MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act 1956)

FACULTY OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF MECHANICAL ENGINEERING

CURRICULUM

AND

SCHEME OF EXAMINATION

(M.TECH IN MECHANICAL ENGINEERING)

BATCH: 2022-24

Index

Vision and Mission of the Department of Mechanical Engineering

Vision of the Department:

To develop the department into an advance center of learning by synergizing teaching, learning and research to produce competent Mechanical Engineers with an exposure to interdisciplinary engineering knowledge.

Mission of the Department:

The Mechanical Engineering Department is committed to:

M1 Produce job ready engineers in the field of production, design, thermal, industrial and automation engineering by imparting basic sciences and engineering education.

M2 Nurture students with creativeness, innovativeness and to develop ability to think out-of-the-box and respond effectively to the needs of the industry and the ever-changing world scenario.

M3 Conduct high quality research, provide industrial consultancy and offer state-of-art undergraduate, postgraduate and doctoral programmes.

About the Department:

Professional opportunities are vast in numbers for a mechanical engineer in generation and distribution of energy, material processing, industrial automation and control of manufacturing systems, design and development of mechanisms and machines. Ever since its inception in 1997, Department of Mechanical Engineering has grown in stature over the years considering its performance and achievements. The B.Tech-Mechanical Engineering programme offered by the department has been accredited by NBA in 2004, 2007 and 2018. Mechanical Engineering, being a very versatile branch, remains the most preferred programme for admission seekers. The department takes pride in its highly qualified faculty members who are actively involved in research and innovation. A large number of research papers have been published by faculty members in reputed journals. The department has labs on Mechatronics, CIM, Thermal Engineering, Fluid Mechanics, Fluid Machines and Turbo Machinery, Applied Mechanics, Strength of Material, Metrology etc. which are at par with the institutes of academic excellence. Mechanical Engineering Department is a continuously evolving department possessing several newer trends and opportunities to offer. Recently the department has procured several versatile software licenses including CREO, ALTAIR, MATLAB, etc. which are installed in CAD lab and design center.Also, the labs are consistently upgraded with the addition of major equipment like Fatigue test rig, Torsion Test rig, HMT Precision Lathe, Cylindrical grinding machine, Tool maker's microscope, Gear Roller tester (Parkinson's type), Autocollimeter, EDM, etc. along with already existing state of the art equipment.

The Institute of Indian Foundrymen (IIF) and Mechanical Engineering Department from Manav Rachna International Institute of Research (MRIIRS) have joined hands to establish the Faridabad Chapter of IIF Northern Region at the Manav Rachna campus.

The student chapter of Mechanical Engineering Department from Manav Rachna International Institute of Research and Studies is responsible for organizing many events in Collaboration with ISHRAE (Indian Society of Heating, Refrigeration & Air conditioning Engineers) such as job junction, expert lectures, technical quiz etc.

The department has signed memorandum of understanding with more than 50 companies including Miniratna Government of India enterprises like National Small Industries Corporation (NSIC), Ministry of Micro, Small & Medium Enterprises (MSME)*, etc. A MoU has also been signed with Orient Electric Ltd, Faridabad to carry out consultancy projects.

The department offers following programmes at Graduate/ Post Graduate level apart from Ph.D. degree. At graduate levels, there are options of core Mechanical Engineering, Industry Integrated (JBM) Mechanical Engineering and Mechanical Engineering with specialization in Mechatronics. At post graduate level, the specialization is in Industrial Engineering. At doctoral level, there is an entire plethora of domains available due to versatility of extremely competent team of faculty members.

Program Outcomes (POs):

1. **Scholarship of Knowledge**

Acquire in-depth knowledge of specific discipline or professional area, including wider and global perspective, with an ability to discriminate, evaluate, analyze and synthesize existing and new knowledge, and integration of the same for enhancement of knowledge.

2. **Critical Thinking**

Analyze complex engineering problems critically, apply independent judgment for synthesizing information to make intellectual and/or creative advances for conducting research in a wider theoretical, practical and policy context

3. **Problem Solving**

Think laterally and originally, conceptualize and solve engineering problems, evaluate a wide range of potential solutions for those problems and arrive at feasible, optimal solutions after considering public health and safety, cultural, societal and environmental factors in the core areas of expertise

4. **Research Skill**

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

5. **Usage of modern tools**

Create, select, learn and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modeling, to complex engineering activities with an understanding of the limitations.

6. **Collaborative and Multidisciplinary work**

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

7. **Project Management and Finance**

Demonstrate knowledge and understanding of engineering and management principles and apply the same to one's own work, as a member and leader in a team, manage projects efficiently in respective disciplines and multidisciplinary environments after consideration of economical and financial factors.

8. **Communication**

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

9. **Life-long Learning**

Recognize the need for, and have the preparation and ability to engage in life-long learning independently, with a high level of enthusiasm and commitment to improve knowledge and competence continuously.

10. Ethical Practices and Social Responsibility

Acquire professional and intellectual integrity, professional code of conduct, ethics of research and scholarship, consideration of the impact of research outcomes on professional practices and an understanding of responsibility to contribute to the community for sustainable development of society.

11. Independent and Reflective Learning

Observe and examine critically the outcomes of one's actions and make corrective measures subsequently, and learn from mistakes without depending on external feedback.

Program Specific Outcomes (PSOs):

1. Student will be able to carry out research/investigation to solve industrial problems related to industrial engineering.
2. Student will be able to write and present substantial technical reports/documents.
3. Studentwill be able to innovative and develop new production components, processes and systems.

Program Educational Objectives (PEOs):

1. To inculcate group work and team management skills with cross-cultural etiquettes, promoting knowledge transfer leading to conceptualization and delivery of projects and products with varied complexity.
2. To provide sound knowledge of industrial engineering and sensitize students towards issues of social relevance, openness to other international cultures and to introduce them to professional ethics and practice.
3. To enable students to develop innovative technologies and find solutions to engineering problems.
4. To equip students with technical and leadership skills for successful transition into an educational, managerial, researchor public sector career.

PEO Statements	**Mission 1**	**Mission 2**	**Mission 3**
PEO1: To inculcate group work and team management skills with cross-cultural etiquettes, promoting knowledge transfer leading to conceptualization and delivery of projects with varied complexity.	**3**	**2**	**2**
PEO2: To sensitize students towards issues of social relevance, openness to other international cultures and to introduce them to professional ethics and practice.	**3**	**1**	**2**
PEO3: To develop innovative technologies and find solutions to engineering problems.	**3**	**3**	**3**
PEO4: To enablestudents with technical and leadership skills for successful transition into an educational, managerial, research or public sector career.	**3**	**3**	**3**

MAPPING OF PEO WITH POs AND PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
PEO1	2	2	3	3	2	3	3	3	2	2	2	3	2	2
PEO2	3	3	3	3	2	3	1	2	3	3	2	2	2	2
PEO3	2	3	3	3	3	1	1	2	2	1	2	3	2	3
PEO4	2	3	2	2	3	3	2	3	2	3	2	2	3	3

Semester & Choice Based Credit System

Credit based system of study and student's performance/progress is measured by the number of credits that he/she has earned, i.e. completed satisfactorily. Based on the course credits and grade obtained by the student, grade point average is calculated

(a) Course credits assignment

Each course has a certain number of credits assigned to it depending upon its duration in periods for lecture, tutorial and laboratory/clinical practice in a week. A few courses/activities are without credit (s) and are referred to as Audit Pass Courses (APC) but are mandatory to pass as a partial fulfillment of award of degree.

(b)Earning of credits

At the end of every course, a letter "Grade" shall be awarded in each course for which a student has registered. On obtaining a minimum Pass Grade, student shall accumulate the course credits as Earned Credits. A student's performance shall be measured by the number of credits that he/she has earned and by the weighted grade point average. Grades obtained in the audit courses shall not be counted for computation of grade point average, however shall be mandatory to pass as a partial fulfillment of award of degree.

For Award of Degree of a programme B.Tech in Mechanical Engineering, he/she has to earn minimum 160 credits during the 4 year duration of the programme in 8 semesters.

The total credits required to be earned have been further classified under two baskets of courses: "Compulsory Courses Basket", and "Elective Courses Basket". The total 122 credits required to be earned under "Compulsory Courses Basket" and 38 credits under "Elective Courses Basket".

All courses under "Compulsory Courses Basket", are required to be qualified and cleared/pass by each and every students enrolled under the programme and are semester-wise listed in the study scheme along with credits assigned to each course.

Under Elective Courses Basket, there will be three types of courses:

- Semester-wise courses offered by the department itself
- Open/Inter-disciplinary courses offered at the Institute/University level notified from the office of Dean-Academics.
- Massive Open Online Courses (MOOCs) available on SWAYAM Platform or any other platform as recommended by UGC/AICTE and notified from the office of Dean-Academics.

Each course shall have credits assigned to it. Student shall be required to register courses every semester for as many courses/credits specified under "Elective Courses Basket" depending upon his/her interest, capability/pace of learning and availability of time slot (without any clash in time table) so as to earn all required total credits under the "Elective Courses Basket" during the entire programme duration.

However, for registration of courses [including courses under "Compulsory Courses Basket", "Elective Courses Basket" and Previous Semester Courses (wherein he/she was declared in-eligible on the basis of attendance or he/she could not clear the course within permissible given chances)], if any, the maximum limit in a semester shall be 30 credits.

Study Scheme
for
M.Tech
Mechanical Engineering
Batch 2022-2024

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

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M.Tech in Mechanical Engineering

Study Scheme for Batch 2020-2022

SEMESTER I

S. No	Course Code	Subject	Periods/Week				Marks			Duration of Exam	Credits
			L	T	P	Total	Int	Ext	Total		
1	MME-101	Work Study and Ergonomics	3	0	0	3	100	100	200	3	3
2	MME-102	Industrial Statistics and Forecasting	3	0	0	3	100	100	200	3	3
3		Programme Elective-I	3	0	0	3	100	100	200	3	3
4		Programme Elective-II	3	0	0	3	100	100	200	3	3
5	M- MC-100	Research Methodology and IPR	2	0	0	2	50	50	100	3	2
6	MME-151	Computational Lab	0	0	4	4	50	50	100	3	2
7	MME-152	Flexible Manufacturing System Lab	0	0	4	4	50	50	100	3	2
8	M-MC-001	Stress Management by Yoga	2	0	0	2	25+25	50	100		AP
TOTAL			**16**	**0**	**8**	**24**	**600**	**600**	**1200**		**18**

SEMESTER II

1	MME-201	Inventory Management	3	0	0	3	100	100	200	3	3
2	MME-202	Operations Planning and Control	3	0	0	3	100	100	200	3	3
3		Programme Elective-III	3	0	0	3	100	100	200	3	3
4		Programme Elective-IV	3	0	0	3	100	100	200	3	3
5	ME-M-200	Mini Project with Seminar	0	0	4	4	100	50	150	3	2
6	MME-251	Simulation Lab	0	0	4	4	50	50	100	3	2
7	MME-252	Quality Control Lab	0	0	4	4	50	50	100	3	2
8	M-MC-002	English for Research Paper Writing	2	0	0	2	50	50	100	2	AP
TOTAL			**14**	**0**	**12**	**26**	**650**	**600**	**1250**		**18**

SEMESTER III

S. No		Subject	Periods/Week				Marks			Duration of Exam	Credits
			L	T	P	Total	Int	Ext	Total		
1		Programme Elective-V	3	0	0	3	100	100	200	3	3
2		Open Elective	3	0	0	3	100	100	200	3	3
3	MME-300	Dissertation (Phase-I)	0	0	20	20	200	100	300	4	10
TOTAL			**6**	**0**	**20**	**26**	**400**	**300**	**700**	**10**	**16**

SEMESTER IV

S.no		Subject	Periods/Week				Marks			Duration of Exam	Credits
			L	T	P	Total	Int	Ext	Total		
1	MME-400*	Dissertation(Phase-II)*	0	0	32	32	400	200	600	**3**	16
TOTAL			**0**	**0**	**32**	**32**	**400**	**200**	**600**	**3**	**16**

Summary of Semester-wise credits	
Semester	**Credits**
I	18
II	18
III	16
IV	16
TOTAL	**68**

* The student should publish at least one research paper in non-paid, non-predatory, journal /conference of high repute preferably indexed in SCI/SCOPUS/WOS database.

S.No	Course Code	Programme Elective-I	L	T	P	Credits
1	MME-121	Management Concept and Organisation Behaviour	3	0	0	3
2	MME-122	Human Resource Management	3	0	0	3
3	MME-123	Project Management	3	0	0	3

S.No	Course Code	Programme Elective-II	L	T	P	Credits
1	MME-131	Enterprise Resource Planning	3	0	0	3
2	MME-132	Supply Chain Management	3	0	0	3
3	MME-133	Material Handling System	3	0	0	3
S.No	**Course Code**	**Programme Elective-III**	**L**	**T**	**P**	**Credits**
1	MME-221	Flexible Manufacturing System	3	0	0	3
2	MME-222	Managerial Accounting & Financial Control	3	0	0	3
3	MME-223	Marketing Management	3	0	0	3
S.No	**Course Code**	**Programme Elective-IV**	**L**	**T**	**P**	**Credits**
1	MME-231	Quality Control Techniques	3	0	0	3
2	MME-232	Lean and Agile Manufacturing	3	0	0	3
3	MME-233	Group Technology	3	0	0	3

S.No	Course Code	Programme Elective-V	L	T	P	Credits
1	MME-321	Simulation and Modelling	3	0	0	3
2	MME-322	E-Commerce	3	0	0	3
3	MME-323	Management Information System	3	0	0	3
4	MME-324	Reliability Engineering	3	0	0	3

S.No	Course Code	Open Elective	L	T	P	Credits
1	M-ID-001	Business Analytics	3	0	0	3
2	M-ID-002	Industrial Safety	3	0	0	3
3	M-ID-003	Operations Research	3	0	0	3
4	M-ID-004	Cost Management of Engineering Projects	3	0	0	3
5	M-ID-005	Composite Materials	3	0	0	3
6	M-ID-006	Waste to Energy	3	0	0	3

S.No	Course Code	Audit Course 1 & 2	L	T	P	Credits
1	M-MC-001	Stress Management by Yoga	2	0	0	AP
2	M-MC-002	English for Research Paper Writing	2	0	0	AP
3	M-MC-003	Disaster Management	2	0	0	AP
4	M-MC-004	Sanskrit for Technical Knowledge	2	0	0	AP
5	M-MC-005	Value Education	2	0	0	AP
6	M-MC-006	Constitution of India	2	0	0	AP
7	M-MC-007	Pedagogy Studies	2	0	0	AP
8	M-MC-008	Personality Development through Life Enlightenment Skills.	2	0	0	AP

Course Details/Contents

SEMESTER I

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

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MME-101: WORK STUDY & ERGONOMICS

Periods/week	Credits	Max. Marks: 200
L: 3 T: 0	3	Continuous Assessment: 100
Duration of Examination: 3 Hrs		End Term Examination: 100

Course Type: CORE

Course Outcomes:
After completion of this course the students will be able to

MME-101.1	Define and calculate the basic work content of a specific job for employees of an organization.
MME-101.2	Assess the level of risk in a job causing stress, fatigue and musculoskeletal disorders and design appropriate work systems
MME-101.3	Evaluate a worker engaged on a live job and calculate basic, allowed and standard time for the same.
MME-101.4	Analyze the existing methods of working for a particular job and develop an improved method through questioning technique.
MME-101.5	Evaluate and devise appropriate wage and incentive plan for the employees of an organization.
MME-101.6	Examine and assess the occupational environmental factors like heat stress, noise, and vibration.

Part-A

Unit 1: Productivity

Introduction of Productivity & its role, Productivity measurement, Kinds of productivity measurements, Role of management in productivity programme, Introduction to work study, Basic principles of work study and motion economy and their applications. Approach to method design, method study charting techniques, chart type, process chart symbols, construction of charts and application of flow chart.

Unit 2: **Work Study & Measurement**

Flow Diagrams, Travel charts, String diagrams and its application in layout development, Objective and purpose of string diagram, Critical examination and analysis, Work study data required to develop work place layout, Motion reduction and time balancing work measurement techniques, Performance rating & allowance, Time study and equipment's required, Data for time study and time study practice, Computation of standard time, Work sampling technique & its applications.

Unit 3: **Human Factor in Work Study**

Work Design approach, a new design, modification of existing design, assessment of design (pertaining to work station), limitation of man and machine with respect to teach other. Posture standing at work, seated at work, work station heights and seat geometry. Micro motion study, purpose of micro motion study and applications, micro study equipment, cycle graph. Definition of therbligs, film analysis and sumochart, memo motion study.

Part-B

Unit 4: **Ergonomics**

Introduction to ergonomics man/machine/environment systems concept, Development of ergonomics system approach to ergonomics models. Work capability, work design consideration, functions performed by man and mechanism involved, muscular performance, Development of stress in human body and their consequences.

Unit 5:**Design of Man-Machine System**

Design and display of controls, hand & foot control, location of control and work place envelop. Recommendation about hand & foot push buttons rotary selector switches, hand wheels, crank levers etc., investments and display. Man-machine system, Quantitative displays, Layout panels and machines. Design of work place and effect of environment on workers.

Unit 6: **Incentive**

Definition of Incentive, Types of incentives, effect of incentive on motivation and productivity, Incentive wage payment plans, effect of climate, heat humidity and body heat balance on performance on work force, effective temperature scales. Zones of discomfort, physiological effects of noise on performance.

Reference Books:

1. Krick E V, 1966, Method of Engineering Study
2. Shah H. S., 2001, Work Study & Ergonomics
3. Suresh Dalela, Saurabh, 1999, Text Book of Work Study & Ergonomics, standard Publisher.
4. Bridger, 2006,Introduction to Ergonomics– Tata McGraw Hill
5. O P Khanna, 2016, Work Study, Dhanpat Rai.
6. Relph M Barnes, John Willy, 1980, Motion & Time study, John Wiley & sons .

Instructions for setting of Paper: Seven questions are to set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each part A and part B (one from each unit). Student needs to attempt two questions out of three questions from each part. Each question will be of 20 marks.

In general parameters for Internal /Continuous Assessment (Theory Courses):

Parameter	Weightage
Two Sessional (Mid-Term)Tests	**60%**
Assignments	**20%**
Class Performance	**10%**
Class Attendance	**10%**

Theory Course: Total Marks 200

Internal/Continuous Assessment: 100

Two Sessional Tests: 30 Marks Each (Total weighted marks for Sessional Tests: 60)

Assignments: 20 Marks

Class Work/ Performance: 10 Marks

Attendance: 10 Marks

End Semester Exams: 100 Marks

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
MME-101.1	3	2	1	2	1	-	1	2	1	1	1	3	2	2
MME-101.2	3	3	3	3	3	2	1	2	2	2	2	2	2	2
MME-101.3	3	3	3	3	3	3	1	2	2	2	3	3	2	3
MME-101.4	3	3	3	3	3	3	1	3	2	3	2	2	3	3
MME-101.5	3	3	3	3	3	3	3	2	2	2	2	-	1	2
MME-101.6	2	3	3	2	3	3	2	3	3	3	2	1	2	3

MME-102: INDUSTRIAL STATISTICS AND FORECASTING

Periods/week	Credits	Max. Marks:200
L: 3 T: 0	3	Continuous Assessment:100
Duration of Examination: 3 Hrs		End Term Examination:100

Course Type: Fundamental

Course Outcomes:
After completion of this course the students will be able to

MME-102.1	Define the various testing methods for statistics and forecasting.
MME-102.2	Assess the effect of forecasting methods on the statistical analysis.
MME-102.3	Evaluate the concepts in sampling, sampling distributions and estimation.
MME-102.4	Understand problem of statistical inference, problem of testing of hypothesis.
MME-102.5	Apply the decision making process under uncertainty using statistical tools.
MME-102.6	Examine the importance and application of different hypothesis testing methods.

Part-A

Unit 1: Moments, Skewness and Kurtosis
Moments, Skewness and Kurtosis, Set theory, Elements of probability, Sampling distribution, Standard error concept, Statistical estimation and decision making.

Unit 2: Tests of Hypotheses
Hypothesis testing procedure for one sample, hypothesis testing of mean. Hypothesis testing procedure for two samples, test for difference between means and proportions for small sample size,test for difference between means and proportions for large sample size, test for difference between means with dependent samples, test for difference between proportions for large sample sizes, Chi-square test as test of independence, chi-square test of goodness of fit, testing the appropriateness of a distribution.

Unit 3: Analysis of Varianceand Regression Analysis
Analysis of variance(ANOVA), making inferences about population parameters, distribution of sample variance, confidence level for population variance, Simple Regression and Correlation, estimation using the regression line, Correlation Analysis.

Part-B

Unit 4: Time Series
Time series and its components, Determination of trend, adaptive filtering, simple regression and correlation.Basic considerations of successful forecasting, forecast object and forecast statement, forecast horizon, modeling and forecasting trends, modeling and forecasting seasonality.

Unit 5:Considerations in Forecasting
Basic considerations of successful forecasting, decision environment and loss function, forecast object and forecast statement, forecast horizon, the information set, methods and complexity, parsimony principle and shrinkage principle, statistical graphics for forecasting

Unit 6: Modelling Cycles

Modelling and forecasting trends, modelling and forecasting seasonality, modelling cycles, Moving average (MA) model, auto-regressive (AR) model, Auto regressive moving average (ARMA) model, forecasting cycles – optimal forecasts, chain rule of forecasting.

Text Books:

1. Richard I Levin, David S Rubin, 1994, Statistics for Management.
2. Elements of Forecasting- Francis X Diebold
3. Statistical Methodology – S P Gupta

Reference Books

1.O P Khanna, 2016, Industrial Engineering, Dhanpat rai Publications

Instructions for setting of Paper: Seven questions are to set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each part A and part B (one from each unit). Student needs to attempt two questions out of three questions from each part. Each question will be of 20 marks.

In general parameters for Internal /Continuous Assessment (Theory Courses):

Parameter	Weightage
Two Sessional (Mid-Term)Tests	**60%**
Assignments	**20%**
Class Performance	**10%**
Class Attendance	**10%**

Theory Course: Total Marks 200

Internal/Continuous Assessment: 100

Two Sessional Tests: 30 Marks Each (Total weighted marks for Sessional Tests: 60)

Assignments: 20 Marks

Class Work/ Performance: 10 Marks

Attendance: 10 Marks

End Semester Exams: 100 Marks

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
MME-102.1	3	2	2	3	-	2	1	1	2	1	3	-	2	2
MME-102.2	3	3	3	3	3	1	1	2	2	2	2	2	2	2
MME-102.3	3	3	3	3	3	2	1	2	2	2	3	3	2	3
MME-102.4	3	3	3	3	3	3	1	2	2	3	2	2	3	3
MME-102.5	2	2	2	2	2	2	1	2	2	2	2	-	1	2
MME-102.6	2	3	3	2	3	3	1	3	3	2	2	2	-	3

Program Elective-I

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MME-121: MANAGEMENT CONCEPT & ORGANISATION BEHAVIOR

Periods/week	Credits	Max. Marks:200
L: 3 T: 0	3	Continuous Assessment:100
Duration of Examination: 3 Hrs		End Term Examination:100

Course Type: Elective

Course Outcomes:
After completion of this course the students will be able to

MME-121.1	Define the concept of management.
MME-121.2	Assess the management functions such as planning and organizing.
MME-121.3	Evaluate the effect of organisational behaviour on organisation growth.
MME-121.4	Illustrate the understanding of behavioural process of the organizations as a whole
MME-121.5	Recall and cultivate an insight into the individual behaviour at work place.
MME-121.6	Examine the behavioural effect on personality and job performance.

Part-A

UNIT 1: Management: Concept and Beyond
Emergence of Management Thought – Classical, Neo-Classical and Modern Theories; Role of various great managers like F.W. Taylor, Gilberth, H.R. Gantt, Henry Fayol in evolution of management concept, Nature and Scope of Management, Functions of Management; Quality, Skills and Responsibilities of good managers, Comparative Management: Japanese, American and Indian.

UNIT 2: Planning and Decisions
Introduction to planning, Steps in Planning Process, Scope and Limitations, Types of planning: Short Range and Long Range Planning, Importance of Flexibility in Planning, Characteristics of a sound Plan.
Introduction to decision, Definition, importance of decision-making, Types of Decisions, Process to make effective decisions, Creativity in Decision Making, decision making environment- certainty, risk, uncertainty, decision making with utilities.

UNIT 3: Organizations
Organization: Introduction, meaning, principles, structure, types; authority and responsibility relationships, Emerging Trends in Organizations: Structure, Strategy and Culture,
Organizational design: Impact of Technology on Organizational design; Mechanistic vs Adoptive Structures - Formal and Informal Organization, Centralized vis Decentralization
Organizational Behaviour: Introduction, meaning, definition, scope, objectives; Various Models for OB; Contributing Disciplines to OB: Emerging Challenges for OB: Organizations as Social Systems.

Part-B

UNIT 4:Perception and Individual Differences
Personality and Individual Differences - Types of personalities, Values, Attitudes and Beliefs,
Foundations of Individual Behaviour; Individual Differences; Basic understanding of Attitudes, perception and learning; Work Motivation – Theories and Applications; communication: Process, Forms, Barriers and Effectiveness Barriers and Effectiveness. Stress Management

UNIT 5:Group Concept and Team Building

Group concept and team building: – Overview of Groups, Types, Stages, Group Decision making; Interpersonal Relationship; Inter group Dynamics, Interactions, Influencing Factors; Leadership Concept, Theories, and Effectiveness. Theories of group formation, Formal and Informal groups, Importance of team building, Conflict management

UNIT 6: Creativity and Innovation

Basics of creativity and innovation, creativity tools and techniques: Lateral Thinking, Enablers and Barriers to Creativity, Creative Personality, Brainstorming, Entrepreneurial Creativity, Characteristics of Creative Groups. Types of Innovation: Incremental and Radical Innovation, Factors that Favour Incremental Innovation, Service Innovations, Innovations in Processes,

Text Books:

1. Stephen Robbins, 2001, Organisation Behavior, 9th Edition, Pearson
2. Davis and Newstorm, 1989, Human Behavior at workDavis and Newstorm
3. Uma Sekaran, 2018, Organisational Behaviour, McGraw Hill.
4. Sharma, 2012, Organisational Behaviour
5. Koontz, 2016, Essentials of Management, McGraw Hill.
6. Saxena, 2007, Principles and Practices of Management
7. Shejwalkar and Ghanekar, 2013,Principles and Practices of Management, TATA mcgraw Hill
8. Hannagan, 2008,Management Concept and Practices, Pearson Publications.
9. Prasad, LM, 2000, Organizational Behaviour; Sultan Chand & Sons, New Delhi

Instructions for setting of Paper: Seven questions are to set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each part A and part B (one from each unit). Student needs to attempt two questions out of three questions from each part. Each question will be of 20 marks.

In general parameters for Internal /Continuous Assessment (Theory Courses):

Parameter	Weightage
Two Sessional (Mid-Term)Tests	**60%**
Assignments	**20%**
Class Performance	**10%**
Class Attendance	**10%**

Theory Course: Total Marks 200

Internal/Continuous Assessment: 100

Two Sessional Tests: 30 Marks Each (Total weighted marks for Sessional Tests: 60)

Assignments: 20 Marks

Class Work/ Performance: 10 Marks

Attendance: 10 Marks

End Semester Exams: 100 Marks

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
MME-121.1	3	2	2	3	3	2	-	1	2	1	3	1	2	2
MME-121.2	3	3	3	3	3	1	1	2	2	2	2	2	2	2
MME-121.3	3	3	3	3	3	2	1	2	2	2	3	3	2	3
MME-121.4	3	3	3	3	3	3	1	2	2	3	2	2	3	3
MME-121.5	2	2	2	2	2	2	1	2	2	2	2	3	-	2
MME-121.6	2	3	3	2	3	3	1	3	3	2	2	-	1	2

MME-122: HUMAN RESOURCE MANAGEMENT

Periods/week	Credits	Max. Marks:200
L: 3 T: 0	3	Continuous Assessment:100
Duration of Examination: 3 Hrs		End Term Examination:100

Course Type: Elective

Course Outcomes:
After completion of this course the students will be able to

MME-122.1	Understand the concept of human resource management and to understand its relevance in organizations.
MME-122.2	Develop necessary skill set for application of various HR issues.
MME-122.3	Analyse the strategic issues and strategies required to select and develop manpower resources
MME-122.4	Integrate the knowledge of HR concepts to take correct business decisions.
MME-122.5	Recall the HR related issues for smooth functioning of an organization.
MME-122.6	Examine the impact the HR related activities on business environment.

Part-A

Unit 1: History of HRM

Evolution and Human Resource Development as a management philosophy – Meaning, Scope and importance – Personnel Management Vs. Human Resource Development – Role Analyor's and Human Resource Development – Key performance areas, critical attributes and role effectiveness.

Unit 2: Performance Appraisaland its Objectives

Considerations in performance appraisal – The Appraisal process – Appraisal methods – Development oriented appraisal system – Interpersonal feedback and performance counseling – Developing dyadic relationship through effective counseling.

Unit 3: Learning Principles

Identification of training needs – Training objectives – Training Programme Design – Training methods – Evaluation of Training and follow-up training

Part-B

Unit 4: Career Planning and Development

Need and Importance of Management Development – Management Process – Components of Management Development programmes – Techniques of Management Development – Merits and Demerits of Management Development Techniques.

Unit 5: Organisational Effectiveness

Organisational culture – Organisational Development – Organisational Development interface – Managing Change through Organisational Development. Human Resource Development.

Unit 6:Total Quality Management and ISO 9000

Total Quality Management and ISO 9000 – Human Resource Development Experiences in India – Emerging trends and perspectives.

Reference Books:

1. Pareek Udai & T.V. Rao, 2015, Designing & Managing Human Resource Systems, Oxford & IBH Publishing Co.
2. T.V. Rao, 2015, Performance Appraisal: Theory & Practice,
3. T.V. Rao, 2012, Alternative Approaches & Strategies of HRD, Oxford & IBH Publishing Co
4. D.M. Silvera, 1988, Human Resource Development, Newsindia Publications,
5. Kohli Unit & D. Sinha, 200, Human Resource Development, Global Changes and Strategies

Instructions for setting of Paper: Seven questions are to set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each part A and part B (one from each unit). Student needs to attempt two questions out of three questions from each part. Each question will be of 20 marks.

In general parameters for Internal /Continuous Assessment (Theory Courses):

Parameter	Weightage
Two Sessional (Mid-Term)Tests	**60%**
Assignments	**20%**
Class Performance	**10%**
Class Attendance	**10%**

Theory Course: Total Marks 200

Internal/Continuous Assessment: 100

Two Sessional Tests: 30 Marks Each (Total weighted marks for Sessional Tests: 60)

Assignments: 20 Marks

Class Work/ Performance: 10 Marks

Attendance: 10 Marks

End Semester Exams: 100 Marks

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
MME-122.1	3	2	2	3	3	2	1	1	-	1	3	3	2	2
MME-122.2	3	3	3	3	3	1	1	2	2	2	2	-	1	2
MME-122.3	3	3	3	3	3	2	1	2	2	2	3	3	2	3
MME-122.4	3	3	3	3	3	3	1	2	2	3	2	2	3	3
MME-122.5	2	2	2	2	2	2	1	2	2	2	2	2	3	1
MME-122.6	2	3	3	2	3	3	1	3	3	2	2	1	-	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

(Deemed to be University under section 3 of the UGC Act 1956)

MME-123 PROJECT MANAGEMENT

Periods/week	Credits	Max. Marks: 200
L: 3 T: 0	3	Continuous Assessment: 100
Duration of Examination: 3 Hrs		End Term Examination: 100

Course Type: Elective

Course Outcomes:

After completion of this course the students will be able to

MME-123.1	Define the project planning, appraisal and monitoring.
MME-123.2	Understand various inventory requirements to manage the project.
MME-123.3	Evaluate how to manage during project implementation, overall management of projects.
MME-123.4	Apply the project management issues in fulfilling the requirements of industry.
MME-123.5	Recall the various principles and methods of project management.
MME-123.6	Examine the effect of project management related activities in project completion.

Part-A

Unit 1: Introduction to Project

Introduction, Project: concept and definition, classifications/types of projects Characteristics of project, Project objectives and scope, Taxonomy of Projects, Establishing procedure for projects, Generation and screening of project ideas, Identification and selection of project, various Project Development Techniques, preparation of project plan.

Unit 2: Project Management: An Overview

Project management, Management principles applied to projects, Management activities: Planning, Coordinating, Controlling etc., Project manager: Roles/responsibilities and qualities, various requirements for project, Project activities: Planning, Coordinating, Controlling etc., project management life cycle, Comparison between project management and general management.

Unit 3: Project Contracts and Monitoring Process

Introduction, contract, types of contract, sub-contract, preparation of specifications for project activities, Trade of Contracts, tenders, Project Review process: Review plan, Schedule Management; Milestone list, success criteria.

Part-B

Unit 4:Quality Planning and Risk Management

Quality Concepts in projects: Quality Control and Quality Assurance, Quality Management, Tools for Quality Management and their utilization in planning and monitoring of the projects, Risk Management: Introduction, problem statement, project goals, risks, obstacles, Prevention planning for the projects, Risk Assessment & Control, models for Risk Management,

Unit 5: Project Cost Estimation, Financing Options and Cost Control

Introduction to cost of the project, direct and indirect cost, components of capital cost of a project, sources of finance, role of various financial institutes in project financing, project cost v/s project completion time, Normal time and crash time, crashing of project costs, Numerical problems related to network planning (PERT & CPM) and crashing.

Unit 6:Project Evaluation, Appraisal and Closure

Evaluation of the project status: planned v/s actual, Project Approval process, Strategic planning, Project Appraisal: meaning, types of appraisal, technical analysis & feasibility study.

Introduction, causes of project termination, strategic implications, Termination- process, procedures and strategies. Project completion and review.

Text Books:

1. K Nagarajan, 2010, Project Management, New Age International
2. Greer Michele, 2002, Project Management, Jaico publication
3. P. Lientz Beenet, P. Kathyn, 1995, Project management for 21st Centenary, Academic press
4. Cleland David, 2000, Project management : I, Tata Mc Graw Hill International Edition

Reference Books:

1. Gopalakrishnan, 2007, Project management, Macmillan India ltd.
2. Harry, Maylor, 2004, Project management, Pearson Education.
3. Bhavesh M. Patel, 2000, Project Management, Vikas publishing house.
4. Prasanna Chandra, Project: Planning, analysis, selection, implementation, and review, Tata McGraw Hill.

Instructions for setting of Paper: Seven questions are to set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each part A and part B (one from each unit). Student needs to attempt two questions out of three questions from each part. Each question will be of 20 marks.

In general parameters for Internal /Continuous Assessment (Theory Courses):

Parameter	Weightage
Two Sessional (Mid-Term)Tests	**60%**
Assignments	**20%**
Class Performance	**10%**
Class Attendance	**10%**

Theory Course: Total Marks 200

Internal/Continuous Assessment: 100

Two Sessional Tests: 30 Marks Each (Total weighted marks for Sessional Tests: 60)

Assignments: 20 Marks

Class Work/ Performance: 10 Marks

Attendance: 10 Marks

End Semester Exams: 100 Marks

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
MME-123.1	3	2	2	3	3	2	3	1	2	1	3	2	3	3
MME-123.2	3	3	3	3	3	1	3	2	2	2	2	2	2	2
MME-123.3	3	3	3	3	3	2	3	2	2	2	3	3	2	3
MME-123.4	3	3	3	3	3	3	3	2	2	3	2	-	2	3
MME-123.5	2	2	2	2	2	2	3	2	2	2	2	1	2	-
MME-123.6	2	3	3	2	3	3	3	3	3	2	2	3	2	1

Program Elective-II

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

(Deemed to be University under section 3 of the UGC Act 1956)

MME-131: ENTERPRISE RESOURCE PLANNING

Periods/week Credits	Max. Mark:200
L: 3 T: 0 3	Continuous Assessment:100
Duration of Examination: 3 Hrs	End Term Examination:100

Course Type: Elective

Course Outcomes:

After completion of this course the students will be able to

MME-131.1	Learn the concepts of ERP
MME-131.2	Describe the selection, acquisition and implementation of ERP
MME-131.3	Examine systematically the planning mechanisms in an enterprise using ERP
MME-131.4	Describe the ERP model and ERP implementation methodology
MME-131.5	Apply the concepts of BPR, SCM and CRM
MME-131.6	Explain the challenges associated with implementing enterprise systems and their impacts on organizations.

Part-A

Unit:1 Enterprise: An Overview

Business Functions and Business Processes, importance of Information: Characteristics of information; Types of information, Information System: Components of an information system; Different types of information systems; Management information system, Enterprise Resource Planning: Business modelling; Integrated data model

Unit 2: Introduction to ERP

Defining ERP, Origin and Need for an ERP System, Benefits of an ERP System, Reasons for the Growth of ERP Market, Reasons for the Failure of ERP Implementation: Roadmap for successful ERP implementation

Unit 3: ERP and Related Technologies

Business Process Re-engineering, Management Information systems, Decision Support Systems, Executive Information Systems- Advantages of EIS; Disadvantages of EIS, Data Warehousing, Data Mining, On-Line Analytical Processing, Product Life Cycle Management, Supply Chain Management, ERP Security

Part-B

Unit 4: Enterprise Modeling and Integration of ERP

Need to focus on Enterprise Integration/ERP; Information mapping; Role of common shared Enterprise database; System Integration, Logical vs. Physical System Integration, Benefits & limitations of System Integration, ERP's Role in Logical and Physical Integration

Unit 5: ERP Architecture and Implementation Methodology

Generic Model of ERP system; Core Modules functionality; Types of ERP architecture, Client Server Architecture, Web-based Architecture, Service Oriented Architecture (SOA) ; Difficulty in selecting ERP, Approach to ERP selection, Request for Proposal approach, Proof-of-Concept approach; General Implementation Methodology of ERP, Vanilla Implementation; Evaluation Criteria of ERP packages; Project Implementation Team Structure

Unit 6: Introduction to SAP, Oracle APPS

SAP, Integrated SAP Model, SAP Architecture, SAP R/3 System & mySAP, SAP Modules; Oracle Apps, Oracle AIM Methodology, Oracle Fusion Modules; A Comparative assessment of ERP Packages

Text Books:

1. Enterprise Systems For Management - Luvai F. Motiwalla, Jeff Thompson, Pearson Education., 2nd Ed., 2011
2. Enterprise Resource Planning - Ravi Shankar, S.Jaiswal, Galgotia Publication Pvt. Ltd., 1st Ed., 1999

Reference Books:

1. Paul Greenberg, 2009, CRM at the speed of Light : Social CRM strategies, tools and techniques for engaging your customers : 4th Edition -, McGraw Hill.
2. Chuck Munson, 2013,Supply Chain Management Casebook: The Comprehensive Coverage and Best Practices in SCM, Pearson FT Press.
3. Robert Frankel, 2014, Definitive Guide to Supply Chain Best Practices, The Comprehensive Lessons and Cases in Effective SCM, Pearson FT Press.
4. Mary Sumner, 2005 Enterprise Resource Planning, , Prentice Hall
5. David Burt, 2010, Supply Management - McGraw Hill Publications, 8th Ed.,
6. Monk, E. F., Wagner, B. J. 2009, Concepts in Enterprise Resource Planning - 3rd Edition, Course Technology Cengage Learning

Instructions for setting of Paper: Seven questions are to set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each part A and part B (one from each unit). Student needs to attempt two questions out of three questions from each part. Each question will be of 20 marks.

In general parameters for Internal /Continuous Assessment (Theory Courses):

Parameter	Weightage
Two Sessional (Mid-Term)Tests	**60%**
Assignments	**20%**
Class Performance	**10%**
Class Attendance	**10%**

Theory Course: Total Marks 200

Internal/Continuous Assessment: 100

Two Sessional Tests: 30 Marks Each (Total weighted marks for Sessional Tests: 60)

Assignments: 20 Marks

Class Work/ Performance: 10 Marks

Attendance: 10 Marks

End Semester Exams: 100 Marks

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
MME-131.1	3	2	2	3	3	2	1	1	2	1	3	2	3	3
MME-131.2	3	3	3	3	3	1	1	2	2	2	2	2	2	2
MME-131.3	3	3	3	3	3	2	1	2	2	2	3	3	2	3
MME-131.4	3	3	3	3	3	3	1	2	2	3	2	-	2	3
MME-131.5	2	2	2	2	2	2	1	2	2	2	2	1	2	-
MME-131.6	2	3	3	2	3	3	1	3	3	2	2	3	2	1

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

(Deemed to be University under section 3 of the UGC Act 1956)

MME-132: SUPPLY CHAIN MANAGEMENT

Periods/week	Credits	Max. Marks:200
L: 3 T: 0	3	Continuous Assessment: 100
Duration of Examination: 3 Hrs		End Term Examination: 100

Course Type: Elective

Course Outcomes:

After completion of this course the students will be able to

MME-132.1	Define the basics and importance of supply chain within and outside the organization.
MME-132.2	Assess the impact of un-managed supply chain and also, helps in understanding the various challenges in managing the supply chain.
MME-132.3	Evaluate the various kinds of cost associated with the transportation of goods within and outside the organization to find out the low cost solutions to transportation. .
MME-132.4	Critique the reasons an organization might outsource inventory capabilities.
MME-132.5	Recall important attributes of a lean retail inventory management supply chain.
MME-132.6	Examine the skills required of supply chain managers to maintain a strategic capacity level.

Part-A

Unit 1: Introduction and Strategic View of Supply Chain

Evolution of supply chain, Historical perspective, objective and importance of supply chain, decision phases in supply chain, competitive and supply chain strategies, achieving and maintaining strategic fit in emerging retail markets : the Indian scenario, customer service and cost tradeoffs, impellers of supply chain, financial measures of performance, drivers of supply chain performance.

Unit 2: Designing of Supply Chain Network

Role of distribution in supply chain, factors influencing distribution network design, Design options for distribution network, role of network design in supply chain, factors influencing network design decisions, Impact of globalization in supply chain networks, risk management in global supply chains, incorporating uncertainty in network design

Unit 3: Material Flow in Supply Chain

Types of inventory, Inventory related costs, economies of scale, managing multiechelon cycle inventory, role of safety inventory on supply chain, impact of supply uncertainty and aggregation in supply chain, managing safety inventory in multiechelon supply chain, factors affecting optimal level of product availability, setting product availability for multiproduct under capacity constraints.

Part-B

Unit 4: Transportation Networks

Drivers for transportation decisions, choice of transportations and their performance measures, strategy for transportation, tradeoffs in transportation design, role of IT in transportation, risk management in transportation, vehicle scheduling, saving algorithm for vehicle scheduling, static versus dynamic scheduling, transportation costs in E-retailing

Unit 5: Information Flow in Supply Chains

Role of forecasting, characteristics of forecast, and forecasting methods, components of forecast, basic approach to demand forecasting, time series forecasting methods, qualitative methods, measures of forecast errors, risk management in forecasting, supply chain IT framework, supply chain collaboration and coordination, IT in supply chain measurement and reporting, future of IT in supply chain.

Unit 6: Agile Supply Chain

Supply chain for high demand uncertainty environment, optimal use of dual sources of supply, responsive supply chain approach, speculative approach and responsive approach, supply chain disruptions and its impact on business, methodologies for handling disruptions, multi location sourcing, factors affecting green supply chain management, challenges of going green.

Text Books/Reference Books:

1. Sunil Chopra, Peter Meindl, D V Kalra, 2010, Supply chain Management, Pearson
2. Janat Shah, 2016, Supply chain Management, Pearson

Instructions for setting of Paper: Seven questions are to set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each part A and part B (one from each unit). Student needs to attempt two questions out of three questions from each part. Each question will be of 20 marks.

In general parameters for Internal /Continuous Assessment (Theory Courses):

Parameter	Weightage
Two Sessional (Mid-Term)Tests	**60%**
Assignments	**20%**
Class Performance	**10%**
Class Attendance	**10%**

Theory Course: Total Marks 200

Internal/Continuous Assessment: 100

Two Sessional Tests: 30 Marks Each (Total weighted marks for Sessional Tests: 60)

Assignments: 20 Marks

Class Work/ Performance: 10 Marks

Attendance: 10 Marks

End Semester Exams: 100 Marks

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
MME-132.1	3	2	2	3	3	2	1	1	2	1	3	2	3	3
MME-132.2	3	3	3	3	3	1	1	2	2	2	2	2	2	2
MME-132.3	3	3	3	3	3	2	1	2	2	2	3	3	2	3
MME-132.4	3	3	3	3	3	3	1	2	2	3	2	-	2	3

MME-132.5	2	2	2	2	2	2	1	2	2	2	2	1	2	-
MME-132.6	2	3	3	2	3	3	1	3	3	2	2	3	2	1

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

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MME-133: MATERIAL HANDLING SYSTEM

Periods/week	Credits	Max. Marks:200
L: 3 T: 0	3	Continuous Assessment:100
Duration of Examination: 3 Hrs		End Term Examination:100

Course Type: Elective

Course Outcomes:

After completion of this course the students will be able to

MME-133.1	Understand the flow and type of movement of industrial goods
MME-133.2	Learn about various material handling equipments used in industries
MME-133.3	Apply general rules for the type of movement
MME-133.4	Identify the appropriate material handling systems to suit the said requirement
MME-133.5	Evaluate and reduce the overall cycle time, with due consideration on economics and payback period
MME-133.6	Design of material handling system for industrial application

Part-A

Unit 1: Overview of Material Handling

Principles of Material Handling, Principal groups of Material Handling equipment – General Characteristics and application of Material Handling Equipment, Modern trends in material handling.

Unit 2: Lifting Equipments: Hoist Components of Hoist

Load Handling attachments hooks, grabs and clamps – Grabbing attachments for bulk material – Wire ropes and chains

Unit 3: Lifting Tackle Pulleys for Gain of Force and Speed

Tension in drop parts – Drums, Shears and sprockets – Arresting gear and brakes – Block brakes, Band brakes, thrust brakes – Safety and hand cranks. Principle operation of EOT, Gantry and jib cranes Hoisting Mechanisms, Travelling mechanisms, lifting mechanisms – Slewing Mechanisms – Elevators and lifts

Part-B

Unit 4: Conveying Machines

Belt conveyors – Types, Principal components of a conveyor and their purpose – conveyor belts – tractive elements – take up devices Special types of belt conveyors – Metal Belt conveyor – Apron conveyor Elevators, Passenger conveyor – Flight conveyor, Principal types and application – Bucket flight conveyors – Cradle conveyor – conveyor elevators. Overhead conveyors – Overhead pusher conveyor, Overhead load towing truck conveyor – Load carrying car conveyors – Load towing and walking beam conveyors – Bucket elevators – Cradle conveyors – Screw conveyors – Oscillating conveyor – Roller conveyor Hydraulic and pneumatic conveyor – Chutes Bins.

Unit 5: Packaging and Storage of Bulk Materials

Steps for design of packages, protective packaging, testing the physical characteristics of packaging, container testing, types of storage and industrial containers, Automatic guided vehicles, Automatic storage and retrieval system

Unit 6: Current Trends in Material Handling

Computer Aided Systems for Material Handling, Application of robotics and automation

Text Books

1. N. Rudenko, 2011,Materials Handling Equipment, Envee Publishers, New Delhi
2. M.P. Alexandrov, 2000, Materials Handling Equipment, Mie publications, Moscow

Reference Books

1. Arora , 2015, Aspects of Material handling, Laxmi Publications
2. Ray, 2017, Introduction to Material Handling, New Age Publications.
3. Chowdary RB, 1986, Plant Layout and Material Handling, Khanna Publishers.

Instructions for setting of Paper: Seven questions are to set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each part A and part B (one from each unit). Student needs to attempt two questions out of three questions from each part. Each question will be of 20 marks.

In general parameters for Internal /Continuous Assessment (Theory Courses):

Parameter	Weightage
Two Sessional (Mid-Term)Tests	**60%**
Assignments	**20%**
Class Performance	**10%**
Class Attendance	**10%**

Theory Course: Total Marks 200

Internal/Continuous Assessment: 100

Two Sessional Tests: 30 Marks Each (Total weighted marks for Sessional Tests: 60)

Assignments: 20 Marks

Class Work/ Performance: 10 Marks

Attendance: 10 Marks

End Semester Exams: 100 Marks

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
MME-133.1	3	2	2	3	3	2	1	1	2	1	3	-	3	3
MME-133.2	3	3	3	3	3	1	1	2	2	2	2	2	2	2
MME-133.3	3	3	3	3	3	2	1	2	2	2	3	3	2	3
MME-133.4	3	3	3	3	3	3	1	2	2	3	2	1	2	3
MME-133.5	2	2	2	2	2	2	1	2	2	2	2	1	2	-
MME-133.6	2	3	3	2	3	3	1	3	3	2	2	3	2	1

M-MC-100: RESEARCH METHODOLOGY AND IPR

Periods/week Credits — Max. Marks : 100
L: 2 T: 0 P: 0 2 — Continuous Assessment : 50
Duration of Examination: 3 Hrs — End Term Examination: 50

Course Type: Audit Pass Course

Course Outcomes:
After completion of this course the students will be able to

M-MC-100.1 Understand research problem formulation. M-
MC-100.2 Analyse research related information
M-MC-100.3 Follow research ethics
M-MC-100.4 Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.
M-MC-100.5 Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasise the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular.
M-MC-100.6 Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits

Unit: 1 Introduction to Research Methodology

Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem.
Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations

Unit: 2 Literature Review

Effective literature studies approaches, analysis Plagiarism, Research ethics

Unit: 3 Research Paper Writing

Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee

Unit: 4 Introduction to IPR

Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development.
International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT

Unit: 5 Patent Rights

Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications

Unit: 6 New Developments in IPR

Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.

Text Books:

1. Stuart Melville and Wayne Goddard, 1996, "Research methodology: an introduction for science & engineering students'", Juta & Co. Ltd..
2. Wayne Goddard and Stuart Melville, 1996, "Research Methodology: An Introduction"Juta & Co. Ltd..
3. Ranjit Kumar,2015, "Research Methodology: A Step by Step Guide for beginners",2nd Edition, Pearson.
4. Halbert,2007, "Resisting Intellectual Property", Taylor & Francis Ltd.
5. Mayall ,1992, "Industrial Design", McGraw Hill.
6. Niebel , 1974, "Product Design", McGraw Hill.
7. Asimov , 1962, "Introduction to Design", Prentice Hall.
8. Robert P. Merges, Peter S. Menell, Mark A. Lemley, 2016, " Intellectual Property in New Technological Age".
9. T. Ramappa, 2008, "Intellectual Property Rights Under WTO", S. Chand

In general parameters for Internal/Continuous Assessment (Lab/Practical Courses):

Parameter	**Weightage**
Two Mid-Term Viva	**60%**
File/Record Keeping	**20%**
Class Performance	**10%**
Class Attendance	**10%**

Lab/Practical Course: Total Marks 100
Internal/Continuous Assessment: 50
Two Viva: 15 Marks Each
File/Records: 10 Marks
Class Work/ Performance: 5 Marks
Attendance: 5 Marks
End Semester Exam: 50 Marks

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
M-MC-100.1	3	2	2	3	-	2	1	1	2	1	3	2	2	2
M-MC-100.2	3	3	3	3	3	1	1	2	2	2	2	3	1	2
M-MC-100.3	3	3	3	3	3	2	1	2	2	2	3	3	2	3
M-MC-100.4	3	3	3	3	3	3	1	2	2	3	2	2	-	3
M-MC-100.5	2	2	2	3	2	2	1	2	2	2	2	1	2	-
M-MC-100.6	2	3	3	3	3	3	1	3	3	2	2	3	2	1

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

(Deemed to be University under section 3 of the UGC Act 1956)

MME-151: COMPUTATIONAL LAB

Periods/week Credits
L: 0 T: 0 P: 4 2
Duration of Examination: 3 Hrs

Max. Marks: 100
Continuous Assessment : 50
End Term Examination : 50

Course Type: Core

Course Outcomes:

After completion of this course the students will be able to

MME-151.1 Learn various modelling and design commands.
MME-151.2 Identify various situations where computational methods would be useful.
MME-151.3 Design and model various components to meet the industrial needs.
MME-151.4 Apply the design software for developing new components.
MME-151.5 Recall the program on a machine for practical application.
MME-151.6 Utilize the techniques, skills and modern engineering design tools.

Experiment No. 1 & 2

Modeling in 2- D & Image Scanning using Pro- E.

Experiment No. 3 & 4:

Modeling in 3- D of machine tool parts like gear details, machine tool beds, tailstocks, and assembly drawings of machine tools like lathe machine components, power drives, jigs & fixtures, power presses etc. using Pro- E.

Experiment No. 5 & 6:

Use of various types of surfaces in 3- D modeling, animation features and other editing entities in machine tool assemblies in Pro- E.

Experiments No. 7 & 8:

Kinematic and dynamic simulation of various mechanisms in machines, process simulation like Pro- Cast, Pro-Mould and other machining features.

Experiment No. 9 & 10:

Tool path generation, Part programming- G& M Codes development for machining operations using Pro- E, Physical interpretation of machining features and tool geometries.

In general parameters for Internal/Continuous Assessment (Lab/Practical Courses):

Parameter	**Weightage**
Two Mid-Term Viva	**60%**

File/Record Keeping	**20%**
Class Performance	**10%**
Class Attendance	**10%**

Lab/Practical Course: Total Marks 100

Internal/Continuous Assessment: 50

Two Viva: 15 Marks Each

File/Records: 10 Marks

Class Work/ Performance: 5 Marks

Attendance: 5 Marks

End Semester Exam: 50 Marks

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
M-ME-151.1	3	2	2	3	-	2	1	1	2	1	3	-	2	2
M-ME-151.2	3	3	3	3	3	1	1	2	2	2	2	3	1	2
M-ME-151.3	3	3	3	3	3	2	1	2	2	2	3	3	2	3
M-ME-151.4	3	3	3	3	3	3	1	2	2	3	2	2	-	3
M-ME-151.5	2	2	2	3	2	2	1	2	2	2	2	1	2	-
M-ME-151.6	2	3	3	3	3	3	1	3	3	2	2	3	2	1

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

(Deemed to be University under section 3 of the UGC Act 1956)

MME-152: FLEXIBLE MANUFACTURING SYSTEM LAB

Periods/week	Credits	Max. Marks: 100
L: 0 T: 0 P: 4	2	Continuous Assessment: 50
Duration of Examination: 3 Hrs		End Term Examination: 50

Course Type: Core

Course Outcomes:

After completion of this course the students will be able to

MME-152.1	Define FMS and other manufacturing systems.
MME-152.2	Explain processing stations and material handling systems used in FMS environments.
MME-152.3	Learn latest FMS methods.
MME-152.4	Understand the concept of group technology and machine cell.
MME-152.5	Design and analyze FMS using simulation and analytical techniques.
MME-152.6	Apply robotic and advanced systems in manufacturing environment.

List of Experiments

1. Introduction of CIM and its importance in manufacturing environment
2. Introduction of FMS
3. Flexibility in FMS and its measurements
4. Selection of FMC according to lamb technical method
5. Introduction of Group Technology
6. Introduction of part family forming using different method
7. Grouping Parts & Machines by Rank Order Clustering
8. Study and Demonstration on Robots.
9. Robot programming: offline programming to perform pick and place task
10. Robot Programming: NC part Programming

Text Books:

1. Groover, 1998, M. P., Automation, Production System and CIM, Prentice-Hall of India.
2. HK Shivanand, MM Benal, V. Koti, 2006, Flexible Manufacturing systems

In general parameters for Internal/Continuous Assessment (Lab/Practical Courses):

Parameter	Weightage
Two Mid-Term Viva	**60%**
File/Record Keeping	**20%**
Class Performance	**10%**

Class Attendance	**10%**

Lab/Practical Course: Total Marks 100

Internal/Continuous Assessment: 50

Two Viva: 15 Marks Each

File/Records: 10 Marks

Class Work/ Performance: 5 Marks

Attendance: 5 Marks

End Semester Exam: 50 Marks

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
MME-152.1	3	2	2	3	3	2	1	-	2	1	3	3	2	2
MME-152.2	3	3	3	3	3	1	1	2	2	2	2	3	1	2
MME-152.3	3	3	3	3	3	2	1	2	2	2	3	3	2	3
MME-152.4	3	3	3	3	3	3	1	2	2	3	2	2	-	3
MME-152.5	2	2	2	3	2	2	1	2	2	2	2	1	2	-
MME-152.6	2	3	3	3	3	3	1	3	3	2	2	3	2	1

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

(Deemed to be University under section 3 of the UGC Act 1956)

M-MC-001: STRESS MANAGEMENT BY YOGA

Periods/week Credits L: 2 T: 0
Pre-requisites: None

Course Outcomes:
The students will be able to-
M-MC-001.1 achieve overall health of body and mind
M-MC-001.2 overcome stress

Syllabus Unit	Content	Hours
1	Definitions of Eight parts of yog. (Ashtanga)	**8**
2	Yam and Niyam. Do`s and Don"t"s in life. i) Ahinsa, satya, astheya, bramhacharya and aparigraha ii) Shaucha, santosh, tapa, swadhyay, ishwarpranidhan	**8**
3	Asan and Pranayam i) Various yog poses and their benefits for mind & body. ii) Regularization of breathing techniques and its effects-Types of pranayam.	**8**

Course Articulation Matrix

CO (M-MC-001)	PO1	PO2	PO3	PO4	PO 5	PO6	PO 7	PSO 1	PSO 2
M-MC-001.1	1	-	3	3	2	-	3	2	2
M-MC-001.2	1	1	3	3	2	1	3	2	2

SEMESTER II

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

(Deemed to be University under section 3 of the UGC Act 1956)

MME-201: INVENTORY MANAGEMENT

Periods/week Credits
L: 3 T: 0 P: 0 3
Duration of Examination: 3 Hrs

Max. Marks: 200
Continuous Assessment : 100
End Term Examination: 100

Course Type: Core

Course Outcomes:

After completion of this course the students will be able to

MME-201.1 Define the basics of inventory management functions/principles within a small/large organization.
MME-201.2 Assess the impact poor inventory management can have on an organization's bottom line.
MME-201.3 Evaluate various inventory management methods/approaches to production process mapping.
MME-201.4 Critique the reasons an organization might outsource inventory capabilities.
MME-201.5 Recall important attributes of a lean retail inventory management supply chain.
MME-201.6 Examine the skills required of inventory managers to maintain a strategic capacity level.

Part-A

Unit 1: Introduction to Inventory Management Environment

Inventory Management: Introduction, Characteristics, Functionality, Components, Planning, Stock Levels under Conditions of Certainty, Risk and Uncertainty, reasons for managing inventory flows in the supply chain Independent versus dependent demand, Types of Inventory, Advantages and disadvantages of holding inventories.

Unit 2: Inventory Economics

Define inventory economy, costs associated with inventories, Cost and Profit implications, Inventory reporting (Ledger): Goods Receipt processing with inbound delivery/without inbound delivery, Goods issue with outbound delivery/internal consumption, Cost of carrying or not holding adequate inventory

Unit 3: Inventory Control

Inventory monitoring and control, Tracking and controlling stock, Methods of inventory control like ABC, HML, SDE, VED and FSN. Economic Order Quantity - Stock-out cost based inventory decisions- Purchase Inventory models – P System & Q System.

Part-B

Unit 4: Material Requirement Planning

Bill of Materials, Master Production schedules, Material flow in MRP, Evolution of MRP into Manufacturing Resource Planning (MRPII), Evolution to Enterprise Resource Planning (ERP)

Unit 5: Lean Supply & Demand Management

Inventory Key Performance Indicators, Vendor Facilitation and Production Logistics as interface function of Demand Forecasting, Global procurement, Tracking inward shipments, In-plant distribution and Storage Planning, Logistics as an enabler of Just-in-Time (JIT), Kanban (A scheduling system for lean inventory)

Unit 6: Advance Issues in Inventory Management

MIS for Inventory, Security in transport and warehousing activities, New trends and the impact of technology on warehousing, Health & Safety and inventory management, Stores Management:Introduction, Function, Importance, Organization and Layout of Stores, Stores procedure and documentation, Inter-relationship with other departments, Types of stores, Centralized and decentralized stores.

Text Books:

1. S N Chary, 2008, Production & Operations Management –McGraw Hill
2. Richard Chase, Ravi Shankar, Robert Jacobs, Nicholas J.Acquilano, 2001, Operations and Supply Management –McGraw Hill
3. A.K.Dutta, 1986, Materials Management, PHI.
4. K.K. Ahuja, 2010, Materials Management - CBS Publishers.

Reference Books:

1. Manoj K. Harbola, 2005, "Engineering Mechanics", Cengage Learning.
2. J. L. Meriam and L. G. Kraige, 2001, "Engineering Mechanics", Wiley Publication.
3. Irving H. Shames and Krishna Mohana Rao. G., 2002, "Engineering Mechanics – Statics and Dynamics", Pearson Education
4. M. F. Beatty, 1999, "Principles of Engineering Mechanics", Springer Science & Business Media

Weblinks:

https://nptel.ac.in/courses/122104015
https://nptel.ac.in/courses/112103109
https://onlinecourses.nptel.ac.in/noc19_me01/preview

Instructions for setting of Paper Seven questions are to set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each part A and part B (one from each unit). Student needs to attempt two questions out of three questions from each part. Each question will be of 20 marks.

In general parameters for Internal /Continuous Assessment (Theory Courses):

Parameter	Weightage
Two Sessional (Mid-Term)Tests	**60%**
Assignments	**20%**
Class Performance	**10%**
Class Attendance	**10%**

Theory Course: Total Marks 200

Internal/Continuous Assessment: 100

Two Sessional Tests: 30 Marks Each (Total weighted marks for Sessional Tests: 60)

Assignments: 20 Marks

Class Work/ Performance: 10 Marks

Attendance: 10 Marks

End Semester Exams: 100 Marks

Assessment Tools:

Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
End term examination

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
MME-201.1	3	2	2	3	-	2	1	1	2	1	3	2	2	2
MME-201.2	3	3	3	3	3	1	1	2	2	2	2	-	1	2
MME-201.3	3	3	3	3	3	2	1	2	2	2	3	3	2	3
MME-201.4	3	3	3	3	3	3	1	2	2	3	2	2	-	3
MME-201.5	2	2	2	2	2	2	1	2	2	2	2	1	2	-
MME-201.6	2	3	3	2	3	3	1	3	3	2	2	3	2	1

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

(Deemed to be University under section 3 of the UGC Act 1956)

MME-202: OPERATIONS PLANNING AND CONTROL

Periods/week Credits	Max. Marks: 200
L: 3 T: 0 3	Continuous Assessment: 100
Duration of Examination: 3 Hrs	End Term Examination: 100

Course Type: Core

Course Outcomes:

After completion of this course the students will be able to

MME-202.1	Understand how the operations, have strategic importance and can provide a competitive advantage in the workplace
MME-202.2	Identify the elements of operations management and various transformation processes to enhance productivity and competitiveness.
MME-202.3	Understand the relationship between operations and other business functions.
MME-202.4	Develop aggregate capacity plans and MRP in operation environments.
MME-202.5	Plan and implement suitable materials handling principles and practices in the operations
MME-202.6	Understand the Materials Management function starting from Demand Management through Inventory Management.

Part-A

Unit-1

Introduction:

Objectives of production Planning and Control (PPC), Functions of production planning and control, Factors affecting PPC, Process planning sheet, Aggregate Planning: Pure and Mixed strategies, Steps in effective aggregate planning.

Unit-2

Production Forecasting:

Importance of forecasting, Types of forecasting, their uses, general principles of forecasting. Forecasting techniques: qualitative methods and quantitative methods. Time series analysis, trend projections, stability versus responsiveness in forecasting, seasonality issues in forecasting, calculating seasonal index values, measuring forecasting accuracy and its illustration, numerical

Unit-3

Inventory Control

Inventory Control: cost trade off, Inventory Models, ABC analysis, VED analysis, Inventory Control System: P and Q Systems, Make or buy decision: criteria for make or buy, simple cost analysis, economic analysis, break even analysis, numerical.

Unit-4

Production Strategies

Production Planning Strategies: Level output plan and Chase plan, Master Production Schedule: Concept, Strategies, Chase sales, Lot-for-lot. Materials Requirement Planning: Inputs to MRP, Structure of MRP, Examples of MRP; Capacity Requirement Planning.

Unit-5

Production Control
Types of production system, Functions of production control, effects of production control, evaluating a production control system, designing the production control organization.

Unit-6

Operations Scheduling
Routing, prioritizing, dispatching and expediting. Forward and backward scheduling, finite and infinite loading. Sequencing or prioritization: Sequencing n jobs in one machine, Sequencing n jobs in two machine, Sequencing "n" jobs in 'm' machines, numerical.

Text Books:

1. Buffa and Sarin, 1987, Modern production/Operation Management, Wiley and sons.
2. S K Mukhopadhaya- 1990, Planning & Control- PHI Delhi
3. Kanishka Bedi, 2000, Production and operation management:- -Oxford Publication.
4. R Panneerselvam- 2006, Production and operation management:- PHI Delhi,
5. Adam and Ebert, 2010, Production and operation management:- PHI Delhi.

Instructions for setting of Paper: Seven questions are to set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each part A and part B (one from each unit). Student needs to attempt two questions out of three questions from each part. Each question will be of 20 marks.

In general parameters for Internal /Continuous Assessment (Theory Courses):

Parameter	Weightage
Two Sessional (Mid-Term)Tests	**60%**
Assignments	**20%**
Class Performance	**10%**
Class Attendance	**10%**

Theory Course: Total Marks 200

Internal/Continuous Assessment: 100

Two Sessional Tests: 30 Marks Each (Total weighted marks for Sessional Tests: 60)

Assignments: 20 Marks

Class Work/ Performance: 10 Marks

Attendance: 10 Marks

End Semester Exams: 100 Marks

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
MME-202.1	3	2	2	3	3	-	1	1	2	1	3	1	2	2
MME-202.2	3	3	3	3	3	1	1	2	2	2	2	3	1	2
MME-202.3	3	3	3	3	3	2	1	2	2	2	3	3	-	3
MME-202.4	3	3	3	3	3	3	1	2	2	3	2	2	-	3
MME-202.5	2	2	2	2	2	2	1	2	2	2	2	1	2	-
MME 202.6	2	3	3	2	3	3	1	3	3	2	2	3	2	1

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

(Deemed to be University under section 3 of the UGC Act 1956)

MME-221: FLEXIBLE MANUFACTURING SYSTEM

Periods/week Credits	Max. Marks :200
L: 3 T: 0 3	Continuous Assessment : 100
Duration of Examination: 3 Hrs	End Term Examination:100

Course Type: Elective

Course Outcomes:

After completion of this course the students will be able to

MME-221.1	Learn the different types of manufacturing available today such as the Special Manufacturing System, the Manufacturing Cell, and the Flexible Manufacturing System
MME-221.2	Recall the fundamentals of computer assisted numerical control programming and programming languages
MME-221.3	Evaluate the effect of common CAD/CAM data base on design and manufacturing
MME-221.4	Apply the learnt concepts in development and processing environment.
MME-221.5	Recall the applications of various new technologies in today's industries.
MME-221.6	Examine the effect of PLC control devices and CNC operation skills on productivity.

Part-A

UNIT-1: INTRODUCTION TO FMS

Basic concepts, advantages, flexibility, types, FMS components and examples of FMS distributed numerical control (DNC). FMS layout configurations, Planning and implementation.

UNIT: 2DATA PROCESSING

Data base, tool management system part alignment and work mounting errors - Distributed data processing in FMS - computer network protocols - part programming in FMS tool data base -

UNIT: 3ROBOTICS

Features of industrial robots - robot cell design – anatomy, configuration. Robotized assembly and control systems. Robotic clamping devices and Programming.

Part-B

UNIT: 4GROUP TECHNOLOGY

Part families-parts classification and coding, group technology machine cells-benefits of group technology, automatic identification system, barcode technology, cellular manufacturing.

UNIT: 5HANDLING SYSTEMS AND INVENTORY

Material handling systems- equipment, design considerations, ASRS. Transport systems, - AGVs, guidance technology. Inventory control.

UNIT:6 INTERFACING

Interfacing of computer - machine tool controllers and handling systems - communications standards - programmable logic controllers (PLC's) – interfacing – components, programming,

Text Books:

1. Groover, M. P.,1998, Automation, Production System and CIM, Prentice-Hall of India.

References:

1. Paul Ranky., 1983.The design and operation of FMS, IFS publication.
2. Viswanathan, N and Nahari, Y, 1992 Performance modeling of automated manufacturing systems, Prentice Hall.

Instructions for setting of Paper: Seven questions are to set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each part A and part B (one from each unit). Student needs to attempt two questions out of three questions from each part. Each question will be of 20 marks.

In general parameters for Internal /Continuous Assessment (Theory Courses):

Parameter	Weightage
Two Sessional (Mid-Term)Tests	**60%**
Assignments	**20%**
Class Performance	**10%**
Class Attendance	**10%**

Theory Course: Total Marks 200

Internal/Continuous Assessment: 100

Two Sessional Tests: 30 Marks Each (Total weighted marks for Sessional Tests: 60)

Assignments: 20 Marks

Class Work/ Performance: 10 Marks

Attendance: 10 Marks

End Semester Exams: 100 Marks

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
MME-221.1	3	2	2	-	3	2	-	1	2	1	3	-	2	2
MME-221.2	3	3	3	3	3	1	1	2	2	2	2	3	1	2

MME-221.3	3	3	3	3	3	2	1	2	2	2	3	3	2	3
MME-221.4	3	3	3	3	3	3	1	2	2	3	2	2	-	3
MME-221.5	2	2	2	2	2	2	1	2	2	2	2	1	2	-
MME-221.6	2	3	3	2	3	3	1	3	3	2	2	3	2	1

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

(Deemed to be University under section 3 of the UGC Act 1956)

MME-222: MANAGERIAL ACCOUNTING & FINANCIAL CONTROL

Periods/week	Credits	Max. Marks: 200
L: 3 T: 0	3	Continuous Assessment: 100
Duration of Examination: 3 Hrs		End Term Examination : 100

Course Type: Elective

Course Outcomes:

After completion of this course the students will be able to

MME-222.1	Learn managerial accounting and financial control techniques.
MME-222.2	Apply cutting edge operational, marketing and competitive decision making practices.
MME-222.3	Understand key concepts in the area and can adopt a much applied learning approach.
MME-222.4	Learn the role of business, accounting and financial control information in industries.
MME-222.5	Use of accounting knowledge to make business decisions.
MME-222.6	Analyze the effectiveness of short-run decision models.

Part-A

Unit:1 Management Accounting

Definitions, Nature, Functions, Scope, Importance, Limitations and conventions of Management Accounting. Distinction between Management Accounting and Financial Accounting, Installation of Management Accounting System.

Unit 2: Budgeting

Functional Budget: Cash budget — Flexible budget — budgetary control for service Organization and for Nonprofit Organization.

Unit 3: Costing Process

Introduction to Cost Accounting - Distinction between Cost Accounting and Management Accounting- Costing of Raw material, Labour & overheads Cost ascertainment allocation and control-Reconciliation of cost & final account.

Part-B

Unit 4: Costing Methods

Job costing, Batch costing, Contract costing ,Process costing, joint products & bye products costing.

Unit 5: Costing Techniques

Operating costing-variable costing and absorption costing-Standard Costing- Cost-volume profit analysis: - Utility of Costing for Managerial Decision.

Unit 6: Financial Management

Concepts- scope- Need- Time value of money- Valuation concepts—Recent development in the domain of financial management

Text Books:

1. I.M. Pandey, 2003, Management Accounting, Vikas publications
2. M.Y. Khan & P.K. Jain, 2000, Cost accounting - Tata McGraw Hill.

Reference Books:

1. Horngren, Foster, Datar, 2000, Cost Accounting, PHI, Tenth Edition.

Instructions for setting of Paper: Seven questions are to set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each part A and part B (one from each unit). Student needs to attempt two questions out of three questions from each part. Each question will be of 20 marks.

In general parameters for Internal /Continuous Assessment (Theory Courses):

Parameter	Weightage
Two Sessional (Mid-Term)Tests	**60%**
Assignments	**20%**
Class Performance	**10%**
Class Attendance	**10%**

Theory Course: Total Marks 200

Internal/Continuous Assessment: 100

Two Sessional Tests: 30 Marks Each (Total weighted marks for Sessional Tests: 60)

Assignments: 20 Marks

Class Work/ Performance: 10 Marks

Attendance: 10 Marks

End Semester Exams: 100 Marks

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
MME-222.1	3	2	2	-	3	2	3	1	-	1	3	2	2	2
MME-222.2	3	3	3	3	3	1	3	2	2	2	2	3	1	2
MME-222.3	3	3	3	3	3	2	3	2	2	2	3	3	2	3
MME-222.4	3	3	3	3	3	3	3	2	2	3	2	2	1	3
MME-222.5	2	2	2	2	2	2	3	2	2	2	2	1	2	-
MME-222.6	2	3	3	2	3	3	3	3	3	2	2	3	2	1

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

(Deemed to be University under section 3 of the UGC Act 1956)

MME-223: MARKETING MANAGEMENT

Periods/week Credits	Max. Marks: 200
L: 3 T: 0 P: 0 3	Continuous Assessment : 100
Duration of Examination: 3 Hrs	End Term Examination: 100

Prerequisites:
Course Type: Elective

Course Outcomes:

After completion of this course the students will be able to

MME - 223.1 Describes objectives, importance and functions of Marketing Management in organizations.
MME – 223.2 Understand the concept of value and satisfaction
MME – 223.3 Apply the concepts of Marketing Management in product development.
MME – 223.4 Examine product pricing and market research.
MME – 223.5 Evaluate the product pricing strategies.
MME – 223.6 Synthesize the sales promotion

Part-A

Unit: 1Concepts in Marketing
Definition and concepts of marketing & marketing management, Nature, Scope, Objectives, Importance, Significance, Benefits and limitations

Unit:2 Concept of Value and Satisfaction
Introduction, Customer perceived value, Total customer value, Total customer cost, Customer satisfaction at various levels,

Unit: 3 New Product and Service Development
Meaning of product, Classification, Importance of innovations, Development of new products, New product development and it's process, Product life cycle, Product mix strategies

Part-B

Unit: 4 Behaviour and Market Segmentation
Factors Motives, Types, Buying Decision, Segmentation factors, Demographic, Psychographic and Geographic Segmentation, Process, Patterns

Unit: 5 Product Pricing and Marketing Research
Pricing, Decisions and Pricing Methods, Branding and packaging decision, Product positioning, Factors affecting consumer behaviour Pricing Strategies.

Unit: 6 Sales Promotion
Benefits of advertising, Developing an advertising program Sales promotion- purpose, Importance and methods, Unique Selling propositions, Characteristics, Wholesaling, Retailing, Channel Design, Logistics Modern Trends in Retailing.

Text Books/ Reference Books:

1. RajanSaxena, 1994, Marketing Management: I edition,Tata Mc Graw Hill Publishing Company Limited.
2. Kotler Philip and Keller, 2003, Marketing Management: I edition, PHI, New Delhi.

Weblinks:

https://nptel.ac.in/courses/112103109

Instructions for setting of Paper Seven questions are to set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each part A and part B (one from each unit). Student needs to attempt two questions out of three questions from each part. Each question will be of 20 marks.

In general parameters for Internal /Continuous Assessment (Theory Courses):

Parameter	Weightage
Two Sessional (Mid-Term)Tests	**60%**
Assignments	**20%**
Class Performance	**10%**
Class Attendance	**10%**

Theory Course: Total Marks 200

Internal/Continuous Assessment: 100

Two Sessional Tests: 30 Marks Each (Total weighted marks for Sessional Tests: 60)

Assignments: 20 Marks

Class Work/ Performance: 10 Marks

Attendance: 10 Marks

End Semester Exams: 100 Marks

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
MME-223.1	3	2	2	3	-	2	1	1	2	1	3	3	-	2
MME-223.2	3	3	3	3	3	1	1	2	2	2	2	-	1	2
MME-223.3	3	3	3	3	3	2	1	2	2	2	3	3	2	3
MME-223.4	3	3	3	3	3	3	1	2	2	3	2	2	-	3

MME-223.5	2	2	2	2	2	2	1	2	2	2	2	1	2	-
MME-223.6	2	3	3	2	3	3	1	3	3	2	2	3	2	1

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

(Deemed to be University under section 3 of the UGC Act 1956)

MME-231: QUALITY CONTROL TECHNIQUES

Periods/week Credits	Max. Marks : 200
L: 3 T: 0 3	Continuous Assessment : 100
Duration of Examination: 3 Hrs	End Term Examination: 100

Course Type: Elective

Course Outcomes:

After completion of this course the students will be able to

MME-231.1	Understand the fundamentals of quality, control charts.
MME-231.2	Learn the techniques of acceptance sampling, process measurement and control.
MME-231.3	Define DOE, ANOVA and various quality tools.
MME-231.4	Apply various quality tools and techniques in root cause analysis and corrective action.
MME-231.5	Evaluate the principles of quality management system.
MME-231.6	Examine the application of quality principles within quality management systems.

Part-A

UNIT 1: Quality

Defining quality, philosophies of quality 'gurus', dimensions / measures of quality, quality of design and quality of conformance, cost of quality, direct costs & indirect costs, 'defectives' and its significance, optimum cost of performance, traditional model and emerging model of 'cost-of-quality.' Continuous process improvement: PDCA/PDSA cycle – problem solving methodology.

UNIT 2 : Statistical Process Control

Statistical tools- frequency distribution, control charts for variables ($\bar{x}$ and R chart) and for attributes (p,c and u charts), numerical, process capability, numerical, Quality Function Deployment (QFD) - house of quality, Quality Policy Deployment.

UNIT 3: Design of Experiments

Full factorial and fractional factorial design, regression models, on-line and off-line quality control, Taguchi's Loss function, Taguchi's method for factorial experiments - orthogonal arrays, signal-to-noise ratio, robust product design, , parametric and tolerance design.

Part-B

UNIT 4: Total Quality Management (TQM):

TQM concept and definitions, TQM models, Deming's approach to TQM, Juran's steps to quality improvement, Juran's triology, Kairyo and Kaizen, six sigma methodology, DMAIC problem solving technique, Poka Yako, 5 S's for improvement, Just in Time (JIT) manufacturing, Kanban system.

Unit 5: Quality Tools:

Seven tools of quality control -, FMEA/FMECA, Fault tree analysis, EFQM excellence model, RADAR matrix,

Unit 6: Quality System and Standards

ISO 9000 series of quality standards – introduction, quality vocabulary, important clauses – quality manual, management reviews, monitoring of customer satisfaction. Continual improvement, corrective & preventive action, internal audits, external audits and certification, an overview of 14000 series of standards.

Text Books :

1. M. Mahajan, 2016, Statistical Quality Control, Dhanpat Rai

Reference Books:

1. S.P.Gupta, 2014, Statistical Methods, Sultan Chand and Sons
2. R. Subburaj, "ISO 9000: Path to TQM, Allied Publishers Limited", New Delhi, 1997
3. A.V. Feizenbaum, 2000, "Total quality control", McGraw Hill
4. G. L. Taguchi and Syed et. al.,2000, "Quality engineering production systems", McGraw Hill
5. Zaidi, SPC, 2006, "concepts, methodology and tools", Prentice Hall
6. Perry L Johnson, 2000, "ISO 9000", McGraw Hill
7. Kothari, 2012, Research Methodology, New Age International
8. Dale H. Besterfield, Carol Besterfield, Glen H. Besterfield & Mary Besterfield, 2008, "Total quality management", Person Education, New Delhi.

Instructions for setting of Paper: Seven questions are to set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each part A and part B (one from each unit). Student needs to attempt two questions out of three questions from each part. Each question will be of 20 marks.

In general parameters for Internal /Continuous Assessment (Theory Courses):

Parameter	Weightage
Two Sessional (Mid-Term)Tests	**60%**
Assignments	**20%**
Class Performance	**10%**
Class Attendance	**10%**

Theory Course: Total Marks 200

Internal/Continuous Assessment: 100

Two Sessional Tests: 30 Marks Each (Total weighted marks for Sessional Tests: 60)

Assignments: 20 Marks

Class Work/ Performance: 10 Marks

Attendance: 10 Marks

End Semester Exams: 100 Marks

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
MME-231.1	3	2	2	3	3	2	-	1	2	1	3	1	2	2
MME-231.2	3	3	3	3	3	1	1	2	2	2	2	3	1	2
MME-231.3	3	3	3	3	3	2	1	2	2	2	3	3	2	3
MME-231.4	3	3	3	3	3	3	-	2	2	3	2	2	2	-
MME-231.5	2	2	2	2	2	2	1	2	2	2	2	-	2	2
MME-231.6	2	3	3	2	3	3	1	3	3	2	2	3	2	1

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

(Deemed to be University under section 3 of the UGC Act 1956)

MME-232: LEAN AND AGILE MANUFACTURING

Periods/week	Credits	Max. Marks: 200
L: 3 T: 0	3	Continuous Assessment: 100
Duration of Examination: 3 Hrs		End Term Examination : 100

Course Type: Elective

Course Outcomes:

After completion of this course the students will be able to

MME-232.1	Understand the principles of lean and agile manufacturing.
MME-232.2	Identify the potential role of lean in agile manufacturing.
MME-232.3	Recognize the role of communication in an effective agile implementation.
MME-232.4	Learn various tools and techniques of Lean and Agile Manufacturing.
MME-232.5	Gain knowledge on the advancements in the field of Lean and Agile Manufacturing.
MME-232.6	Apply lean agile manufacturing system in industries for cost reduction and profitability.

Part-A

Unit 1: Introduction to Lean Manufacturing

Comparison of Mass Manufacturing and Lean Manufacturing, Lean Principles, Types of Wastes – Seven basic categories, Types of activities – Value Added, Non Value Added and Necessary but Non Value Added activities, Examples

Unit 2: Primary Tools of Lean Manufacturing

5S, Process Mapping and Value Stream Mapping, Work Cells, Total Productive Maintenance – Principle, Procedural steps and Advantages- Secondary Lean Tools.

Unit 3: Lean Rules

Training and Implementation for lean systems, How to succeed with lean manufacturing, Leanness assessment – Indicators, methods and illustrative example.

Part-B

Unit 4: Fundamentals of Agile Manufacturing

Agile Principles, Conceptual models of Agile Manufacturing, Product Development Strategies for agility, Developing the agile enterprise, Managing People in agile organizations.

Unit 5: Strategic Approach to Agile Manufacturing

Information Technology applications in Agile Manufacturing, Assessment of agility – Activity Based Costing - Application Case studies on Lean and Agile Manufacturing.

Unit 6: Lean manufacturing and Six Sigma

Introduction to Lean Six Sigma, Synchronization of Lean and Six Sigma, Application of Lean and Six Sigma for Service and Manufacturing Organizations.

Text Books:

1. Ohio Seichi, 2001, Toyota production System - McGraw Hill.
2. Korgaonkar, 1998, Just in Time Manufacturing –PHI.
3. Yam Guichi,1994, Total Productive Maintenance - Japanese Institute of Plant Maintenance, Oxford Press.

Instructions for setting of Paper: Seven questions are to set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each part A and part B (one from each unit). Student needs to attempt two questions out of three questions from each part. Each question will be of 20 marks.

In general parameters for Internal /Continuous Assessment (Theory Courses):

Parameter	Weightage
Two Sessional (Mid-Term)Tests	**60%**
Assignments	**20%**
Class Performance	**10%**
Class Attendance	**10%**

Theory Course: Total Marks 200

Internal/Continuous Assessment: 100

Two Sessional Tests: 30 Marks Each (Total weighted marks for Sessional Tests: 60)

Assignments: 20 Marks

Class Work/ Performance: 10 Marks

Attendance: 10 Marks

End Semester Exams: 100 Marks

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
MME-232.1	3	2	2	3	3	-	1	1	2	1	3	1	-	2
MME-232.2	3	3	3	3	3	1	1	2	2	2	2	-	1	2
MME-232.3	3	3	3	3	3	2	1	2	2	2	3	3	2	3
MME-232.4	3	3	3	3	3	3	1	2	2	3	2	3	3	3
MME-232.5	2	2	2	2	2	2	1	2	2	2	2	1	2	-
MME-232.6	2	3	3	2	3	3	1	3	3	2	2	3	2	1

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

(Deemed to be University under section 3 of the UGC Act 1956)

MME-233: GROUP TECHNOLOGY

Periods/week	Credits	Max. Marks: 200
L: 3 T: 0	3	Continuous Assessment : 100
Duration of Examination: 3 Hrs		End Term Examination: 100

Course Type: Elective

Course Outcomes:

After completion of this course the students will be able to

MME-233.1	Understand the principles of group technology.
MME-233.2	Identify the potential role of group technology in production system.
MME-233.3	Learn steps in upgrading the production system using group technology.
MME-233.4	Learn various tools and techniques of group technology.
MME-233.5	Apply knowledge about various methods of group technology in production system
MME-233.6	Design flexible manufacturing cell after carrying out group technology study and finally creating FMS.

Part-A

Unit:1 Introduction to Group Technology

Part families-parts classification and cooling, group technology machine cells-benefits of group technology, automatic identification system, barcode technology, automated data collection system

Unit 2: Data Processing

Distributed data processing in FMS - computer network protocols - interfacing of CAD and CAM - part programming in FMS tool data base - clamping devices and fixtures.

Unit 3: Data Base Management System

Data base tool management system, part alignment and work mounting errors - surface description method for automated design and robotized assembly.

Part-B

Unit 4: Introduction to FMS

Basic concepts, advantages, components and examples of FMS distributed numerical control (DNC) - communication between DNC computer and MCU.

Unit 5: Material Handling Systems

Material handling systems - ASRS - AGVs – features of industrial robots - robot cell design and control.

Unit 6: Interfacing

Interfacing of computer - machine tool controllers and handling systems - communications standards - programmable logic controllers

Text Books:

1. Automation, Production System and CIM - M. P. Groover, Prentice-Hall of India, 1998

Reference Books:

2. - Paul Ranky, 1983, The design and operation of FMS.IFS publication
3. Viswanathan, N and Nahari, Y, 1992Performance Modeling of Automated Manufacturing Systems, Prentice Hall

Instructions for setting of Paper: Seven questions are to set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each part A and part B (one from each unit). Student needs to attempt two questions out of three questions from each part. Each question will be of 20 marks.

In general parameters for Internal /Continuous Assessment (Theory Courses):

Parameter	Weightage
Two Sessional (Mid-Term)Tests	**60%**
Assignments	**20%**
Class Performance	**10%**
Class Attendance	**10%**

Theory Course: Total Marks 200

Internal/Continuous Assessment: 100

Two Sessional Tests: 30 Marks Each (Total weighted marks for Sessional Tests: 60)

Assignments: 20 Marks

Class Work/ Performance: 10 Marks

Attendance: 10 Marks

End Semester Exams: 100 Marks

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
MME-233.1	3	2	-	3	3	2	1	1	2	1	3	2	2	-
MME-233.2	3	3	3	3	3	1	1	2	2	2	2	3	1	2
MME-233.3	3	3	3	3	3	2	1	2	2	2	3	-	2	3

MME-233.4	3	3	3	3	3	3	1	2	2	3	2	2	2	3
MME-233.5	2	2	2	2	2	2	1	2	2	2	2	1	2	3
MME-233.6	2	3	3	2	3	3	1	3	3	2	2	3	2	1

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

(Deemed to be University under section 3 of the UGC Act 1956)

ME-M-200: MINI PROJECT AND SEMINAR

Periods/week Credits
L: 0 T: 0 P: 4 2
Duration of Examination: 3 Hrs

Max. Marks: 150
Continuous Assessment: 100
End Term Examination: 50

Course Type: Core

Course Outcomes:

After completion of this course the students will be able to

ME-M-200.1 Planning research including steps like indentifying research problem and selecting appropriate research methods and tools.
ME-M-200.2 Organising ideas into the form of a research synopsis/proposal.
ME-M-200.3 Organising and write references.
ME-M-200.4 Communicating effectively verbally and in writing.
ME-M-200.5 Discussing novel ideas critically and openly, and improving the research proposal in the light of the feedback given by others.
ME-M-200.6 MS Office and other tools for writing and presenting the research proposals.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
ME-M-200.1	3	2	2	3	-	2	1	1	2	1	3	1	2	2
ME-M-200.2	3	-	3	3	3	1	1	2	2	2	2	3	1	2
ME-M-200.3	3	3	3	3	3	2	1	2	2	2	3	-	2	3
ME-M-200.4	3	3	3	3	3	3	1	2	2	3	2	2	3	3
ME-M-200.5	2	2	2	3	2	2	1	2	2	2	2	-	2	1
ME-M-200.6	2	3	3	3	3	3	1	3	3	2	2	3	2	1

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

(Deemed to be University under section 3 of the UGC Act 1956)

MME-251: SIMULATION LAB

Periods/week Credits
L: 0 T: 0 P: 4 2
Duration of Examination: 3 Hrs

Max. Marks: 100
Continuous Assessment : 50
End Term Examination : 50

Course Type: Core

Course Outcomes:
After completion of this course the students will be able to

MME-251.1 Solve engineering problems using MATLAB software.
MME-251.2 Use graphical tools in order to visualize input data or solution.
MME-251.3 Write scripts and functions in MATLAB.
MME-251.4 Understand the fundamental concepts of Simulation and Modeling of mechanical systems.
MME-251.5 Form Simulink models using mathematical equations and can analyze and simulate it.
MME-251.6 Apply the learnt concepts in technical writing by research work.

List of Experiments:

1. Introduction to MATLAB
2. Graphics in MATLAB
3. Writing scripts in MATLAB
4. Writing functions in MATLAB
5. Introduction to Simulink
6. Problem Solving using Simulink
7. Introduction to Fuzzy Logic Toolbox
8. Problem solving using Fuzzy Logic Toolbox
9. Inventory Analysis using Simulation
10. Simulation of Translation and Rotational Mechanical System

Note:

1. 10 Experiments are to be performed in the semester.
2. At least eight experiments should be performed from above list. Remaining two experiments may either be performed from the above list or designed & set as per the scope of the syllabus.

Assessment Tools:

Surprise questions during lab/Class Performance
Term end examination/viva

In general parameters for Internal/Continuous Assessment (Lab/Practical Courses):

Parameter	Weightage
Two Mid-Term Viva	**60%**
File/Record Keeping	**20%**
Class Performance	**10%**
Class Attendance	**10%**

Lab/Practical Course: Total Marks 100

Internal/Continuous Assessment: 50

Two Viva: 15 Marks Each

File/Records: 10 Marks

Class Work/ Performance: 5 Marks

Attendance: 5 Marks

End Semester Exam: 50 Marks

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
MME-251.1	3	2	2	3	3	2	1	1	2	1	3	3	2	2
MME-251.2	3	3	3	3	3	1	1	2	2	2	2	3	1	2
MME-251.3	3	3	3	3	3	2	1	2	2	2	3	3	2	3
MME-251.4	3	3	3	3	3	3	1	2	2	3	2	2	2	3
MME-251.5	2	2	2	2	2	2	1	2	2	2	2	1	2	2
MME-251.6	2	3	3	2	3	3	1	3	3	2	2	3	2	1

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

(Deemed to be University under section 3 of the UGC Act 1956)

MME-252: QUALITY CONTROL LAB

Periods/week	Credits	Max. Marks: 100
L: 0 T: 0 P 4	2	Continuous Assessment : 50
Duration of Examination: 3 Hrs		End Term Examination : 50

Course Type: Core

Course Outcomes:

After completion of this course the students will be able to

MME-252.1 Learn the concepts of quality control applicable in industries.
MME-252.2 Assess the effect of rejection and quality on manufactured parts.
MME-252.3 Apply the learnt concept in data collection and analysis of quality on shop floor.
MME-252.4 Evaluate the quality of products in various manufacturing organizations.
MME-252.5 Recall the techniques used in quality control of parts on shop floor.
MME-252.6 Examine the quality related report related to manufactured products.

Case Study of a Forging/Casting/Machining/Plastic Moulding Manufacturing Company: Application of seven Quality Control Tools to investigate the rejection of the engineering component

(Note: The students to visit any of the above mention industries and select any one component with highest number of rejection of those component i.e. manufactured in the industry. The detailed process planning of the identified component has to be formulated to identify and define the problem, criteria for acceptance (Lower Specific Limit and Upper Specific Limit), data collection and analysis in consultation with the quality and production engineers on the shop floor and submit the report)

Report submitted should contain the following:

1. Process Planning of the component
2. Identification and defining the problem along with the performance indicator
3. Criteria for acceptance (Lower Specific Limit and Upper Specific Limit)
4. Data collection
5. Primary observation and develop the run chart/histogram of the performance indicator indicating directly the rejection percentage
6. Ascertain the cause of the defects and the reasons
7. Explore the causes using cause and effect diagram
8. Investigation into the causes and process quality check using X bar and R chart
9. Process capability assessment
10. Suggestion to control the process if any.

In general parameters for Internal/Continuous Assessment (Lab/Practical Courses):

Parameter	**Weightage**
Two Mid-Term Viva	**60%**

File/Record Keeping	**20%**
Class Performance	**10%**
Class Attendance	**10%**

Lab/Practical Course: Total Marks 100
Internal/Continuous Assessment: 50
Two Viva: 15 Marks Each
File/Records: 10 Marks
Class Work/ Performance: 5 Marks
Attendance: 5 Marks
End Semester Exam: 50 Marks

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
MME-252.1	3	2	2	3	3	2	1	1	2	1	3	-	2	2
MME-252.2	3	3	3	3	3	1	1	2	2	2	2	3	1	2
MME-252.3	3	3	3	3	3	2	1	2	2	2	3	3	2	3
MME-252.4	3	3	3	3	3	3	1	2	2	3	2	2	-	3
MME-252.5	2	2	2	2	2	2	1	2	2	2	2	1	2	-
MME-252.6	2	3	3	2	3	3	1	3	3	2	2	3	2	1

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

(Deemed to be University under section 3 of the UGC Act 1956)

M-MC-002: ENGLISH FOR RESEARCH PAPER WRITING

Periods/week Credits Max. Marks: Nil
L: 2 T: 0 P: 0 AP

Pre-requisites: None
Course Type: Audit Pass

Course Outcomes: The students will be able to-
M-MC-002.1 identify how to improve the writing skills and level of readability.
M-MC-002.2 learn about what to write in each section.
M-MC-002.3 understand the skills needed for writing a title.
M-MC-002.4 design the good quality of paper at very first-time submission.

Unit 1
Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing, Redundancy, Avoiding Ambiguity and Vagueness
Unit 2
Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticizing, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts.
Unit 3
Introduction, Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check.
Unit 4
Key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature,
Unit 5
Skills needed when writing the Methods, skills needed when writing, the Results, skills needed when writing the Discussion, skills needed when writing the Conclusions
Unit 6
Useful phrases, how to ensure paper is as good as it could possibly be the first- time submission

Reference
Books:
1. R. Goldbort, 2006, Writing for Science, Yale University Press.
2. R. Day, 2006, How to Write and Publish a Scientific Paper, Cambridge University Press
3. N. Highman, 1998, Handbook of Writing for the Mathematical Sciences, SIAM, Highman"s book.
4. Adrian Wallwork, 2011, English for Writing Research Papers, Springer New York Dordrecht, Heidelberg London.

SEMESTER III

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

(Deemed to be University under section 3 of the UGC Act 1956)

MME-321: SIMULATION AND MODELLING

Periods/week Credits	Max. Marks : 200
L: 3 T: 1 P: 0 3	Continuous Assessment: 100
Duration of Examination: 3 Hrs	End Term Examination : 100

Course Type: Elective

Course Outcomes:

After completion of this course the students will be able to

MME-321.1	Illustrate the use of simulation and modelling technique in effective decision-making.
MME-321.2	Generate random numbers and random variates using different techniques.
MME-321.3	Understand use of simulation in modelling, analysis and improvement of systems under study.
MME-321.4	Identify and apply basic concepts related to simulation and modeling.
MME-321.5	Model and simulate mechanical systems using the Simulink tool.
MME-321.6	Develop simulation based research projects in mechanical engineering.

Part-A

Unit 1: Introduction to Simulation: Simulation, model types, principles used in modelling, system studies, interacting subsystems and example, steps in computer simulation, advantages and disadvantages of simulation.

Unit 2: Probability concepts in Simulation: Stochastic variables, discrete and continuous probability function, continuous uniform distributed and computer generation of random numbers, uniform random number generator

Unit 3: Physical Modelling: Concept of system and environment, continuous and discrete system, linear and non linear system, Introduction to Stochastic activities

Part-B

Unit 4: System Simulation: Techniques of simulation, Monte Carlo method, comparison of simulation and analytical methods, computation techniques for continuous and discrete models.

Unit 5: System Dynamics: Historical background, exponential, Growth and decay models, modified exponential growth models, logistic curves and generalization of growth models, system dynamics diagrams

Unit 6: Simulation of Mechanical Systems: Building of simulation model, Simulation of translation and rotational mechanical system, Simulation of manufacturing systems, Case studies in simulation.

Text Books:

1. Jerry Banks and John Carson, 2005, "Discrete Event System Simulation", Fourth Edition, PHI.
2. Geoffrey Gordon, 2006 "System Simulation", Second Edition, PHI
3. Frank L. Severance, 2001, "System Modeling and Simulation", Wiley
4. Sheldon M. Ross, 2002: Introduction to Probability Models 7th Edition, Academic Press

Reference Books:

1. Donald E. Knuth, 2000: The Art of Computer Programming - Volume 2: Semi Numerical Algorithms, 2nd Edition, PEARSON Education, Reading MA, USA
2. Sheldon M. Ross, 2002: Simulation 3rd Edition, Academic Press
3. M. Law and W. D. Kelton, 1998 Simulation Modeling and Analysis, 3rd Edition, McGrawHill, New York, USA

Weblinks:

https://nptel.ac.in/courses/112107220/
https://nptel.ac.in/courses/112107214/
https://nptel.ac.in/courses/103107096/

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Instructions for setting of Paper Seven questions are to set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each part A and part B (one from each unit). Student needs to attempt two questions out of three questions from each part. Each question will be of 20 marks.

In general parameters for Internal /Continuous Assessment (Theory Courses):

Parameter	Weightage
Two Sessional (Mid-Term)Tests	**60%**
Assignments	**20%**
Class Performance	**10%**
Class Attendance	**10%**

Theory Course: Total Marks 200
Internal/Continuous Assessment: 100
Two Sessional Tests: 30 Marks Each (Total weighted marks for Sessional Tests: 60)
Assignments: 20 Marks
Class Work/ Performance: 10 Marks
Attendance: 10 Marks
End Semester Exams: 100 Marks

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
MME-321.1	3	2	2	3	3	2	1	-	2	1	3	3	2	2
MME-321.2	3	3	3	3	3	1	1	2	2	2	2	3	1	2
MME-321.3	3	3	3	3	3	2	1	2	2	2	3	3	-	3

MME-321.4	3	3	3	3	3	3	1	2	2	3	2	2	1	3
MME-321.5	2	2	2	2	2	2	1	2	2	2	2	-	2	3
MME-321.6	2	3	3	2	3	3	1	3	3	2	2	3	2	1

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

(Deemed to be University under section 3 of the UGC Act 1956)

MME-322: E-COMMERCE

Periods/week	Credits	Max. Marks: 200
L: 3 T: 0	3	Continuous Assessmen : 100
Duration of Examination: 3 Hrs		End Term Examination: 100

Course Type: Elective

Course Outcomes:

After completion of this course the students will be able to

MME-322.1	Understand the foundations and importance of E-commerce
MME-322.2	Demonstrate an understanding of E-commerce in business sector
MME-322.3	Analyze the impact of E-commerce on business models and strategy
MME-322.4	Describe the infrastructure for E-commerce
MME-322.5	Discuss legal issues and privacy in E-Commerce
MME-322.6	Recognize and discuss global E-commerce issues

Part-A

Unit 1: E –Commerce Introduction

Principles – Potential – Data Warehousing – Temporal Coherency, Networking Infrastructure – Software Tools – IP, TCP HTTP, HTML

Unit 2: E-commerce Technology

Cryptography –Consumer Interface Technologies – OALP & Data mining – Case studies.

Unit 3: E-commerce Approach

Effect on job, growth, trade, international co-operation – Tax problems - Application of E-commerce in different sectors – service, industry, domestic etc., - multidisciplinary approach to E-commerce – Software's – case studies.

Part-B

Unit 4: E-commerce Management

Net Centrism – Navigation – Digital Design – Web Metrics – Business models – Hyper Markets – Intelligent Agents – Auctions – Design, Protocol – Case Studies.

Unit 5: Channel Conflict Management

Security and Encryption – Abuse and Netiguette – Internet Governance – Economics of E Commerce – Equilibrium price – Electronic Marketing – Taxing – E business – Road map for success – case studies.

Unit 6: E-commerce – Legal Issues

Software Intellectual property law – Contract law for Ecommerce, Warranties and New Products – Cyber law issues – Privacy and Transborder flows, Fraud – Security of Information and Risks – Electronic Highway Robbery.

Text Books/ Reference Books

1. Kalakota & Whinston,2001,Frontiers of Electronic Commerce- Addison Wesley.
2. Efraim Turbon, Jae Lee, David King, H. Michael Chung, , 2001, Electronic Commerce, A Managerial Perspective
3. Napier, Judd, Rivers and Wagner, 2000, Creating a winning E-Business-, Thomson Learning, 2000.

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In general parameters for Internal /Continuous Assessment (Theory Courses):

Parameter	Weightage
Two Sessional (Mid-Term)Tests	**60%**
Assignments	**20%**
Class Performance	**10%**
Class Attendance	**10%**

Theory Course: Total Marks 200

Internal/Continuous Assessment: 100

Two Sessional Tests: 30 Marks Each (Total weighted marks for Sessional Tests: 60)

Assignments: 20 Marks

Class Work/ Performance: 10 Marks

Attendance: 10 Marks

End Semester Exams: 100 Marks

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
MME-322.1	3	2	2	3	-	2	1	1	2	1	-	3	2	2
MME-322.2	3	3	3	3	3	1	1	2	2	2	2	3	1	2
MME-322.3	3	3	3	3	3	2	3	2	2	2	3	3	-	3
MME-322.4	3	3	3	3	3	3	1	2	2	3	2	2	1	3
MME-322.5	2	2	2	2	2	2	1	2	2	2	2	-	2	3
MME-322.6	2	3	3	2	3	3	1	3	3	2	2	3	2	1

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

(Deemed to be University under section 3 of the UGC Act 1956)

MME-323: MANAGEMENT INFORMATION SYSTEM

Periods/week	Credits	Max. Marks : 200
L: 3 T: 0	3	Continuous Assessment: 100
Duration of Examination: 3 Hrs		End Term Examination: 100

Course Type: Elective

Course Outcomes:

After completion of this course the students will be able to

MME-323.1	Evaluate the role of information systems in today's competitive business environment.
MME-323.2	Define an information system from both a technical and business perspective.
MME-323.3	Evaluate the relationship between the digital firm, electronic commerce, electronic business and internet technology.
MME-323.4	Identify the major management challenges to building and using information systems in organizations.
MME-323.5	Identify the hardware and software components in computer system.
MME-323.6	Apply appropriate strategies to manage the system implementation process.

Part-A

Unit:1 Concept of MIS

Role of MIS – Characteristic of MIS Functional Sub systems – Activities Subsystems Pre-requisite of MIS – Contemporarily. Approaches to MIS – Technical Approach, Technical Approach, Information as strategic resource, use information complete advantage.

Unit: 2Computer Hardware

Generation of computers – complete categories – softwares – system software. Application software, data communication, data processing, transaction processing, data processing modes, data transmission, functions of telecommunications, communication, transmission channel, characteristic of communication channel.

Unit: 3 Network Technologies

Types of networks, OSI, TCP/IP Internet – Internal, external, ISDN, multimedia, IT enabled services, SPO, Cell Centres, MT, GIS Information.

Part-B

Unit: 4 Management Decision Making

Decision types, decision making tools, principle of rationality, principle of logic & interaction, decision making models, classical model, administrative model, Herbert Simon Model Information, Source of Information, Types of Information, Information Requirements, Techniques for Assessing information. Requirements – systems analysis and design systems, types, characteristics, control, control process, requirements of good control system, control system, law of requisite variety systems, development of system analysis, system design, system implementation, system development process system.

Unit: 5 Life Cycle Development

Rapid system development tools, proto type, CASE Tools, object oriented system for decision support system, the decision support system, components, characteristics, structure, group decision, support system configuration. Feature – executive information system/ executive support system, definition, characteristic, capabilities, benefits – expert system artificial intelligence, database management system – DBMS component database model.

Unit: 6Data Ware-Housing & Data Mining

Data warehousing, definition, structure, architecture, data mining, information security & control, information system security threats – external & internal. Threats information system & quality control assurance, software quality assurance, management role in software quality assurance, quality assurance method, quality profile model, construction quality model, Tick IT, Imitative – functional application of MIS – stores & purchase management account payable system – inventory. Management production, management system, making service system, applications in service sector – MIS, application in service industry.

Text Books:

1. Jerome Kauter – Management & Info
2. Gordon B. Davis & Alson – 1985, Management Info System, Tata McGraw Hill
3. Robert C Murdic Joel E Ross & James R Clagget, 1985, Info system for modern management, Prentice Hall
4. Henry C Lucy Jr, 2000, The Analysis Design & Implementation of MIS Kickson & Wheterbe – MIS

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Assignments	**20%**
Class Performance	**10%**
Class Attendance	**10%**

Theory Course: Total Marks 200
Internal/Continuous Assessment: 100
Two Sessional Tests: 30 Marks Each (Total weighted marks for Sessional Tests: 60)

Assignments: 20 Marks
Class Work/ Performance: 10 Marks
Attendance: 10 Marks
End Semester Exams: 100 Marks

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
MME-323.1	3	2	2	3	3	2	1	1	2	1	3	3	2	2
MME-323.2	3	3	3	3	3	1	1	2	2	2	2	3	1	2
MME-323.3	3	3	3	3	3	2	1	2	2	2	3	3	-	3
MME-323.4	3	3	3	3	3	3	1	2	2	3	2	2	1	3
MME-323.5	2	2	2	2	2	2	1	2	2	2	2	-	2	3
MME-323.6	2	3	3	2	3	3	1	3	3	2	2	3	2	1

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

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MME-324: RELIABILITY ENGINEERING

Periods/week	Credits	Max. Marks : 200
L: 3 T: 0	3	Continuous Assessment: 100
Duration of Examination: 3 Hrs		End Term Examination : 100

Course Type: Elective

Course Outcomes:

After completion of this course the students will be able to

MME-324.1	Understand the basic concepts reliability
MME-324.2	Model various systems applying reliability networks
MME-324.3	Evaluate the reliability of simple and complex systems
MME-324.4	Estimate the limiting state probabilities of repairable systems
MME-324.5	Apply various mathematical models for evaluating reliability of irreparable systems
MME-324.6	Design of systems with high reliability for industrial application

Part-A

Unit 1: Concept of Reliability

Importance of reliability, definition of reliability and its measures, concept of failure. General provision of a reliability specification, Methods of achieving reliability, Broad functions of reliability.

Unit 2: Failure Patterns

Bath tub curve, causes of early failure and methods to avoid them, failure distributions: exponential, Weibull, truncated normal, log normal, gamma, inverse Gaussian, their properties and uses.

Unit 3: Combinatorial Reliability

Series, parallel and r-out of n configurations; their block diagram, reliability graph and determination of reliability through combinatorial methods of inspection, events space, cut set and tie set. Multistate models.

Part-B

Unit 4: System Reliability Redundancy

System reliability with exponential components in series, parallel and r-out of- n system. Usefulness of redundancy and improvement factor. MTTF, MTBF, Equivalents MTBF of series and parallel system. Cold and hot redundancy, reliability of stand-by system. Weakest link model, chain model, stress-strength model, non-parametric estimation of reliability.

Unit 5: Reliability Testing Demonstration -I

Problem of life testing, estimation of parameters and reliability using standard probability models using complete and censored (type I, II and III) samples, properties of these estimators.

Unit 6: Reliability Testing Demonstration -II

Probability plotting and graphical procedures for estimating the parameter and testing validity of model by some standard statistical tests. Life test acceptance sampling plans in exponential case. Sequential life test in exponential case, accelerated life tests.

Text Books

1. K. K. Agarwal, 1993 Reliability Engineering, Kluwer Academic Publishers
2. E. Balagurusamy, 1984, Reliability Engineering-, Tata McGraw-Hill Education

3. V. Sankar, 2015System Reliability Concepts, Himalaya Publishing House

Reference Books

1. Roy Billinton and Ronald N. Allan, 2007, Reliability Evaluation of Engineering Systems, Reprinted in India B. S. Publications
2. Charles E. Ebeling, 2000,Reliability and Maintainability Engineering Tata McGraw Hill.
3. G.J.Anders-1stedition –1990, Probability concepts in Electric Power system –John Wiley & sons

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Assignments	**20%**
Class Performance	**10%**
Class Attendance	**10%**

Theory Course: Total Marks 200

Internal/Continuous Assessment: 100

Two Sessional Tests: 30 Marks Each (Total weighted marks for Sessional Tests: 60)

Assignments: 20 Marks

Class Work/ Performance: 10 Marks

Attendance: 10 Marks

End Semester Exams: 100 Marks

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
MME-324.1	3	2	2	3	3	2	1	1	2	1	3	3	2	2
MME-324.2	3	3	3	3	3	1	1	2	2	2	2	3	1	2
MME-324.3	3	3	3	3	3	2	1	2	2	2	3	3	-	3
MME-324.4	3	3	3	3	3	3	1	2	2	3	2	2	1	3
MME-324.5	2	2	2	2	2	2	1	2	2	2	2	2	2	3
MME-324.6	2	3	3	2	3	3	1	3	3	2	2	3	2	1

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

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MME-300: DISSERTATION (PHASE-I)

Periods/week Credits
L: 0 T: 0 P: 20 10
Duration of Examination: 4 Hrs

Max. Marks:300
Continuous Assessment: 200
End Term Examination: 100

Course Type: Core

Course Outcomes:

After completion of this course the students will be able to

MME-300.1 Planning research including steps like indentifying research problem and selecting appropriate research methods and tools.

MME-300.2 Organising ideas into the form of a research synopsis/proposal.

MME-300.3 Organising and write references.

MME-300.4 Communicating effectively verbally and in writing.

MME-300.5 Discussing novel ideas critically and openly, and improving the research proposal in the light of th feedback given by others.

MME-300.6 MS Office and other tools for writing and presenting the research proposals.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
MME-300.1	3	2	2	3	3	2	1	1	2	1	3	3	2	2
MME-300.2	3	3	3	3	3	1	1	3	2	2	2	3	1	2
MME-300.3	3	3	3	3	3	2	1	2	2	2	3	3	1	3
MME-300.4	3	3	3	3	3	3	1	2	2	3	2	2	1	3
MME-300.5	2	2	2	3	2	2	1	2	2	2	2	2	2	3
MME-300.6	2	3	3	3	3	3	1	3	3	2	2	3	2	1

SEMESTER IV

MME-400: DISSERTATION (PHASE-II)

Periods/week Credits
L: 0 T: 0 P: 32 16
Duration of Examination: 3 Hrs

Max. Marks: 600
Continuous Assessment: 400
End Term Examination : 200

Course Type: Core

Course Outcomes:

After completion of this course the students will be able to

MME-400.1 Planning research including steps like indentifying research problem and selecting appropriate research methods and tools.
MME-400.2 Organising ideas into the form of a research synopsis/proposal.
MME-400.3 Organising and write references.
MME-400.4 Communicating effectively verbally and in writing.
MME-400.5 Discussing novel ideas critically and openly, and improving the research proposal in the light of the feedback given by others.
MME-400.6 MS Office and other tools for writing and presenting the research proposals.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
MME-400.1	3	2	2	3	3	2	1	1	2	1	3	3	2	2
MME-400.2	3	3	3	3	3	1	1	3	2	2	2	3	1	2
MME-400.3	3	3	3	3	3	2	1	2	2	2	3	3	2	3
MME-400.4	3	3	3	3	3	3	1	2	2	3	2	2	1	3
MME-400.5	2	2	2	3	2	2	1	2	2	2	2	2	2	3
MME-400.6	2	3	3	3	3	3	1	3	3	2	2	3	2	1