, Medium – 2, and Low – 3

INDUSTRIAL MARKETING			
Course Code	**22MEM324**	CIE Marks	**50**
Teaching Hours/Week (L:P:SDA)	**3:0:0**	SEE Marks	**50**
Total Hours of Pedagogy	**40**	Total Marks	**100**
Credits	**03**	Exam Hours	**03**

Course Learning objectives: The course objective is *to learn new concepts, tools, and techniques applicable to the marketing of industrial products*.

Module-1	
Introduction: The Industrial Marketing Concept Marketing System: Participant, Channels, Contracts of Sale, Franchise Agreements Loyalty, Confidence and Reciprocity. **Demand and Product Characteristics:** Market levels and product type. Derived demand; Influence of ultimate buyer, business conditions, Financial conditions, Influence of price. **08HRs**	
Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-2	
Industrial Customer: Buyer Motives: The core variables, Quality, Service, And Price, Savings assurance of supply and buyer temperament, Buyer characteristics, Customer types. **Marketing Strategy:** The concept of strategy Mission Strategy, Operating, plans, Organizational Plan and logistical plans; choice of strategy components. 08 hrs	
Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-3	
The Channel Component: Industrial Distributors, Geographical Distributions, Size, Characteristics. Condition influencing channel structure, Intensive versus selective strategy. **The Price Component: Condition affecting price:** Condition affecting price: Competition, firm size product type, Direct and Indirect Costs. The nature of demand. Pricing decisions, New Markets versus established markets pricing policies; Net pricing; Discount pricing, trades discount, Quantity discounts and cash discounts. Legal considerations and pricing methods. 08HRs	
Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-4	
The Promotional Component: Advertising functions, motivating distributions sales and message case of advertising agencies. Sales promotion and public relations promotional letters and n novelties personal selling and selling support. **08HRs**	
Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-5	
. **Marketing Control:** Strategic goals. Identifying market opportunity. Short-term goals expense based goals. The market and sales budget. Budgetary Control, the process of control. Comprising standards and performance. Correctiveaction. **08HRs**	
Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 50% of the maximum marks. Minimum passing marks in SEE is 40% of the maximum marks of SEE. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 50% (50 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

9. Three Unit Tests each of **20 Marks**
10. Two assignments each of **20 Marks** or **one Skill Development Activity of 40 marks** to attain the COs and POs

The sum of three tests, two assignments/skill Development Activities, will be **scaled down to 50 marks**

CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination:

21. The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
22. The question paper will have ten full questions carrying equal marks.
23. Each full question is for 20 marks. There will be two full questions (with a maximum of four sub-questions) from each module.
24. Each full question will have a sub-question covering all the topics under a module.
25. The students will have to answer five full questions, selecting one full question from each module

Suggested Learning Resources:

Text Books:

(1) **Industrial Marketing -**Richard M. Hill.Ralph. S. Alexander and James S. Cross. Published by AITBS, New Delhi.

(2) **Industrial Marketing -**Phadtare, PHI Pvt., Ltd

Reference Books:

(1) **Industrial Marketing -A process of creating and maintaining exchanges**- KrishnamachryulyCsg, Lalitha R - Jaico Book House

Web links and Video Lectures (e-Resources):

- http://.ac.in/courses.php?disciplineID=111
- http://academicearth.org/
- http://www.bookstreet.in.
- VTU e-Shikshana Program
- VTU EDUSAT Program

Skill Development Activities Suggested

- Quizzes
- Assignments
- Seminars

Course outcome (Course Skill Set)

At the end of the course the student will be able to :

Sl. No.	Description	Blooms Level
CO1	Analyse the Industrial Marketing Concept.	
CO2	Understand the Industrial Customer& Marketing Strategy	
CO3	Understand the The Channel Component.	
CO4	Understand the Advertising functions, motivating distributions sales and message case of advertising agencies	
CO5	Understand the concept of marketing controls, strategic goals	

Program Outcome of this course
Programme Outcome:

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

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

PO3 - Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program

PO4 - Understand contemporary issues in management and develop relationship between engineering and management practices

PO5 – develop the understanding of various quantitative techniques and approaches to solve management problems

PO6 – ability to understand the techniques of marketing management and marketing research

PO7 –familiarization with roles and responsibilities of a manager in engineering practice

Mapping of COS and POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	1	1	1	2	2	3	3
CO2	2	3	2	3	3	1	3
CO3	2	2	2	2	2	2	3
CO4	2	3	1	2	1	2	2
CO5	2	2	3	2	2	3	2

INDUSTRIAL ROBOTICS			
Course Code	**22MEM325**	CIE Marks	**50**
Teaching Hours/Week (L:P:SDA)	**2:0:0**	SEE Marks	**50**
Total Hours of Pedagogy	**40**	Total Marks	**100**
Credits	**03**	Exam Hours	**03**

Course Learning objectives:

- Gain knowledge of Robotics and automation.
- Understand the working methodology of robotics and automation.
- Write the program for robot for various applications

Module-1

FUNDAMENTAL CONCEPTS OF ROBOTICS: History, present status and future trends, Robotics. Robot, Definition. Robotics Systems and Robot Anatomy, Specification of Robotics. Resolution, Repeatability and Accuracy of a Manipulator.

ROBOT DRIVES: Power transmission systems and control Robot drive mechanisms, hydraulic-electric-pneumatic drives. Mechanical transmission method – Rotary-to-Rotary motion conversion. Rotary-to- linear motion conversion end effectors – types-grip and problem Remote-Centered compliance Devices- Control of Actuators in Robotic Mechanisms.

8 Hrs

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-2

SENSORS AND INTELLIGENT ROBOTS: Sensory devices – Non-optical-Position sensors – Optical position sensors – velocity sensors – proximity sensors: Contact and non-contact type- Touch and slip sensors – Force and Torque Sensors – AI and Robotics.

COMPUTER VISION FOR ROBOTICS SYSTEMS: Robot vision systems – Imaging components – Image representation – Hardware aspects-Picture coding – Object Recognition and Categorization- Visual inspection – software considerations – applications – commercial – Robotic vision systems.

8Hrs

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-3

COMPUTER CONSIDERATIONS FOR ROBOTIC SYSTEMS: Computer architecture for robots, hardware, Computational elements in robotic applications – Robot programming – sample programs path planning – Robot's computer system.

8Hrs

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-4

TRANSFORMATIONS AND KINEMATICS: Homogeneous Co- ordinates – Co-ordinate Reference Frames – Homogeneous Transformations for the manipulator – the forward and inverse problem of manipulator kinematics – Motion generation – Manipulator dynamics – Jacobian in terms of D.H.Matrices controller architecture.

8Hrs

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-5

ROBOT CELL DESIGN AND CONTROL: Specifications of Commerical Robots – Robot Design and Process specifications – motor selection in the design of a robotic joint – Robot Cell layouts – Economic and Social aspects of robotics.

APPLICATIONS OF ROBOTS: Capabilities of Robots – Robotics Applications – Obstacle avoidance – Robotics in India – The future of Robotics.

8Hrs

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 50% of the maximum marks. Minimum passing marks in SEE is 40% of the maximum marks of SEE. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 50% (50 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

11. Three Unit Tests each of **20 Marks**
12. Two assignments each of **20 Marks** or **one Skill Development Activity of 40 marks** to attain the COs and POs

The sum of three tests, two assignments/skill Development Activities, will be **scaled down to 50 marks**

CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination:

26. The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
27. The question paper will have ten full questions carrying equal marks.
28. Each full question is for 20 marks. There will be two full questions (with a maximum of four sub-questions) from each module.
29. Each full question will have a sub-question covering all the topics under a module.
30. The students will have to answer five full questions, selecting one full question from each module

Suggested Learning Resources:

Books

(1)Robotics Engineering An integrated approach - Richard D Klafter, Thomas A Chmielewski, Michael Negin – Prentice Hall of India Pvt. Ltd.

(2)Robotics: Control Sensing, Vision, intelligence - Fu KS Gomaler R C, Lee C S G - McGraw Hill.

Reference Books

(1)Handbook of Industrial Robotics - Shuman Y. Nof - John Wiley & Sons, New York - 1985.

(2)Robotics Technology and Flexible Automation - Deb SR - McGraw Hill BookCo. - 1994.

Skill Development Activities Suggested

- Quizzes
- Assignments
- Seminars

Course outcome (Course Skill Set)

At the end of the course the student will be able to :

Sl. No.	Description	Blooms Level
CO1	Understand the concept of robotics and its drives.	
CO2	Understand the sensors applications and images recognition mechanism.	
CO3	Program robot and analyse the computational element of robot computer system.	
CO4	Transform robot manipulator using knowledge kinematics and mathematical methods.	
CO5	Design and control robot cells and understand the application of robots.	

Program Outcome of this course

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

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

PO3 - Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program.

PO4 - Understand contemporary issues in management and develop relationship between engineering and management practices.

PO5 – develop the understanding of various quantitative techniques and approaches to solve management problems.

PO6 – ability to understand the techniques of marketing management and marketing research.

PO7 –familiarization with roles and responsibilities of a manager in engineering practice.

Mapping of COS and POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	1	2	3	3	2	3	2
CO2	2	1	2	2	2	2	3
CO3	2	3	1	2	2	2	3
CO4	2	2	2	3	2	3	3
CO5	2	2	3	3	3	3	1

Note : High - 1, Medium – 2, and Low – 3

INTERNATIONAL MARKETING			
Course Code	**22MEM331**	CIE Marks	**50**
Teaching Hours/Week (L:P:SDA)	**3:0:0**	SEE Marks	**50**
Total Hours of Pedagogy	**40**	Total Marks	**100**
Credits	**03**	Exam Hours	**03**

Course Learning objectives: Develop an understanding of and an appreciation for basic international marketing concepts, theories, principles, and terminology. Be able to demonstrate an awareness and knowledge of the impact of environmental factors (cultural, economic, institutional, legal and political) on international marketing activities.

Module-1

Introduction to International Marketing: Environment and Sustainability, Scope, Importance of World Trade, Features, Opportunities and Challenges in International Marketing, Comparison of Domestic with International Marketing, Stages of International Marketing, Motivating Factors of International Marketing, Internationalisation – Reasons and Strategies.

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-2

Global Environmental Drivers: WTO and Globalization – Issues, Types - Political, Economic, Social, Legal and Technological Environments, EXIM Policy, International Trade and its barriers, trade in Goods & Services, International Trade Agreements.

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-3

Global Customers: Drivers of Global Consumers, Influences of the Global Consumer - Role of Culture - elements, Social Factors, Situational Factors, Industrial Buyer, Government Buyer, International Marketing Research: Opportunity Analysis, Market Selection, Assessing Market Size and Sales Potential, Government Policies of Target Markets, SWOT Analysis of Target Markets, Global Market Entry Modes – Strategies, Problems and Challenges.

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-4

Global Marketing: Globalization Drivers – Market, Cost, Environmental, Competitive Factors, International Marketing Mix, Developing the Global Marketing Program, Segmentation of product &services, Marketing channels and Distribution Promotion Strategies, Pricing strategies – Factors influencing Pricing Decisions, Concept of International Product Life Cycle.

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-5

Implementing Global marketing strategies: Negotiation with customers and selection method – Cultural and International Negotiations, E-Marketing channels organization &controlling of the global marketing programme, Export Documentation, Export Procedures, Steps in processing an Export Order.

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Assessment Details (both CIE and SEE)

The weight age of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 50% of the maximum marks. Minimum passing marks in SEE is 40% of the maximum marks of SEE. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 50% (50 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

13. Three Unit Tests each of **20 Marks**
14. Two assignments each of **20 Marks** or **one Skill Development Activity of 40 marks** to attain the COs and POs

The sum of three tests, two assignments/skill Development Activities, will be **scaled down to 50 marks**

CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination:

31. The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
32. The question paper will have ten full questions carrying equal marks.
33. Each full question is for 20 marks. There will be two full questions (with a maximum of four sub-questions) from each module.
34. Each full question will have a sub-question covering all the topics under a module.
35. The students will have to answer five full questions, selecting one full question from each module

Suggested Learning Resources:

- Michael R. Czinkota, Ilkka A. Ronkainen, International Marketing, 10e, Cengage, 2017
- Justin Paul, Ramneek Kapoor, International Marketing: Text and Cases, 2e, TMH, 2012

Web links and Video Lectures (e-Resources):

- http://.ac.in/courses.php?disciplineID=111
- http://academicearth.org/
- http://www.bookstreet.in.
- VTU e-Shikshana Program
- VTU EDUSAT Program

Skill Development Activities Suggested

- Quizzes
- Assignments
- Seminars

Course outcome (Course Skill Set)

At the end of the course the student will be able to :

Sl. No.	Description	Blooms Level
CO1	The Global Marketing Management	
CO2	Environment of global markets	
CO3	Assessing Global Market Opportunities	
CO4	Developing and Implementing Global Marketing Strategies.	
CO5	Implementing Global marketing strategies.	

Program Outcome of this course

Programme Outcome:

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

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

PO3 - Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program

PO4 - Understand contemporary issues in management and develop relationship between engineering and management practices

PO5 – develop the understanding of various quantitative techniques and approaches to solve management problems

PO6 – ability to understand the techniques of marketing management and marketing research

PO7 –familiarization with roles and responsibilities of a manager in engineering practice

Mapping of COS and POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	2	2	2	3	3	3	3
CO2	2	2	2	3	2	2	2
CO3	1	2	1	3	2	3	2
CO4	2	2	1	2	3	3	2
CO5	1	2	3	2	2	3	2

PRODUCT DATA MANAGEMENT			
Course Code	**22MEM332**	CIE Marks	**50**
Teaching Hours/Week (L:P:SDA)	**3:0:0**	SEE Marks	**50**
Total Hours of Pedagogy	**40**	Total Marks	**100**
Credits	**03**	Exam Hours	**03**

Course Learning objectives: PDM software helps companies bring products to market faster by bringing all project data into one place; reducing time spent on low-value tasks, increasing product development agility, and increasing collaboration.

Module-1

Product Data Management : Product life cycle, Complexity in Product Development, General Description of PDM Basic functionality of PDM: Information architecture, PDM System architecture, Applications used in PDM systems. Trends in PDM. . **08HRs**

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-2

Document Management Systems: Document management and PDM, Document life cycle, Content Management, Document management and related technologies, Document management resources on the Internet. **08HRs**

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-3

.
Workflow Management in PDM: Structure Management, Engineering Change Management, Release Management, Version Management, Configuration Management. . **08HRs**

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-4

Creating Product Structures: Part centric approach, CAD centric approach, Product Structure configuration, Managing Product Structures,PDM Tools: Matrix One, Team Center, Windchill. Enovia, PDM resources on the Internet. . **08HRs**

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-5

PDM Implementation Case Studies: Sun Microsystems, Inc., Mentor Graphics Corporation, Ericsson Radio Systems AB, Ericsson Mobile Communications AB, ABB Automation Technology Products, SaabTech Electronics AB. **08HRs**

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 50% of the maximum marks. Minimum passing marks in SEE is 40% of the maximum marks of SEE. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 50% (50 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

15. Three Unit Tests each of **20 Marks**
16. Two assignments each of **20 Marks** or **one Skill Development Activity of 40 marks** to attain the COs and POs

The sum of three tests, two assignments/skill Development Activities, will be **scaled down to 50 marks**

CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination:

36. The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
37. The question paper will have ten full questions carrying equal marks.
38. Each full question is for 20 marks. There will be two full questions (with a maximum of four sub-questions) from each module.
39. Each full question will have a sub-question covering all the topics under a module.
40. The students will have to answer five full questions, selecting one full question from each module

Suggested Learning Resources:

(1)Implementing and Integrating Product Data Management and Software Configuration Management - 20 - IvicaCmkovic Ulf Asklund – Annita PerssonDahlqvist – ArchtechHouse Publishers.

(2)Product Data Management - Rodger Burden - Publisher: Resource Publishing- ISBN-10: 0970035225, ISBN-13: 978-0970035226 –2003.

(3)The AutoCAD Database Book – Accessing and Managing CAD Drawing Information- Galgotia Publications – Third Edition.

Web links and Video Lectures (e-Resources):

- http://.ac.in/courses.php?disciplineID=111
- http://academicearth.org/
- http://www.bookstreet.in.
- VTU e-Shikshana Program
- VTU EDUSAT Program

Skill Development Activities Suggested

- Quizzes
- Assignments
- Seminars

Course outcome (Course Skill Set)

At the end of the course the student will be able to :

Sl. No.	Description	Blooms Level
CO1	Explain the concepts, tools and techniques for managing product data.	
CO2	Analyze various processes in the product data management frameworks.	
CO3	Evaluate risks in large and complex workflow management environments.	
CO4	Develop product data management plans for various types of organizations.	
CO5	Understand the PDM and ABB technologies.	

Program Outcome of this course

Programme Outcome:

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

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

PO3 - Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program

PO4 - Understand contemporary issues in management and develop relationship between engineering and management practices

PO5 – develop the understanding of various quantitative techniques and approaches to solve management problems

PO6 – ability to understand the techniques of marketing management and marketing research

PO7 –familiarization with roles and responsibilities of a manager in engineering practice

Mapping of COS and POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	2	2	2	3	3	3	3
CO2	2	1	2	3	3	2	3
CO3	3	1	2	3	2	3	3
CO4	1	3	1	2	3	3	2
CO5	1	3	3	2	2	3	2

PROJECT MANAGEMENT			
Course Code	**22MEM333**	CIE Marks	**50**
Teaching Hours/Week (L:P:SDA)	**2:0:0**	SEE Marks	**50**
Total Hours of Pedagogy	**40**	Total Marks	**100**
Credits	**03**	Exam Hours	**03**

Course Learning objectives:

- To disseminate the application of Project Management in various phases of project embracing various processes.
- To make them understand the concepts of Project Management for planning to execution of projects.
- To make them understand the feasibility analysis in Project Management and network analysis tools for cost and time estimation.
- To enable them to comprehend the fundamentals of Contract Administration, Costing and Budgeting.
- Make them capable to analyze, apply and appreciate contemporary project management tools and methodologies.

Module-1

Introduction: Identification of Investment Opportunities, Market and Demand Analysis – Technical Analysis -Investment Outlay. 8 Hrs

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-2

Means of Financing- Profitability and Breakeven Analysis -Cash Flows of Projects -Tax factor in investment Analysis - Interest Compounding and Discounting. 8Hrs

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-3

Appraisal Criteria and Selection of Investment-cost of capital analysis of Risk -Financial Projection, social Cost Benefit Analysis. 8Hrs

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-4

Manpower Management in Projects- Functional Approach to Manpower Management, - the Element of decision Process Project Team Concepts - Field Autonomy- Policies Governing Projects. 8Hrs

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-5

Networks Techniques in Project Management-PERT/CPM Analysis - Administrative aspects of Capital Investment. 8Hrs

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 50% of the maximum marks. Minimum passing marks in SEE is 40% of the maximum marks of SEE. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 50% (50 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

17. Three Unit Tests each of **20 Marks**
18. Two assignments each of **20 Marks** or **one Skill Development Activity of 40 marks** to attain the COs and POs

The sum of three tests, two assignments/skill Development Activities, will be **scaled down to 50 marks**

CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination:

41. The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
42. The question paper will have ten full questions carrying equal marks.
43. Each full question is for 20 marks. There will be two full questions (with a maximum of four sub-questions) from each module.
44. Each full question will have a sub-question covering all the topics under a module.
45. The students will have to answer five full questions, selecting one full question from each module

Suggested Learning Resources:

Books

(1)Projects: appraisal, preparation, budgeting & implementation – Prasannachandra - TMH
(2)Handbook of Project Management - Dennis lock.

Reference Books

(1) Project Management - Dennis lock - GowerPublishing Ltd - 8th Revised edition.

Skill Development Activities Suggested

- Quizzes
- Assignments
- Seminars

Course outcome (Course Skill Set)

At the end of the course the student will be able to :

CO1: Understand the selection, prioritization and initiation of individual projects and strategic role of project management.

CO2: Understand the work breakdown structure by integrating it with organization.

CO3: Understand the scheduling and uncertainty in projects.

CO4: Students will be able to understand risk management planning using project quality tools.

CO5: Draw the network diagram to calculate the duration of the project and reduce it using crashing.

Program Outcome of this course

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

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

PO3 - Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program

PO4 - Understand contemporary issues in management and develop relationship between engineering and management practices

PO5 – develop the understanding of various quantitative techniques and approaches to solve management problems

PO6 – ability to understand the techniques of marketing management and marketing research

PO7 –familiarization with roles and responsibilities of a manager in engineering practice

Mapping of COS and POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	2	2	3	2	2	3	2
CO2	1	2	1	2	2	2	3
CO3	2	1	3	2	2	3	2
CO4	3	3	3	3	3	3	2
CO5	2	3	2	3	3	2	2

Note : High - 1, Medium – 2, and Low – 3

INDUSTRIAL DESIGN & ERGONOMICS

Course Code	**22MEM334/CAE235**	CIE Marks	**50**
Teaching Hours/Week (L:P:SDA)	**3:0:0**	SEE Marks	**50**
Total Hours of Pedagogy	**40**	Total Marks	**100**
Credits	**03**	Exam Hours	**03**

Course Learning objectives: The course aims to provide an overview of ergonomics principles. A comprehensive view of ergonomics applied in various domains like industrial cognitive and interaction will be covered. The course will help in understanding the design aspects of ergonomics and their applications in real-world problems through case studies and studio sessions.

Module-1

Introduction: An approach to industrial design - elements of design structure for industrial design in engineering application in modem manufacturing systems. Ergonomics and Industrial Design: Introduction - general approach to the man-machine relationship- work station design-working position. **08HRs**

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-2

Control and Displays: shapes and sizes of various controls and displays-multiple displays and control situations - design of major controls in automobiles, machine tools etc., - design of furniture - designof instruments. **08HRs**

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-3

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Ergonomics and Production: Ergonomics and product design ergonomics in automated systems- expert systems for ergonomic design, Anthropomorphic data and its applications in ergonomic design limitations of anthropomorphic data-use of computerized database**... . 08HRs**

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-4

Visual Effects of Line and Form: The mechanics of seeing psychology of seeing, general influences of lined and form. Colour: colour and light - colour and objects - colour and the eye colour consistency - colour terms - reactions to colour and colour continuation - colour on engineering equipments. **08HRs**

8Hrs

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-5

Aesthetic Concepts: Concept of unity - concept of order with variety - concept of purpose style and environment - Aesthetic expressions. Style-components of style - house style, observations style in capital goods. **Industrial Design in Practice:** General design - specifying design equipments - rating the importance of industrial design – industrial design in the design process. **08HRs**

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 50% of the maximum marks. Minimum passing marks in SEE is 40% of the maximum marks of SEE. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 50% (50 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

19. Three Unit Tests each of **20 Marks**
20. Two assignments each of **20 Marks** or **one Skill Development Activity of 40 marks** to attain the COs and POs

The sum of three tests, two assignments/skill Development Activities, will be **scaled down to 50 marks**

CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination:

46. The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
47. The question paper will have ten full questions carrying equal marks.
48. Each full question is for 20 marks. There will be two full questions (with a maximum of four sub-questions) from each module.
49. Each full question will have a sub-question covering all the topics under a module.
50. The students will have to answer five full questions, selecting one full question from each module

Suggested Learning Resources:

Text Books

(1)Industrial design for Engineers - Mayall W.H. - LondonCliffee Books Ltd.

(2)Applied Ergonomics Hand Book - Brien Shakel (Edited) - Butterworth Scientific,

Web links and Video Lectures (e-Resources):

- http://.ac.in/courses.php?disciplineID=111
- http://academicearth.org/
- http://www.bookstreet.in.
- VTU e-Shikshana Program
- VTU EDUSAT Program

Skill Development Activities Suggested

- Quizzes
- Assignments
- Seminars

Course outcome (Course Skill Set)

At the end of the course the student will be able to :

Sl. No.	Description	Blooms Level
CO1	Understanding the concepts of Industrial design and man-machine relationship.	
CO2	Design of optimistic display and control devices for various applications.	
CO3	Applying the anthropomorphic data in ergonomic design.	
CO4	Understanding the visual effects of lines, form and color on engineering equipments.	
CO5	Choosing appropriate aesthetic aspects for design of industrial machinery and evices.	

Program Outcome of this course
Programme Outcome:

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

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

PO3 - Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program

PO4 - Understand contemporary issues in management and develop relationship between engineering and management practices

PO5 – develop the understanding of various quantitative techniques and approaches to solve management problems

PO6 – ability to understand the techniques of marketing management and marketing research

PO7 –familiarization with roles and responsibilities of a manager in engineering practice

Mapping of COS and POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	2	1	2	2	3	2	2
CO2	1	2	2	2	2	2	2
CO3	2	2	2	3	2	3	3
CO4	2	3	1	2	3	3	1
CO5	2	3	3	2	2	3	2

Professional Elective 4			
PRODUCT DESIGN AND DEVELOPMENT			
Course Code	**22MEM/MTR335**	CIE Marks	**50**
Teaching Hours/Week (L:P:SDA)	**3:0:0**	SEE Marks	**50**
Total Hours of Pedagogy	**40**	Total Marks	**100**
Credits	**03**	Exam Hours	**03**

Course Learning objectives: Competence with a set of tools and methods for product design and development. Confidence in your own abilities to create a new product. Awareness of the role of multiple functions in creating a new product (e.g. marketing, finance, industrial design, engineering, production).

Module-1

Introduction: Characteristics of successful product development, Design and development of products, duration and cost of product development, the challenges of product development. **Development Processes and Organizations:** A generic development process, concept development: the front-end process, adopting the generic product development process, the AMF development process, product development organizations, the AMF organization. **Product Planning:** The product planning process, identify opportunities. Evaluate and prioritize projects, allocate resources and plan timing, complete pre project planning, reflect all the results an

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-2

Identifying Customer Needs: Gather raw data from customers, interpret raw data in terms of customer needs, organize the needs into a hierarchy, establish the relative importance of the needs and reflect on the results and the process. **Product Specifications:** What are specifications, when are specifications established, establishing target specifications, setting the final specifications. **Concept Generation:** The activity of concept generation, clarifies the problem, search externally, search internally, explore systematically, reflect on the results andtheprocess. **08HRs**

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-3

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Concept Selection: Overview of methodology, concept screening, and concept scoring, **Concept Testing:** Define the purpose of concept test, choose a survey population, choose a survey format, communicate the concept, measure customer response, interpret the result, reflect on the results and the process. **Product Architecture:** What is product architecture, implications of the architecture, establishing the architecture, variety and supply chain considerations, platform planning, related system level designissues. . **08HRs**

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-4

Industrial design: Assessing the need for industrial design, the impact of industrial design, industrial design process, managing the industrial design process, assessing the quality of industrial design. **Design for Manufacturing:** Definition, estimation of manufacturing cost, reducing the cost of components, assembly, supporting production, impact of DFM on other factors. **Prototyping:** Prototyping basics, principles of prototyping, technologies, planning for prototypes. **08HRs**

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-5

Product Development Economics: Elements of economic analysis, base case financial mode,. Sensitive analysis, project trade-offs, influence of qualitative factors on project success, qualitative analysis. **Managing Projects:** Understanding and representing task, baseline project planning, accelerating projects, project execution, postmortem project evaluation. **08HRs**

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 50% of the maximum marks. Minimum passing marks in SEE is 40% of the maximum marks of SEE. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 50% (50 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

21. Three Unit Tests each of **20 Marks**
22. Two assignments each of **20 Marks** or **one Skill Development Activity of 40 marks** to attain the COs and POs

The sum of three tests, two assignments/skill Development Activities, will be **scaled down to 50 marks**

CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination:

51. The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
52. The question paper will have ten full questions carrying equal marks.
53. Each full question is for 20 marks. There will be two full questions (with a maximum of four sub-questions) from each module.
54. Each full question will have a sub-question covering all the topics under a module.
55. The students will have to answer five full questions, selecting one full question from each module

Suggested Learning Resources:

Books

Product Design and Development - Karl.T.Ulrich, Steven D

Reference Books

(1) Product Design and Manufacturing - A C Chitale and R C Gupta, PH1, - 3rd Edition, 2003

(2) New Product Development - Timjones. Butterworth Heinmann - Oxford. UCI -1997

Web links and Video Lectures (e-Resources):

- http://.ac.in/courses.php?disciplineID=111
- http://academicearth.org/
- http://www.bookstreet.in.
- VTU e-Shikshana Program
- VTU EDUSAT Program

Skill Development Activities Suggested

- Quizzes
- Assignments
- Seminars

Course outcome (Course Skill Set)

At the end of the course the student will be able to :

Sl. No.	Description	Blooms Level
CO1	Identify and analyse the product design and development processes in manufacturing industry	
CO2	Define the components and their functions of product design and development processes and their relationships from concept to customer over whole product life cycle	
CO3	. Analyse, evaluate and apply the methodologies for product design, development and management	
CO4	Undertake a methodical approach to the management of product development to satisfy customer needs. .	
CO5	Carry out cost and benefit analysis through various cost models	

Program Outcome of this course

Programme Outcome:

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

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

PO3 - Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program

PO4 - Understand contemporary issues in management and develop relationship between engineering and management practices

PO5 – develop the understanding of various quantitative techniques and approaches to solve management problems

PO6 – ability to understand the techniques of marketing management and marketing research

PO7 –familiarization with roles and responsibilities of a manager in engineering practice

Mapping of COS and POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	2	2	2	3	3	3	3
CO2	1	3	1	3	2	2	3
CO3	2	2	1	2	2	2	2
CO4	1	2	2	2	3	2	2
CO5	2	3	3	2	2	3	2

PROJECT WORK PHASE – 1			
Course Code	**22MEM34**	CIE Marks	100
Number of contact Hours/Week	**0-6-0**	SEE Marks	**--**
Credits	**03**	Exam Hours	**--**

Course objectives:

- Support independent learning.
- Guide to select and utilize adequate information from varied resources maintaining ethics.
- Guide to organize the work in the appropriate manner and present information (acknowledging the sources) clearly.
- Develop interactive, communication, organisation, time management, and presentation skills.
- Impart flexibility and adaptability.
- Inspire independent and team working.
- Expand intellectual capacity, credibility, judgement, intuition.
- Adhere to punctuality, setting and meeting deadlines.
- Instil responsibilities to oneself and others.
- Train students to present the topic of project work in a seminar without any fear, face audience confidently, enhance communication skill, involve in group discussion to present and exchange ideas.

Project Phase-1: The project work shall be carried out individually. However, in case a disciplinary or interdisciplinary project requires more participants, then a group consisting of not more than three shall be permitted.
Students in consultation with the guide/co-guide (if any) in disciplinary project or guides/co-guides (if any) of all departments in case of multidisciplinary projects, shall pursue a literature survey and complete the preliminary requirements of the selected Project work. Each student shall prepare a relevant introductory project document, and present a seminar.

Course Outcomes:

At the end of the course the student will be able to:

- Demonstrate a sound technical knowledge of their selected project topic.
- Undertake problem identification, formulation, and solution.
- Design engineering solutions to complex problems utilising a systems approach.
- Communicate with engineers and the community at large in written an oral forms.
- Demonstrate the knowledge, skills and attitudes of a professional engineer.

Continuous Internal Evaluation

- CIE marks shall be awarded by a committee comprising of HoD as Chairman, all Guide/s and co-guide/s (if any) and a senior faculty of the concerned departments. The CIE marks awarded for project work phase -1, shall be based on the evaluation of Project Report, Project Presentation skill, and performance in the Question-and-Answer session in the ratio of **50:25:25**.
- There will be **no SEE**.

INTERNSHIP			
Course Code	**22MEMI36**	CIE Marks	50
Number of contact Hours/Week	**6 Weeks**	SEE Marks	50
Credits	**06**	Exam Hours	03

Course Objectives:

Internship/Professional practice provide students the opportunity of hands-on experience that include personal training, time and stress management, interactive skills, presentations, budgeting, marketing, liability and risk management, paperwork, equipment ordering, maintenance, responding to emergencies etc.

The objectives are further,

- To put theory into practice.
- To expand thinking and broaden the knowledge and skills acquired through course work in the field.
- To relate to, interact with, and learn from current professionals in the field.
- To gain a greater understanding of the duties and responsibilities of a professional.
- To understand and adhere to professional standards in the field.
- To gain insight to professional communication including meetings, memos, reading, writing, public speaking, research, client interaction, input of ideas, and confidentiality.
- To identify personal strengths and weaknesses.
- To develop the initiative and motivation to be a self-starter and work independently.

Internship: Students under the guidance of internal guide/s and external guide shall take part in all the activities regularly to acquire as much knowledge as possible without causing any inconvenience at the place of internship.

Each student, is required to

- Present the seminar on the internship orally and/or through power point slides.
- Answer the queries and involve in debate/discussion.
- Submit the report duly certified by the external guide.
- The participants shall take part in discussion to foster friendly and stimulating environment in which the students are motivated to reach high standards and become self-confident.

Course outcomes:

At the end of the course the student will be able to:

- Gain practical experience within industry in which the internship is done.
- Acquire knowledge of the industry in which the internship is done.
- Apply knowledge and skills learned to classroom work.
- Develop a greater understanding about career options while more clearly defining personal career goals.
- Experience the activities and functions of professionals.
- Develop and refine oral and written communication skills.
- Identify areas for future knowledge and skill development.
- Expand intellectual capacity, credibility, judgment, intuition.
- Acquire the knowledge of administration, marketing, finance and economics.

Continuous Internal Evaluation

CIE marks for the Internship report, presentation and question and answer session shall be awarded in the ratio of 50:25:25 for the **total CIE of 50 marks** by the committee constituted for the purpose by the Head of the Department. The committee shall consist of three faculty from the department with committee comprising of HoD as Chairman, all Guide/s and co-guide/s (if any) and a senior faculty of the concerned departments.

Semester End Examination

SEE marks for the internship report (30 marks), seminar (20 marks) and question and answer session (10 marks) shall be awarded in the ratio of 50:25:25 for the **total SEE of 50 marks** (based on the quality of report and presentation skill, participation in the question and answer session) by the examiners appointed by the University.

IV SEMESTER

PROJECT WORK PHASE -2

Course Code	**22MEM41**	CIE Marks	100
Number of contact Hours/Week	**8 Hours/Week**	SEE Marks	100
Credits	**18**	Exam Hours	03

Course Objectives:

- To support independent learning.
- To guide to select and utilize adequate information from varied resources maintaining ethics.
- To guide to organize the work in the appropriate manner and present information (acknowledging the sources) clearly.
- To develop interactive, communication, organisation, time management, and presentation skills.
- To impart flexibility and adaptability.
- To inspire independent and team working.
- To expand intellectual capacity, credibility, judgement, intuition.
- To adhere to punctuality, setting and meeting deadlines.
- To instill responsibilities to oneself and others.
- To train students to present the topic of project work in a seminar without any fear, face audience confidently, enhance communication skill, involve in group discussion to present and exchange ideas.

Project Work Phase - II: Students in consultation with the guide/co-guide (if any) in disciplinary project or guides/co-guides (if any) of all departments in case of multidisciplinary projects, shall continue to work of Project Work phase -1to complete the Project work. Each student / batch of students shall prepare project document, and present a seminar.

CIE marks shall be awarded by a committee comprising of HoD as Chairman, all Guide/s and co-guide/s (if any) and a senior faculty of the concerned departments. The CIE marks awarded for project work phase -2, shall be based on the evaluation of Project Report, Project Presentation skill, and performance in the Question-and-Answer session in the ratio of 50:25:25.

SEE shall be at the end of IV semester. Project work evaluation and Viva-Voce examination (SEE), after satisfying the plagiarism check, shall be as per the University norms.

Course Outcomes:

At the end of the course the student will be able to:

- Present the project and be able to defend it.
- Make links across different areas of knowledge and to generate, develop and evaluate ideas and information so as to apply these skills to the project task.
- Habituated to critical thinking and use problem solving skills
- Communicate effectively and to present ideas clearly and coherently in both the written and oral forms.
- Work in a team to achieve common goal.
- Learn on their own, reflect on their learning and take appropriate actions to improve it.