MMPM258D	Advanced Processing of Materials	00	02/01	00

Semester- II

Operations Management			
Course Code	**MMPM201**	CIE Marks	50
Teaching Hours/Week (L:P:SDA)	3:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03

Course Learning objectives:

- Learn about historical beginning associated with operations management.
- Develop the forecasting of demands.
- Impart models used in decision making, Recognize and apply basic appropriate analytics.
- Interpret material scheduling and controlling of production activities.
- Develop schedules on single machine, flow shop and job shop.

Module-1

Operations Management Concepts: Introduction, Historical development, The trend: Information and Non-manufacturing systems, Operations management, Factors affecting productivity.
Operations Decision Making: Introduction, Management as a science, Characteristics of decisions, and Framework for decision making, Decision methodology, Decision support systems, Economic models, and Statistical models.

Module-2

Forecasting Demand: Forecasting Objectives And Uses, Forecasting Variables, Opinion And Judgmental Methods, Time Series Methods, Exponential Smoothing, Regression And Correlation Methods.

Module-3

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

Module-4

Scheduling of operations: need for scheduling, loading of machines, scheduling context, scheduling flow shops, scheduling of job shops, input output control, operational control issues in mass production systems, operations planning and control based on the theory of constrains, related problems.

Module-5

Single Machine Scheduling: Concept, measures of performance, SPT rule, Weighted SPT rule,EDD rule, minimizing the number of tardy jobs.

Flow -Shop Scheduling: Introduction, Johnson's rule for ‘n’ jobs on 2 and 3 machines, CDS heuristic. JOB-SHOP SHEDULING: Types of schedules, Heuristic procedure, scheduling 2 jobs on 'm' machines

Assessment Details (both CIE and SEE)

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

Continuous Internal Evaluation:

1. Two Unit Tests each of **25 Marks**
2. Two assignments each of **25 Marks** or **one Skill Development Activity of 50 marks** to attain the COs and POs

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

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

Semester-End Examination:

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

Suggested Learning Resources:

Books

1. Operations Management Monks J.G McGraw Hill International Editions - 1987.
2. Production and Operations Management Pannerselvam. R PHI 2nd edition
3. Production and Operations Management Chary, S.N TataMcGraw Hill. 3rd edition

Web links and Video Lectures (e-Resources):

- https://www.investopedia.com/terms/o/operations-management.asp
- https://www.youtube.com/watch?v=Hy48AFKEepo
- https://www.shipbob.com/blog/demand-forecasting/
- https://www.youtube.com/watch?v=IDITxCjlyFE

  https://decisions.com/videos/scheduling-job-flow/

Skill Development Activities Suggested

At the end of the lecture/presentation, numerical exercises are to be taken up to solve problems related to the topics covered. Additional problems are to be given for practice and also as assignments under each of the topics covered.

Course outcome (Course Skill Set)

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

Sl. No.	Description	Blooms Level
CO1	Describe the basic concept of OM, manufacturing trends in INDIA.	L1, L2, L3
CO2	Design of product layout, process layout and analyse process and capacity	L1, L2, L3, L4,L5
CO3	Applying appropriate inventory planning technique	L1, L2, L3,
CO4	Assess the demand and prioritise MPS	L, L2, L3, L4,L5
CO5	Design MRP, MRPII and schedule the jobs and machines.	L1, L2, L3, L4

Program Outcome of this course

Sl. No.	Description	POs
1	An ability to independently carry out research /investigation and development work to solve practical problems.	PO1
2	An ability to write and present a substantial technical report/document.	PO2
3	Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program	PO3
4	Understand contemporary issues in manufacturing engineering and develop relationship between product design and manufacturability to create safe, reliable, and cost-effective products.	PO4
5	Understand the process of converting customer needs into engineering specifications to create product designs that are sensitive to user needs and robust against unanticipated uses and misuse	PO5
6	Employ advanced prototyping methods to shorten design cycles and narrow alternatives without restricting innovation.	PO6
7	Understand and debate the roles and responsibilities of a product designer/manufacturer on society.	PO7

Mapping of COS and POs (Note : High - 3, Medium – 2, and Low – 1)

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

Semester- II

Organizational Behaviour			
Course Code	MMPM202	CIE Marks	50
Teaching Hours/Week (L:P: SDA)	3:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03

Course Learning objectives:

- Define organisational behaviour, analyse discipline and area of application in business.
- Understand personality, interpersonal and intergroup behaviour.
- Understand group types, norms and decision making.
- Understand nature and development of leadership and types of power.
- Learn the management of conflict, development, effectiveness and cross cultural management.

Module-1

OrgnanizationalBehavior – Definition, Need for studying Organizational Behavior, Disciplines involved in the study of Organizational Behavior, -Contributing disciplines and area like psychology, social psychology, economics, anthropology etc. Application of Organizational Behavior in Business.

Module-2

Individual behaviour – personality, perception, learning, attitudes inter-personal behaviour – Group and inter-group behaviour .

Module 3

Group Dynamics – Formal and Informal Group, Group Norms, Group Cohesiveness, Group Behaviour and Group Decision – making.

Module-4

Motivation and morale, leadership-nature, styles and approaches, development of leadership including laboratory training. Power and Authority – Definition of Power – Types of Power

Module-5

Management of change- Conflict Management- Organisation Health, Development and Effectiveness. Management of culture, Cross Cultural Management.

Assessment Details (both CIE and SEE)

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

Continuous Internal Evaluation:

1. Two Unit Tests each of **25 Marks**
2. Two assignments each of **25 Marks** or **one Skill Development Activity of 50 marks** to attain the COs and POs

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

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

Semester-End Examination:

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

Suggested Learning Resources:

Books

1. **Organizational Behavior** – Stephen. P. Robbins – Prentice Hall, India. - 9th edition 2001.
2. **Organizational Behavior** – Fred Luthans – McGraw Hill.
3. **Human Behavior at work**– Keith Davis – Prentice Hall India – 2007.

Web links and Video Lectures (e-Resources):

- VTU e-Shikshana Program
- VTU EDUSAT Program

Skill Development Activities Suggested

At the end of the lecture/presentation, numerical exercises are to be taken up to solve problems related to the topics covered. Additional problems are to be given for practice and also as assignments under each of the topics covered.

Course outcome (Course Skill Set)

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

Sl. No.	Description	Blooms Level
CO1	Define organisational behaviour, discipline and area of application in business	L1, L2, L3
CO2	Identify personality, interpersonal and intergroup behaviour.	L1, L2, L3, L4,L5
CO3	Identify group types, norms and decision making	L1, L2, L3, L4
CO4	Explain nature and development of leadership and Identify types of power.	L1, L2, L3, L4
CO5	Solve problems of the management of conflict, development, effectiveness and cross cultural management	L1, L2, L3, L4

Program Outcome of this course

Sl. No.	Description	POs
1	An ability to independently carry out research/investigation and development work to solve practical problems	PO1
2	An ability to write and present a substantial technical report/document.	PO2
3	To be able to demonstrate a degree of mastery over the area as per the specialization of the program.	PO3
4	Understand contemporary issues in manufacturing engineering and develop relationship between product design and manufacturability to create safe, reliable, and cost-effective products.	PO4
5	Understand the process of converting customer needs into engineering specifications to create product designs that are sensitive to user needs and robust against unanticipated use and misuse	PO5
6	Employ advanced prototyping methods to shorten design cycles and narrow alternatives without restricting innovation.	PO6
7	Understand and debate the roles and responsibilities of a product designer/manufacturer on society.	PO7

Mapping of COS and POs (Note : High - 3, Medium – 2, and Low – 1)

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

Semester- II

Industrial Design and Ergonomics			
Course Code	**MMPM203**	CIE Marks	50
Teaching Hours/Week (L:P:SDA)	3:2:0	SEE Marks	50
Total Hours of Pedagogy	40hrs+10-12 Labs	Total Marks	100
Credits	04	Exam Hours	03

Course Learning objectives:

- To increase awareness of the need for and role of ergonomics in occupational health.
- To obtain knowledge in the application of ergonomic principles to design of industrial workplaces and the prevention of occupational injuries
- To understand the breadth and scope of occupational ergonomics.

Module-1

Method study I / work simplication: Definition and objectives procedures, Selection of jobs.

Recording Tools and Techniques: Operation process chart, flow process charts (Man type-Material type), Flow diagram, critical examination, Develop the improved method.

Method study II/ Work simplication II: Tools for recording the movement of workers: String diagram, travel chart, multi activity chart, and Man & Machine process chart, Gang process chart, Two handed process chart (operator process chart), principles of motion economy.

Module-2

Work measurement / Time study: Objectives, purpose/use techniques, Time study equipments**,** selection of job and operator for time study. Basic steps recording the information, examination of data, measurement of operation, rating and levelling, allowances, standard time.

Work Sampling: Procedure, sample size determination, estimation of standard time, advantages and disadvantages.

Synthetic data: Development of standard data, machine time calculation, practical systems of PMTS (work factor system, motion time measurement system, basic motion time study) advantages.

Module-3

Introduction: An approach to industrial design - elements of design structure for industrial design in engineering application in modem manufacturing systems. Ergonomics and Industrial Design: Introduction - general approach to the man-machine relationship-workstation design-working position.

Control and Displays: shapes and sizes of various controls and displays-multiple displays and control situations - design of major controls in automobiles, machine tools etc., - design of furniture – design of instruments.

Module-4

Visual Effects of Line and Form: The mechanics of seeing psychology of seeing, general influences of lined and form. Colour: colour and light - colour and objects - colour and the eye colour consistency - colour terms - reactions to colour and colour continuation - colour on engineering equipments.

Module-5

Aesthetic Concepts: Concept of unity - concept of order with variety - concept of purpose style and environment - Aesthetic expressions. Style-components of style - house style, observations style in capital goods.

Industrial Design in Practice: General design - specifying design equipments - rating the importance of industrial design – industrial design in the design process.

PRACTICAL COMPONENT OF IPCC

Sl.NO	Experiments
1	Preparing the Outline process chart and Multiple Activity Chart
2	Construct the Flow process chart for various applications
3	Experiments on the principle of motion economy by Two handed process chart.
4	Draw the Flow diagram and String diagram for various applications.
5	Rating practice using: pin board assembly, dealing a deck of cards and marble collection activity
6	Determining the standard time for simple operations using stopwatch time study
7	Measurement of parameters (heart beat rate, calorie consumption) using walking simulator
8	Measurement of parameters (heart beat rate, calorie consumption, revolutions per minute) using ergonometer.
Experiments/ Activities/Demonstrations/Visits/Analytics etc., that enhances the skill of the learners (Activities are only for CIE)	
1	Exercises on conducting method study for assembling simple components and office work.
2	Development of Layout plans using SLP technique. Experiments on Line balancing.
3	Determination of standard time using PDA device and time study software

Assessment Details (both CIE and SEE)

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

CIE for the theory component of IPCC

1. Two Tests each of **25 Marks**
2. Two assignments each of **25 Marks/One Skill Development Activity of 50 marks**
3. Total Marks of two tests and two assignments/one Skill Development Activity added will be CIE for 60 marks, marks scored will be proportionally scaled down to **30 marks**.

CIE for the practical component of IPCC

- On completion of every experiment/program in the laboratory, the students shall be evaluated and marks shall be awarded on the same day. The**15 marks** are for conducting the experiment and preparation of the laboratory record, the other **05 marks shall be for the test** conducted at the end of the semester.
- The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report. Each experiment report can be evaluated for 10 marks. Marks of all experiments' write-ups are added and scaled down to 15 marks.
- The laboratory test at the end /after completion of all the experiments shall be conducted for 50 marks and scaled down to 05 marks**.**

  Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of IPCC for **20 marks**.

SEE for IPCC

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (duration 03 hours)

1. The question paper will be set for 100 marks and marks scored will be scaled down proportionately to 50 marks.
2. The question paper will have ten questions. Each question is set for 20 marks.
3. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
4. The students have to answer 5 full questions, selecting one full question from each module.

The theory portion of the IPCC shall be for both CIE and SEE, whereas the practical portion will have a CIE component only. Questions mentioned in the SEE paper shall include questions from the practical component).

- The minimum marks to be secured in CIE to appear for SEE shall be the 15 (50% of maximum marks-30) in the theory component and 10 (50% of maximum marks -20) in the practical component. The laboratory component of the IPCC shall be for CIE only. However, in SEE, the questions from the laboratory component shall be included**.** The maximum of 04/05 questions to be set from the practical component of IPCC, the total marks of all questions should not be more than

Suggested Learning Resources:

Books

- Introduction to Work Study, ILO, 4th edition, 1992
- Human Factor in Engineering and Design by Mark. S. Sanders and Ernest. J, McCornick McGraw-Hill Book Co., Inc., New York, 1993
- Work Study and Ergonomics by S. Dalela and Sourabh, Standard publishers, 2013
- Human Factors Design Handbook by Wesley Woodson,Peggy Tillman and Barry Tillman, McGraw-Hill, 2nd edition, 1992
- Motion and Time Study by Ralph M. Barnes, Wiley International, 7th Edition
- Work study and ergonomics by Lakhwinder pal singh, Cambridge university press, 2016

Web links and Video Lectures (e-Resources):

- www.nptel.ac.in
- https://youtu.be/gJDYV2SmFeY
- https://youtu.be/KktqRSxfTxo
- https://youtu.be/b05FPBjFH6A?list=PL6mZDY1bMAzhknOcAfFy_FI9vb5rzJzUv
- https://youtu.be/DlCDzSzsCDk
- https://youtu.be/nDUN_Kndxbc
- https://youtu.be/Fh6S5anFnbg
- https://youtu.be/pHc89bejapU
- https://youtu.be/wYvqHJ7FNAM
- https://youtu.be/1sb548iiuPY
- https://youtu.be/kQ-A9zvi7kA
- https://youtu.be/dVFtAEDlnRA
- https://youtu.be/ZrgYdAQ68T4

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Design of a reading table.
- Watering the garden.
- College layout for constructing flow diagram, string diagram.
- At the end of the lecture/presentation, exercises are to be taken up to solve problems related to the topics covered. Additional assignments are to be given under each of the topics covered.

Course outcome

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

Sl. No.	Description	Blooms Level
CO1	Define the various charts and to construct the charts on the basis of present method and develop a new / proposed method and identify the unnecessary movements. Explain the basic work measurement techniques and to gain knowledge of measurement of work, rating and imbibe the concept of allowance in estimating Standard Time.	L1, L2, L3, L4

CO2	Determine the basic concepts of Ergonomics and demonstrate a sound knowledge of Ergonomics in engineering applications.	L1, L2, L3, L4
CO3	Demonstrate a sound knowledge of Man-Machine Interfaces and design of displays and controls in engineering systems	L1, L2, L3

Program Outcome of this course

Sl. No.	Description	POs
1	An ability to independently carry out research/investigation and development work to solve practical problems	PO1
2	An ability to write and present a substantial technical report/document.	PO2
3	To be able to demonstrate a degree of mastery over the area as per the specialization of the program.	PO3
4	Understand contemporary issues in manufacturing engineering and develop relationship between product design and manufacturability to create safe, reliable, and cost-effective products.	PO4
5	Understand the process of converting customer needs into engineering specifications to create product designs that are sensitive to user needs and robust against unanticipated use and misuse	PO5
6	Employ advanced prototyping methods to shorten design cycles and narrow alternatives without restricting innovation.	PO6
7	Understand and debate the roles and responsibilities of a product designer/manufacturer on society.	PO7

Mapping of COS and POs (Note : High - 3, Medium – 2, and Low – 1)

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

Semester-II

Project Management			
Course Code	**MMPM206**	CIE Marks	50
Teaching Hours/Week (L:P:SDA)	3:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03

Course Learning objectives:

- To enable the students to understand the project management and its types.
- To help the students focus on and analyse the issues and strategies required to Project Selection and Prioritization
- To develop relevant skills necessary for Resourcing Projects and Budgeting the Projects.
- To enable the students to integrate the understanding of various Network Analysis.

Module-1

Introduction: Definition of project, characteristics of projects, understand projects, types of projects, scalability of project tools, project roles.

Project Selection and Prioritization: Strategic planning process, Strategic analysis, strategic objectives, portfolio alignment – identifying potential projects, methods of selecting projects, financial mode / scoring models to select projects, prioritizing projects, securing and negotiating projects.

Module-2

Planning Projects: Defining the project scope, Project scope checklist, Project priorities, Work Breakdown Structure (WBS), Integrating WBS with organisation, coding the WBS for the information system.

Scheduling Projects: Purpose of a project schedule, historical development, how project schedules are limited and created, develop project schedules, uncertainty in project schedules, Gantt chart.

Module-3

Resourcing Projects: Abilities needed when resourcing projects, estimate resource needs, creating staffing management plant, project team composition issues.

Budgeting Projects: Cost planning, cost estimating, cost budgeting, establishing cost control.

Project Risk Planning: Risk Management Planning, risk identification, risk analysis, risk response planning.

Module-4

Performing Projects: Project supply chain management: - Plan purchasing and acquisitions, plan contracting, contract types, project partnering and collaborations, project supply chain management.

Project Progress and Results: Project Balanced Scorecard Approach, Internal project, customer, financial issues.

Finishing the project: Terminate project early, finish projects on time, secure customer feedback and approval, knowledge management, perform administrative and contract closure.

Module-5

Network Analysis: Introduction, network construction - rules, Fulkerson's rule for numbering the events.

AON and AOA diagrams: Critical path method (CPM) to find the expected completion time of a project.

Floats: PERT for finding expected duration of an activity and project, determining the probability of completing a Project.

Predicting the completion time of project: Crashing of simple projects.

Assessment Details (both CIE and SEE)

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

Continuous Internal Evaluation:

1. Two Unit Tests each of **25 Marks**
2. Two assignments each of **25 Marks**or**oneSkill Development Activity of 50 marks** to attain the COs and POs

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

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

Semester-End Examination:

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

Suggested Learning Resources:

Books

1. Project Management by Timothy J Kloppenborg Cengage Learning, Edition 2009.
2. Project Management, A systems approach to planning scheduling and controlling by S Choudhury, McGraw Hill Education (India) Pvt. Ltd. New Delhi, 2016.
3. Project Management Pennington Lawrence McGraw hill.
4. Project Management A Moder Joseph and Phillips New Yark Van Nostrand, Reinhold.
5. Project Management Bhavesh M. Patal Vikas publishing House.

Web links and Video Lectures (e-Resources):

- https://www.youtube.com/watch?v=BOU1YP5NZVA
- https://www.simplilearn.com/project-selection-methods-article
- https://www.youtube.com/watch?v=DFL9FkIrXLI
- https://www.techtarget.com/searchcio/definition/project-planning
- https://www.ecosys.net/knowledge/scheduling-project-management-project-scheduling/
- https://www.workbreakdownstructure.com/
- https://docs.oracle.com/en/cloud/saas/project-management/22a/oapjs/how-project-progress-is-calculated.html
- https://www.youtube.com/watch?v=ljtGERVLF5U

Skill Development Activities Suggested

- Quizzes
- Assignments
- Seminars

Course outcome (Course Skill Set)

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

Sl. No.	Description	Blooms Level
CO1	Understand project characteristics and various stages of a project.	L1, L2, L3, L4
CO2	Understand the conceptual clarity about project organization and feasibility analyses	L1, L2, L3, L4,L5
CO3	Analyze the learning and understand techniques for Project planning, scheduling and Execution Control.	L1, L2, L3, L4
CO4	Apply the risk management plan and analyse the role of stakeholders.	L1, L2, L3, L4,L5
CO5	Understand the contract management, Project Procurement, Service level Agreements and productivity.	L1, L2, L3, L4

Program Outcome of this course

Sl. No.	Description	POs
1	An ability to independently carry out research /investigation and development work to solve practical problems.	PO1
2	An ability to write and present a substantial technical report/document.	PO2
3	Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program	PO3
4	Understand contemporary issues in manufacturing engineering and develop relationship between product design and manufacturability to create safe, reliable, and cost-effective products.	PO4
5	Understand the process of converting customer needs into engineering specifications to create product designs that are sensitive to user needs and robust against unanticipated uses and misuse	PO5
6	Employ advanced prototyping methods to shorten design cycles and narrow alternatives without restricting innovation.	PO6
7	Understand and debate the roles and responsibilities of a product designer/manufacturer on society.	PO7

Mapping of COS and POs (Note : High - 3, Medium – 2, and Low – 1)

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

Semester-II

QT AND QC LABORATORY			
Course Code	**MMPML207**	CIE Marks	50
Teaching Hours/Week (L:P:SDA)	0:0:2	SEE Marks	50
Credits	02	Exam Hours	03

Course objectives:

- The course aims at building capabilities in the students for analyzing different situations in the industrial/ business scenario involving limited resources and finding the optimal solution within constraints.

Sl.NO	Experiments
1	Regression analysis using any of the statistical packages.
2	Correlation analysis using any of the statistical packages.
3	Use of software package to solve LPP problems.
4	Use of software package to solve assignment and transportation problems.
5	Use of software package to solve PERT problems.
6	Use of software package to solve CPM problems.
7	Plotting Quality Control chart for attributes using Software Packages. Plotting appropriate charts and diagrams relevant to various industrial Applications
8	Plotting Quality Control chart for variables using Software Packages. Plotting appropriate charts and diagrams relevant to various industrial Applications

Experiments beyond the syllabus (For CIE only)

1	Development of simple MIS application programs for use in Library.
2	Development of simple MIS application programs for use in Bank.
3	Development of simple MIS application programs for use in Business shop.
4	Development of simple MIS application programs for use in Hospital.

Course outcomes

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

1. Analyse any real life system with limited constraints and depict it in a model form.
2. Convert the problem into a mathematical model.
3. Solve mathematical model manually as well as using software such as TORA, etc.
4. Understand variety of problems such as assignment, transportation, travelling salesman, etc.
5. Solve the problems using linear programming approach using software.
6. Solve the problems on PERT and CPM using software.
7. Solve Quality Control chart for attributes and variables using Software Packages

Assessment Details (both CIE and SEE)

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

Continuous Internal Evaluation (CIE):

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

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

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

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

Semester- II

Supply Chain Management			
Course Code	MMPM214A	CIE Marks	50
Teaching Hours/Week (L:P:SDA)	3:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03

Course Learning Objectives:

- To develop an understanding of basic concepts and role of Logistics and supply chain management in business.
- To understand how supply chain drivers play an important role in redefining value chain excellence of Firms.
- To develop analytical and critical understanding & skills for planning, designing and operations of supply chain.
- To understand, appraise and integrate various supply chain strategies.

Module-1

Building A Strategic Frame Work To Analyse Supply Chains: Supply chain stages and decision phase, process view of a supply chain. Supply chain flows. Examples of supply chains. Competitive and supply chain strategies. Achieving strategic fit. Expanding strategic scope. Drivers of supply chain performance. Framework for structuring drivers – Inventory, Transportation, Facilities, Information. Obstacles to achieving fit, Case discussions.

Designing The Supply Chain Network: Distribution Networking – Role, Design. Supply Chain Network (SCN) – Role, Factors, Framework for Design Decisions.

Module-2

Facility Location And Network Design: Models for facility location and capacity allocation. Impact of uncertainty on SCN – discounted cash flow analysis, evaluating network design decisions using decision trees. Analytical problems.

Planning And Managing Inventories In A Supply Chain: Review of inventory concepts., Concepts of Safety Inventory, Concept of Aggregation of Inventory, Concept of product availability.

Module-3

Sourcing, Transportation And Pricing Products: Role of sourcing, supplier – scoring & assessment, selection and contracts. Design collaboration. Role of transportation, Factors affecting transportation decisions. Modes of transportation and their performance characteristics. Designing transportation network. Trade-off in transportation design. Tailored transportation, Routing and scheduling in transportation. International transportation. Analytical problems. Role of Revenue Management in the supply chain, Revenue management for: Multiple customer segments, perishable assets, seasonal demand, bulk and spot contracts.

Module-4

Coordination And Technology In The Supply Chain: Co-ordination in a supply chain: Bullwhip effect. Obstacles to coordination. Managerial levers to achieve coordination, Building strategic partnerships. The role of IT supply Chain, The Supply Chain IT framework, CRM, Internal SCM, SRM. The role of ebusiness in a supply chain, The e-business framework, e-business in practice. Case discussion.

Module-5

Application Of Value Analysis: Application of Value analysis in the field of Accounting, Appearance Design, Cost reduction, Engineering, manufacturing, Management, Purchasing, Quality Control, Sales, marketing, Material Management Etc., Comparison of approach of Value analysis & other management techniques.

Assessment Details (both CIE and SEE)

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

Continuous Internal Evaluation:

1. Two Unit Tests each of **25 Marks**
2. Two assignments each of **25 Marks** or **one Skill Development Activity of 50 marks** to attain the COs and POs

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

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

Semester-End Examination:

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

Suggested Learning Resources:

Books

1. Supply Chain Management – Strategy, Planning, Sunil Chopra & Peter Meindl, Pearson Education Asia ISBN: 81-7808-272-1. – 2001
2. Supply Chain and Logistics Management, UpendraKachuru
3. Supply Chain Redesign –Transforming Supply Chains into Integrated Value Systems, Robert B Handfield, Ernest L Nichols, Jr. – Pearson Education Inc, ISBN: 81-7808- 272-1. – 2001.
4. Modelling the Supply Chain, Jeremy F Shapiro, uxbury, Thomson Learning, McGraw Hill
5. Designing & Managing the Supply Chain, David Simchi Levi, Philip Kaminsky& Edith Simchi Levi , McGraw Hill

Web links and Video Lectures (e-Resources):

- https://www.gartner.com/en/topics/supply-chain-management
- https://www.youtube.com/watch?v=Mi1QBxVjZAw
- https://www.youtube.com/watch?v=TTojGYDDR18
- https://www.youtube.com/watch?v=AB7kmDmEbMI
- https://www.youtube.com/watch?v=o8APky4PGJA

Skill Development Activities Suggested

- Quizzes
- Assignments
- Seminars

Course outcome (Course Skill Set)

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

Sl. No.	Description	Blooms Level
CO1	Understand the fundamentals of elements and functions of supply chain, role of drivers and demand forecasting	L1, L2, L3, L4
CO2	To apply various techniques of inventory management and their practical situations.	L1, L2, L3, L4,L5
CO3	Analyze how supply chain decisions related to facility location can be applied to various industries and designing the supply chain.	L1, L2, L3, L4,L5
CO4	How various warehousing management system and transportation can be practiced in various industries?	L1, L2, L3, L4,L5
CO5	How logistics and supply chain strategies can create value generation and utilise IT applications	L1, L2, L3, L4

Program Outcome of this course

Sl. No.	Description	POs
1	An ability to independently carry out research/investigation and development work to solve practical problems	PO1
2	An ability to write and present a substantial technical report/document.	PO2
3	To be able to demonstrate a degree of mastery over the area as per the specialization of the program.	PO3
4	Understand contemporary issues in manufacturing engineering and develop relationship between product design and manufacturability to create safe, reliable, and cost-effective products.	PO4
5	Understand the process of converting customer needs into engineering specifications to create product designs that are sensitive to user needs and robust against unanticipated use and misuse	PO5
6	Employ advanced prototyping methods to shorten design cycles and narrow alternatives without restricting innovation.	PO6
7	Understand and debate the roles and responsibilities of a product designer/manufacturer on society.	PO7

Mapping of COS and POs (Note : High - 3, Medium – 2, and Low – 1)

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

Semester II

Simulation and Modelling of Production Systems			
Course Code	MMPM214B	CIE Marks	50
Teaching Hours/Week (L:P:SDA)	3:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03

Course Learning objectives:

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

Module-1

Principle of Computer Modelling and Simulation: Monte Carlo simulation. Nature ofcomputer-modeling and simulation. Limitations of simulation, areas of applications. System and Environment: Components of a system -discrete and continuous systems, Models of a system –a variety of modeling approaches. Simulation Software: Selection of simulation software, simulation packages.

Module-2

Discrete Event Simulation: Concepts in discrete event simulation, manual simulation using event scheduling, single channel queue, too server queue, simulation of inventory problem.

Statistical Models in Simulation: Discrete distributions, continuous distributions. **Discrete Event Simulation:** Concepts in discrete event simulation, manual simulation using event scheduling, single channel queue, too server queue, simulation of inventory problem.

Statistical Models in Simulation: Discrete distributions, continuous distributions.

Module-3

Random Number Generation: Techniques for generating random numbers- Mid square method -the mod product method -Constant multiplier technique -Additive congruential method –Linear congruential method -Tests for random numbers -The Kolmogorov-Smimov test -the Chi-square test.

Module-4

Random Variable Generation: Inversion transforms technique-exponential distribution, uniform distribution, weibul distribution, continuous distribution, generating approximate normal variates-Erlang distribution.

Module-5

Empirical Discrete Distribution: Discrete uniform -distribution poisson distribution –geometricdistribution -acceptance -rejection technique for Poisson distribution gamma distribution

Designand Evalution of Simulation Experiments: variance reduction techniques -antithetic variables, variables-verification and validation of simulation models.

Assessment Details (both CIE and SEE)

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

Continuous Internal Evaluation:

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

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

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

Semester End Examination:

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

Suggested Learning Resources:

Books

TEXT BOOKS:

1. **Discrete Event System Simulation** - Jerry Banks & .John S Carson II - Prentice Hall Inc.-1984.
2. **Systems Simulation** - Gordan. G. - Prentice Hall India Ltd - 1991.

REFERENCE BOOKS:

1. **System Simulation with Digital Computer** - NusingDeo - Prentice Hall of India - 1979.
2. **Computer Simulation and Modeling** - Francis Neelamkovil - John Wilely& Sons - 1987.
3. **Simulation Modeling with Pascal** - RathM.Davis& Robert M O Keefe - Prentice Hall Inc. -1989.

Web links and Video Lectures (e-Resources):

- https://www.youtube.com/watch?v=gbOn3jRc_Wc
- https://www.youtube.com/watch?v=Wp3jyLkfBQs
- https://www.youtube.com/watch?v=WfEZMhpzsT8
- https://www.youtube.com/watch?v=DBmYYpxjqvM
- https://www.youtube.com/watch?v=O46ZlKEjjHE
- https://www.youtube.com/watch?v=OH8MRT8eqRI
- https://www.youtube.com/watch?v=yN6cvjtlQtY
- https://www.youtube.com/watch?v=pt4v5l8-Pjw
- https://www.youtube.com/playlist?list=PL3l_ZG2nBXNLoPB26LeNRVDP6oG6Sz8tu
- https://www.youtube.com/watch?v=Oomz_iZ5d-0

Skill Development Activities Suggested

- At the end of the lecture/presentation, numerical exercises are to be taken up to solve problems related to the topics covered. Additional problems are to be given for practice and also as assignments under each of the topics covered.

Course outcome

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

Sl. No.	Description	Blooms Level
CO1	Describe the role of important elements of discrete event simulation and modeling paradigm.	L1, L2, L3, L4
CO2	Develop skills to apply simulation software to construct and execute goal-driven system models.	L1, L2, L3, L4, L5
CO3	Interpret the model and apply the results to resolve critical issues in a real world environment.	L1, L2, L3, L4, L5

Program Outcome of this course

	Description	POs
1	An ability to independently carry out research/investigation and development work to solve practical problems	PO1
2	An ability to write and present a substantial technical report/document.	PO2
3	To be able to demonstrate a degree of mastery over the area as per the specialization of the program.	PO3
4	Understand contemporary issues in manufacturing engineering and develop relationship between product design and manufacturability to create safe, reliable, and cost-effective products.	PO4
5	Understand the process of converting customer needs into engineering specifications to create product designs that are sensitive to user needs and robust against unanticipated use and misuse	PO5
6	Employ advanced prototyping methods to shorten design cycles and narrow alternatives without restricting innovation.	PO6
7	Understand and debate the roles and responsibilities of a product designer/manufacturer on society.	PO7

Mapping of COS and POs (Note : High - 3, Medium – 2, and Low – 1)

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

Semester-II

Human Resource Management			
Course Code	**MMPM214C**	CIE Marks	50
Teaching Hours/Week (L:P:SDA)	3:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	02

Course Learning objectives:

- To enable the students to understand the HR Management and system at various levels in general and in certain specific industries or organizations.
- To help the students focus on and analyse the issues and strategies required to select and develop manpower resources.
- To develop relevant skills necessary for application in HR related issues.
- To Enable the students to integrate the understanding of various HR concepts along with the domain concept in order to take correct business decisions

Module-1

Introduction: Evolution of HRM, Objectives, Functions and Policies.

Human Resource Planning: Uses and benefits, Man Power Inventory, Man Power Forecasting, Methods of Man Power Forecasting, job Description, Job Specification.

Module-2

Recruitment: Sources of Man power, Advertisement, Short Listing of Candidates calling Candidates for selection Process.

Selection: Selection procedure – Written Test, Group Discussion. Interview – Different methods, advantages and limitations, Psychological testing – Advantages and limitations, Induction procedure, transfers, promotion, exit interview, (Tutorial on written test, Group Discussion, Interviews)

Module-3

Training And Development: Identification of Training needs, Training Evaluation, Training Budget, Executive Development – Different Approaches, Non-executive development – Different methods.

Performance Appraisal: Components (all round performance appraisal), Methods. Advantages and limitations of different methods, Personal Counseling based on Annual Confidential Reports.

Module-4

Counselling And Human Resource Accounting: Characteristics, Need, Function, Types, Suggestions for personnel development, communication function, communication process, effective communication. Human resource records, Advantages of HR accounting, Various methods of accounting.

Module-5

Industrial Relations: Indian trade union act, standing orders act, Indian factories act

Industrial Disputes And Settlement: Indian Industrial Disputes act, Industrial disputes settlement machinery. Works committee, Board of Conciliation, Voluntary Arbitration, Compulsory arbitration, Court of inquiry, Industrial tribunal, Adjudication.

Assessment Details (both CIE and SEE)

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

Continuous Internal Evaluation:

1. Two Unit Tests each of **25 Marks**
2. Two assignments each of **25 Marks** or **oneSkill Development Activity of 50 marks** to attain the COs and POs

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

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

Semester-End Examination:

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

Suggested Learning Resources:

Books

1. Human Resources Management – Dr. K Ashwathappa – Tata McGraw Hill - Edition 1999.
2. Management of Human Resources – CB Mamoria – Himalaya Publication House – 2003.
3. Personnel / Human resource Management – Decenoz and robbins- PHI - 2002
4. Industrial Relations – Arun Monappa – TMH - ISBN – 0-07-451710-8.
5. Human Resources Management – VSP Rao

Web links and Video Lectures (e-Resources):

- https://www.lkouniv.ac.in/site/writereaddata/siteContent/20200407095112659 9shaile_Evolution_of_Human_Resource_Management.pdf
- https://www.investopedia.com/terms/h/human-resource-planning.asp
- https://www.hrhelpboard.com/recruitment.htm
- https://www.accountingnotes.net/human-resource-management/selection-process/selection-process-in-hrm/17676
- https://www.hrhelpboard.com/training-development.htm
- https://www.startuphrtoolkit.com/performance-appraisal-in-hrm/
- https://backup.pondiuni.edu.in/storage/dde/downloads/hrmiv_hra.pdf
  https://www.legalserviceindia.com/legal/article-956-industrial-and-national-tribunal.html

Skill Development Activities Suggested

At the end of the lecture/presentation, numerical exercises are to be taken up to solve problems related to the topics covered. Additional problems are to be given for practice and also as assignments under each of the topics covered.

Course outcome (Course Skill Set)

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

Sl. No.	Description	Blooms Level
CO1	Understand the basic concepts of HRM, Functions and role of HRM	L1, L2, L3, L4
CO2	Know methodology of job selection process implemented in various sectors.	L1, L2, L3, L4,L5
CO3	Analyse the effectiveness in training, evaluating and benchmarking HR training	L1, L2, L3, L4,L5
CO4	Understand the career development concept and methods of personal appraisal	L1, L2, L3, L4,L5
CO5	Understand International activities of HRM, Staffing, communication, appraisal training and interview system.	L1, L2, L3, L4

Program Outcome of this course

Sl. No.	Description	POs
1	An ability to independently carry out research /investigation and development work to solve practical problems.	PO1
2	An ability to write and present a substantial technical report/document.	PO2
3	Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program	PO3
4	Understand contemporary issues in manufacturing engineering and develop relationship between product design and manufacturability to create safe, reliable, and cost-effective products.	PO4
5	Understand the process of converting customer needs into engineering specifications to create product designs that are sensitive to user needs and robust against unanticipated uses and misuse	PO5
6	Employ advanced prototyping methods to shorten design cycles and narrow alternatives without restricting innovation.	PO6
7	Understand and debate the roles and responsibilities of a product designer/manufacturer on society.	PO7

Mapping of COS and POs (Note : High - 3, Medium – 2, and Low – 1)

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

Semester-II

Management Information Systems			
Course Code	**MMPM214D**	CIE Marks	50
Teaching Hours/Week (L:P:SDA)	3:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03

Course Learning objectives:

- To elevate students' awareness of information Technology and develop an in-depth and systematic understanding of key aspects of IT management.
- To help students gain a strategic perspective on business.
- To evaluate the value of emerging technologies and their competitive advantage.

Module-1

Fundamentals of Information Systems: Information systems in business, fundamentals of information systems solving business problems with information systems.

Module-2

Information Systems for Business Operations: Business information systems, Transaction processing systems, management, information systems and decision support systems. Artificial intelligence technologies in business, information system for strategic applications and issues in information technology.

Module-3

Issues in Managing Information Technology: Managing information resources and technologies global information technology, management, planning and implementing change, integrating business change with IT, security and ethical challenges in managing IT, social challenges of information technology.

Module-4

E-Business Model: E-commerce frame work, Architectural frame work for e-commerce, Application services and transaction, Models – B2C Transactions, B2B Transactions, Intra-Organizational Transactions**.**

WWW Architecture: Client server structure of the web, e-Commerce architecture, Technology behind the web.

Module-5

Consumer Oriented E-Commerce: Consumer oriented Application: Finance and Home Banking, Home shopping, Home Entertainment, Mercantile Process Models, Consumers perspective, Merchants perspective.

Electronic Data Interchange (EDI): EDI Concepts, Applications in business – components of international trade, Customs Financial EDI, Electronic fund transfer, Manufacturing using EDI, Digital Signatures and EDI.

Assessment Details (both CIE and SEE)

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

Continuous Internal Evaluation:

1. Two Unit Tests each of **25 Marks**
2. Two assignments each of **25 Marks**or**oneSkill Development Activity of 50 marks** to attain the COs and POs

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

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

Semester-End Examination:

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

Suggested Learning Resources:

Books

1. Management Information systems- managing information technology in the internet worked. Jams. A O'Brien. Tata McGraw Hill publishing company limited. 2002.
2. Management Information Systems. Laaudon & Laudo. PHI. ISBN 81-203-1282.
3. Management Information Systems. S. Sadogopan. PHI 1998Edn. ISBN 81-203- 1180-9.
4. Information systems for modern management G.R. Murdick PHI 2nd Edition..4. Human Resources Management – Ravi Dharma Rao

Web links and Video Lectures (e-Resources):

- https://www.youtube.com/watch?v=xisFrwLkR58
- https://www.youtube.com/watch?v=T7eyTJA1qQ4
- https://www.nibusinessinfo.co.uk/content/examples-artificial-intelligence-use-business
- https://planningtank.com/computer-applications/strategic-information-system
- https://www.itproportal.com/features/ten-challenges-facing-it-managers-right-now-and-how-to-overcome-them/
- https://www.geeksforgeeks.org/ethical-issues-in-information-technology-it/
- https://www.bigcommerce.com/articles/ecommerce-website-development/ecommerce-frameworks/
- https://learn.financestrategists.com/finance-terms/b2c/?gclid=Cj0KCQjwmuiTBhDoARIsAPiv6L-s-GL7tTYIaXqdEzWojJv0k1wJVlN4VG0xJycy3nlsCf-aMUgDPRUaAgH0EALw_wcB

Skill Development Activities Suggested

- Quizzes
- Assignments
- Seminars

Course outcome

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

Sl. No.	Description	Blooms Level
CO1	Relate the basic concepts and technologies used in the field of management information systems	L1, L2, L3, L4
CO2	Compare the processes of developing and implementing information systems	L1, L2, L3, L4,L5
CO3	Outline the role of the ethical, social, and security issues of information systems.	L1, L2, L3, L4,L5
CO4	Translate the role of information systems in organizations, the strategic management processes, with the implications for the management.	L1, L2, L3, L4,L5
CO5	Apply the understanding of how various information systems like DBMS work together to accomplish the information objectives of an organization.	L1, L2, L3, L4

Program Outcome of this course

Sl. No.	Description	POs
1	An ability to independently carry out research /investigation and development work to solve practical problems.	PO1
2	An ability to write and present a substantial technical report/document.	PO2
3	Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program	PO3
4	Understand contemporary issues in manufacturing engineering and develop relationship between product design and manufacturability to create safe, reliable, and cost-effective products.	PO4
5	Understand the process of converting customer needs into engineering specifications to create product designs that are sensitive to user needs and robust against unanticipated uses and misuse	PO5
6	Employ advanced prototyping methods to shorten design cycles and narrow alternatives without restricting innovation.	PO6
7	Understand and debate the roles and responsibilities of a product designer/manufacturer on society.	PO7

Mapping of COS and POs (Note : High - 3, Medium – 2, and Low – 1)

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

Semester- II

Total Quality Management			
Course Code	**MMPM215A**	CIE Marks	50
Teaching Hours/Week (L:P:SDA)	3:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03

Course Learning objectives:

- Understand various approaches to TQM
- Understand the characteristics of quality leader and his role.
- Develop feedback and suggestion systems for quality management.
- Enhance the knowledge in Tools and Techniques of quality management.

Module-1

Principles and Practice: Definition, basic approach, gurus of TQM, TQM Framework, awareness, defining quality, historical review, obstacles, benefits of TQM. Quality Management Systems: Introduction, benefits of ISO registration, ISO 9000 series of standards, ISO 9001 requirements.

Module-2

Leadership: Definition, characteristics of quality leaders, leadership concept, characteristics of effective people, ethics, the Deming philosophy, role of TQM leaders, implementation, core values, concepts and framework, strategic planning communication, decision making,

Module-3

Customer Satisfaction and Customer Involvement: Customer Satisfaction: customer and customer perception of quality, feedback, using customer complaints, service quality, translating needs into requirements, customer retention, case studies. Employee Involvement – Motivation, employee surveys, empowerment, teams, suggestion system, recognition and reward, gain sharing, Performance appraisal, unions and employee involvement, case studies.

Module-4

Continuous Process Improvement: process, the Juran trilogy, improvement strategies, types of problems, the PDSA Cycle, problem-solving methods, Kaizen, reengineering, six sigma, case studies.
Statistical Process Control : Pareto diagram, process flow diagram, cause and effect diagram, check sheets, histograms, statistical fundamentals, Control charts, state of control, out of control process, control charts for variables, control charts for attributes, scatter diagrams, case studies.

Module-5

Tools and Techniques: Benching marking, information technology, quality management systems, environmental management system, and quality function deployment, quality by design, failure mode and effect analysis, product liability, total productive maintenance.

Assessment Details (both CIE and SEE)

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

Continuous Internal Evaluation:

1. Two Unit Tests each of **25 Marks**
2. Two assignments each of **25 Marks**or**oneSkill Development Activity of 50 marks** to attain the COs and POs

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

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

Semester-End Examination:

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

Suggested Learning Resources:

Books

1. Total Quality Management Dale H. Besterfield, Pearson Education India ISBN:8129702606, Edition 03.
2. Total Quality Management, Engineers, M. Zairi head, Publishing.
3. Managing for Quality and Performance Excellence, James R. Evans and W M, Cengage Learning, 9th edition,
4. A New American TQM, four revolutions in management, Shoji Shiba,Alan Graham, Productivity press, Oregon, 1990.
5. Engineering Optimization Methods and Applications
6. Organizational Excellence through TQM, H. Lal, New age Publications, 2008.
7. Introduction to Operations Research- Concepts and Cases, F.S. Hillier. G.J. Lieberman, Tata McGraw Hill, 9th Edition, 2010

Web links and Video Lectures (e-Resources):

- https://www.investopedia.com/terms/t/total-quality-management-tqm.asp
- https://www.youtube.com/watch?v=VD6tXadibk0
- https://aboutthree.com/blog/five-important-factors-in-total-quality-management/
- https://www.youtube.com/watch?v=renlXcpK9sk
- https://www.youtube.com/watch?v=umqtSNPp5Dk
- https://study.com/academy/lesson/five-principles-of-total-quality-management-tqm.html
- https://www.greenlight.guru/blog/total-quality-management-principles

Skill Development Activities Suggested

At the end of the lecture/presentation, numerical exercises are to be taken up to solve problems related to the topics covered. Additional problems are to be given for practice and also as assignments under each of the topics covered.

Course outcome (Course Skill Set)

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

Sl. No.	Description	Blooms Level
CO1	To understand the concept of Quality costs.	L1, L2, L3, L4
CO2	Understand the concept of problem solving using the process.	L1, L2, L3, L4
CO3	Understand the use of control charts for improving the process quality.	L1, L2, L3, L4
CO4	Illustrate design of experiments using Taguchi technique.	L1, L2, L3, L4, L5
CO5	Acquire basic knowledge of total quality management.	L1, L2, L3, L4, L5

Program Outcome of this course

Sl. No.	Description	POs
1	An ability to independently carry out research /investigation and development work to solve practical problems.	PO1
2	An ability to write and present a substantial technical report/document.	PO2
3	Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program	PO3
4	Understand contemporary issues in manufacturing engineering and develop relationship between product design and manufacturability to create safe, reliable, and cost-effective products.	PO4
5	Understand the process of converting customer needs into engineering specifications to create product designs that are sensitive to user needs and robust against unanticipated uses and misuse	PO5
6	Employ advanced prototyping methods to shorten design cycles and narrow alternatives without restricting innovation.	PO6
7	Understand and debate the roles and responsibilities of a product designer/manufacturer on society.	PO7

Mapping of COS and POs (Note : High - 3, Medium – 2, and Low – 1)

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

Semester- II

Product Design and Manufacturing			
Course Code	**MMPM215B**	CIE Marks	50
Teaching Hours/Week (L:P:SDA)	3:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03

Course Learning objectives:

- Understand modern product development processes.
- Understand and explain the concept of Industrial design and robust design concepts.
- Understand the concept of Design for manufacture and assembly.
- Understand the legal factors, social issues, engineering ethics related to product design

Module-1

Product Data Management : Product life cycle, Complexity in Product Development, General Description of PDM

Basic functionality of PDM: Information architecture, PDM System architecture, Applications used in PDM systems. Trends in PDM.

Module-2

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

Module-3

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

Module-4

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

Module-5

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

Assessment Details (both CIE and SEE)

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

Continuous Internal Evaluation:

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

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

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

Semester End Examination:

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

Suggested Learning Resources:

Books

1. Computer Integrated Design and Manufacturing - David Bed worth. Mark Henderson &. Philips Wolfe - McGraw Hill Inc
2. Visual Modeling with Rational Rose and UML - Terry Quatrain –
3. Wind-chill - RS.O Reference manuals - 2000.

Web links and Video Lectures (e-Resources):

- https://www.youtube.com/watch?v=oTqtY8yjUw4
- https://www.youtube.com/watch?v=bxHbP-q9InU
- https://www.youtube.com/watch?v=0XFuRPPkZvA
- https://www.technia.com/blog/cad-data-management-on-the-3dexperience-platform/
- https://www.youtube.com/watch?v=JvQI0jkv89k

Skill Development Activities Suggested

- Quizzes
- Assignments
- Seminars

Course outcome

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

Sl. No.	Description	Blooms Level
CO1	Use the Product Design and Development Process, as a means to manage the development of an idea from concept through to production.	L1, L2, L3, L4
CO2	Employ research and analysis methodologies as it pertains to the product design process, meaning, and user experience.	L1, L2, L3, L4,L5
CO3	Apply creative process techniques in synthesizing information, problem-solving and critical thinking.	L1, L2, L3, L4
CO4	Demonstrate and employ hand drawing and drafting principles to convey concepts.	L1, L2, L3, L4,L5
CO5	Use basic fabrication methods to build prototype models for hard-goods and soft-goods and packaging.	L1, L2, L3, L4

Program Outcome of this course

Sl. No.	Description	POs
1	An ability to independently carry out research/investigation and development work to solve practical problems	PO1
2	An ability to write and present a substantial technical report/document.	PO2
3	To be able to demonstrate a degree of mastery over the area as per the specialization of the program.	PO3
4	Understand contemporary issues in manufacturing engineering and develop relationship between product design and manufacturability to create safe, reliable, and cost-effective products.	PO4
5	Understand the process of converting customer needs into engineering specifications to create product designs that are sensitive to user needs and robust against unanticipated use and misuse	PO5
6	Employ advanced prototyping methods to shorten design cycles and narrow alternatives without restricting innovation.	PO6
7	Understand and debate the roles and responsibilities of a product designer/manufacturer on society.	PO7

Mapping of COS and POs (Note : High - 3, Medium – 2, and Low – 1)

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

Semester- II

Design of Experiments			
Course Code	MMPM215C	CIE Marks	50
Teaching Hours/Week (L:P:SDA)	3:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03

Course Learning objectives:

- Plan data collection, to turn data into information and to make decisions that lead appropriate action.
- Apply the methods taught to real life situations.
- Plan, analyze, and interpret the results of experiments.
- To understand the Orthogonal arrays.
- Analyze the Parameter and tolerance design concepts.

Module-1

Strategy of Experimentation, Typical applications of Experimental design, Basic Principles, Guidelines for Designing Experiments. **Concepts of random variable,** probability, density function cumulative distribution function. Sample and population, Measure of Central tendency; Mean median and mode, Measures of Variability, Concept of confidence level. Statistical Distributions: Normal, Log Normal & Weibull distributions. Hypothesis testing, Probability plots, choice of sample size. Illustration through Numerical examples.

Module-2

Classical Experiments: Factorial Experiments: Terminology: factors, levels, interactions, treatment combination, randomization, Two-level experimental designs for two factors and three factors. Three-level experimental designs for two factors and three factors, Factor effects, Factor interactions, Fractional factorial design, Saturated Designs, Central composite designs. Illustration through Numerical examples.

Module-3

Measures of variability, Ranking method, Column effect method & Plotting method, Analysis of variance (ANOVA) in Factorial Experiments: YATE's algorithm for ANOVA, Regression analysis, Mathematical models from experimental data. Illustration through Numerical examples.

Quality, Western and Taguchi's quality philosophy, elements of cost, Noise factors causes of variation. Quadratic loss function & variations of quadratic loss function. Robust Design: Steps in Robust Design: Parameter design and Tolerance Design. Reliability Improvement through experiments, Illustration through Numerical examples**.**

Module-4

Types of Orthogonal Arrays, selection of standard orthogonal arrays, Linear graphs and Interaction assignment, Dummy level Technique, Compound factor method, Modification of linear graphs. Illustration through Numerical examples.

Module-5

Evaluation of sensitivity to noise. Signal to Noise ratios for static problems: Smaller-the-better type, Nominal-the –better-type, Largerthe- better type. Signal to Noise ratios for Dynamic problems. Illustration through Numerical examples.

Parameter and tolerance design concepts, Taguchi's inner and outer arrays, parameter design strategy, tolerance design strategy. Illustration through Numerical examples.

Assessment Details (both CIE and SEE)

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

Continuous Internal Evaluation:

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

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

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

Semester End Examination:

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

Suggested Learning Resources:

Books

- Design and Analysis of Experiments, Douglas C Montgomerry, Wiley, 8th Edition
- Design and Analysis of Experiments, R. Panneerselvam, PHI
- Quality Engineering Using Robust Design, Madhav S,Phadke, PHI
- Design of Experiments with Minitab, Paul Mathews, New Age International
- Design of Experiments with Minitab, Virgil L Anderson and Robert A Mclean, Taylor and Francis

Web links and Video Lectures (e-Resources):

- https://www.youtube.com/watch?v=G_IAeHoukvE
- https://www.youtube.com/watch?v=KhjM8YI3agk
- https://www.youtube.com/watch?v=1fgvi1dXfMg
- https://www.youtube.com/watch?v=dmvo_B91vlc
- https://www.youtube.com/watch?v=sIRl1xWrViY

Skill Development Activities Suggested

- Quizzes
- Assignments
- Seminars

Course outcome

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

Sl. No.	Description	Blooms Level
CO1	Plan data collection, to turn data into information and to make decisions that lead appropriate action.	L1, L2, L3, L4, L5
CO2	Plan, analyze, and interpret the results of experiments, To understand the Orthogonal arrays.	L1, L2, L3, L4, L5
CO3	Analyze the Parameter and tolerance design concepts.	L1, L2, L3, L4, L5

Program Outcome of this course

Sl. No.	Description	POs
1	An ability to independently carry out research/investigation and development work to solve practical problems	PO1
2	An ability to write and present a substantial technical report/document.	PO2
3	To be able to demonstrate a degree of mastery over the area as per the specialization of the program.	PO3
4	Understand contemporary issues in manufacturing engineering and develop relationship between product design and manufacturability to create safe, reliable, and cost-effective products.	PO4
5	Understand the process of converting customer needs into engineering specifications to create product designs that are sensitive to user needs and robust against unanticipated use and misuse	PO5
6	Employ advanced prototyping methods to shorten design cycles and narrow alternatives without restricting innovation.	PO6
7	Understand and debate the roles and responsibilities of a product designer/manufacturer on society.	PO7

Mapping of COS and POs (Note : High - 3, Medium – 2, and Low – 1)

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

Semester- II

Advanced Manufacturing Practices			
Course Code	**MMPM215D**	CIE Marks	50
Teaching Hours/Week (L:P:SDA)	3:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03

Course Learning objectives:

- Students will introduced to the concept of JIT production & TQC .
- Students will learn about the effective use of Kanaban as per Toyota production system.
- Students will understand the different plant configuration & their characteristics, Automation & Robotics.

Module-1

Need of CPC for a company, what CPC can do, CPC-getting the right tool.
JIT – Introduction – The spread of JIT Movement, some definitions of JIT, core Japanese practices of JIT, Creating continuous Flow Manufacture, Enabling JIT to occur, Basic elements of JIT, Benefits of JIT.

Module-2

Just in Time Production – Primary purpose, profit through cost reduction, Elimination of over production, Quality control, Quality Assurance, Respect for Humanity, Flexible work Force, JIT Production Adapting to changing production Quantities, process layout for shortened lead Times, Standardization of operation, Automation.
Sequence and scheduling used by suppliers: Monthly and daily Information. Sequenced withdrawal system by sequenced schedule table, problems and counter measures in applying the Kanban system to sub contractors.

Module-3

Just-in-Time Production with Total Quality Control just in time concept, cutting lot sizes, cutting set-up times, cutting purchase order costs, the JIT cause-Effect chain, Scrap/Quality Improvements, Motivational effects, Responsibility effects, small Group improvement Activities, withdrawal of Buffer Inventory, the total Quality Control Concept.

Module-4

Total Quality Control-Introduction-Total Quality Control concepts, responsibility, learning from the west, TQC concepts categorized, Goals, Habit of improvement, perfection, Basics, process control, Easy to see Quality control as facilitator, small lot sizes, Housekeeping, Less than full capacity scheduling, Daily machine checking, Techniques and Aids, Exposure of problems, Fool proof Devices, Tools of Analysis, QC Circles, TQC in Japanese-owned US Electronics plant, TQC in Japanese-owned Automotive plants.

Module-5

Plant Configurations: Introduction-ultimate lant configuration, job shop Fabrication, Frame Welding, Forming Frame parts from Tubing, Dedicated production lines, overlapped production, the daily schedule, Forward Linkage by means of Kanban, physical merger of processes, Adjacency, mixed Models, Automated production Lines, Pseudo Robots, Robots, CAD and Manufacturing, Conveyors and stacker Cranes, Automatic Quality Monitoring.

Assessment Details (both CIE and SEE)

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

Continuous Internal Evaluation:

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

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

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

Semester End Examination:

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

Suggested Learning Resources:

Books

- Japanese Manufacturing Techniques - Richard Schonberger - Pearson Higher Education.
- Just In Time Manufacturing – Kargoanker (manual).
- An Integrated Approach To Just In Time - Yasuhiro Monden - Toyota Production system.
- Lean Thinking - James Womack - Simon & Schuster Adult - ISBN: 0743249275, 2003.
- The machine that changed the World - James P. Womack, Daniel T Jones, and Daniel Roos - The story of Lean production – by– Harper Perennial edition published -1991.

Web links and Video Lectures (e-Resources):

- VTU e-Shikshana Program
- VTU EDUSAT Program

Skill Development Activities Suggested

At the end of the lecture/presentation, numerical exercises are to be taken up to solve problems related to the topics covered. Additional problems are to be given for practice and also as assignments under each of the topics covered.

Course outcome

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

Sl. No.	Description	Blooms Level
CO1	Explaining the details of types of advanced manufacturing and machining processes, their evolution and need.	L1, L2, L3, L4
CO2	Identifying the correct advanced manufacturing processes by formulating and determining the correct AMPs for development of various complex shaped geometries.	L1, L2, L3, L4
CO3	Hands on experiments on the Advanced Machines such as EDM, WEDM etc.	L1, L2, L3, L4
CO4	Design and development of experimental apparatus of any one advanced or derived and hybrid manufacturing	L1, L2, L3, L4, L5
CO5	Understand the different plant configurations.	L1, L2, L3, L4, L5

Program Outcome of this course

Sl. No.	Description	POs
1	An ability to independently carry out research/investigation and development work to solve practical problems	PO1
2	An ability to write and present a substantial technical report/document.	PO2
3	To be able to demonstrate a degree of mastery over the area as per the specialization of the program.	PO3
4	Understand contemporary issues in manufacturing engineering and develop relationship between product design and manufacturability to create safe, reliable, and cost-effective products.	PO4
5	Understand the process of converting customer needs into engineering specifications to create product designs that are sensitive to user needs and robust against unanticipated use and misuse	PO5
6	Employ advanced prototyping methods to shorten design cycles and narrow alternatives without restricting innovation.	PO6
7	Understand and debate the roles and responsibilities of a product designer/manufacturer on society.	PO7

Mapping of COS and POs (Note : High - 3, Medium – 2, and Low – 1)

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

Nano Technology			
Course Code	MMPM258A	CIE Marks	50
Teaching Hours/Week (L:P:SDA)	00:02/01:00	SEE Marks	50
Total Hours of Pedagogy	30/15	Total Marks	100
Credits	01	Exam Hours	03

Course Learning objectives:

- To provide an intensive and in-depth learning to the students in field of Nanotechnology.
- Beyond simulating, learning, understanding the techniques, the course also addresses the underlying recurring problems of disciplines in today scientific and changing business world.
- To develop awareness & knowledge of different organization requirement and subject knowledge through varied subjects and training methodology in students.
- To train the students to take up wide variety of roles like researchers, scientists, consultants, entrepreneurs, academicians, industry leaders and policy.

Module-1

Metal based nanocomposites- Metal-Oxide or Metal-Ceramic composites, Different aspects of their preparation techniques and their final properties and functionality. Metal-metal nanocomposites, some simple preparation techniques and their new electrical and magnetic properties

Teaching-Learning Process	Chalk and talk method and Power Point presentation and YouTube videos, Animation videos, creating right time in classroom discussions. Giving activities &assignments.

Module-2

Design of Super hard materials- Super hard nano composites, its designing and improvements of mechanical properties.

Nanofiller synthesis - applications, Polymer nano composites, particulate and fibre modified nano composites, matrices and fibres, polymer- filler interphase, pull- out strength, effect of various treatments

Teaching-Learning Process	Chalk and talk method and Power Point presentation and YouTube videos, Animation videos, creating right time in classroom discussions. Giving activities &assignments.

Module-3

Mechanics of polymer nanocomposites, Interfacial adhesion and characterisation, factors influencing the performance of nanocomposites, physical and functional properties. Nano composite fabrication, matrices, methods, additives, moulding processes.

Teaching-Learning Process	Chalk and talk method and Power Point presentation and YouTube videos, Animation videos, creating right time in classroom discussions. Giving activities &assignments.

Module-4

Polymer-carbon nano tubes based composites-processing methods and characterization using OM, SEM, XRD, TEM

Teaching-Learning Process	Chalk and talk method and Power Point presentation and YouTube videos, Animation videos, creating right time in classroom discussions. Giving activities &assignments.

Module-5

Characterization of Polymer nanotubes based composites for Mechanical, Electrical and Thermal Properties and their applications - Polymer / nanofillers (metallic nano powders) systems, Rheological measurements, processing characteristics. Testing of nano composites,
Thermal analysis such as TGA,TMA,DSC,DMTA.

Teaching-Learning Process	Chalk and talk method and Power Point presentation and YouTube videos, Animation videos, creating right time in classroom discussions. Giving activities &assignments.

Assessment Details (both CIE and SEE)

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

Continuous Internal Evaluation:

1. Three Unit Tests each of **20 Marks**
2. Two assignments each of **20 Marks** or **one Skill Development Activity of 40 marks** to attain the COs and POs
3. The sum of three tests, two assignments/skill Development Activities, will be **scaled down to 50 marks**

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

Semester End Examination:

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

Textbooks

1. **Polymer Science and Technology**-JoelR.Fried-Prentice-Hall, Inc. EnglewoodCliffs, N. J., USA - 2000.
2. **New Developments and Technology** -Hand book of Elastomers - (Eds. A. K.Bhowmic and H. C. Stephense), Marcel - Dekker Inc., New York - 1995.
3. **Polymer Blends**-D.R.PaulandS.Newman-AcademicPress, New York - 1978.
4. **Polymer Science** -FredW.Billimeyer,Jr-WileyInterscience Publication – thirdedition , 1994

Program Outcome of this course

Sl. No.	Description	Pos
1	An ability to independently carry out research/investigation and development work to solve practical problems	PO1
2	An ability to write and present a substantial technical report/document.	PO2
3	To be able to demonstrate a degree of mastery over the area as per the specialization of the program.	PO3
4	Understand contemporary issues in manufacturing engineering and develop relationship between product design and manufacturability to create safe, reliable, and cost-effective products.	PO4
5	Understand the process of converting customer needs into engineering specifications to create product designs that are sensitive to user needs and robust against unanticipated use and misuse	PO5
6	Employ advanced prototyping methods to shorten design cycles and narrow alternatives without restricting innovation.	PO6
7	Understand and debate the roles and responsibilities of a product designer/manufacturer on society.	PO7

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

Mapping of COS and Pos (Note : High – 3, Medium – 2, and Low – 1)

Smart Materials			
Course Code	MMPM258B	CIE Marks	50
Teaching Hours/Week (L:P:SDA)	00:02/01:00	SEE Marks	50
Total Hours of Pedagogy	30/15	Total Marks	100
Credits	01	Exam Hours	03

Course Learning objectives:

- Learn about composite materials, smart materials, their properties, classification and applications
- Understand types of smart material based on their electrical and magnetic properties
- Characterize piezoelectric, ferroelectric and multi-ferroic materials,
- Identify novel functions of smart materials,
- Apply the acquired knowledge of smart materials in different applications
- Evaluate the importance of smart materials in day-to-day life.

Module-1

Introduction: Closed loop and Open loop Smart Structures. Applications of Smart structures, Piezoelectric properties. Inchworm Linear motor, Shape memory alloys, Shape memory effect- Application, Processing and characteristics. Shape Memory Alloys: Introduction, Phenomenology, and Influence of stress on characteristic temperatures, Modelling of shape memory effect. Vibration control through shape memory alloys. Design considerations, multiplexing embedded NiTiNOL actuators

Teaching-Learning Process	Chalk and talk method and Power Point presentation and YouTube videos, Animation videos, creating right time in classroom discussions. Giving activities &assignments.

Module-2

Electro rheological and Magneto rheological Fluids: Mechanisms and Properties, Characteristics, Fluid composition and behaviour, Discovery and Early developments, Summary of material properties. Applications of ER and MR fluids (Clutches, Dampers, others). Fibre Optics: Introduction, Physical Phenomenon, Characteristics, Fibreoptic strain sensors, Twisted and Braided Fibre Optic sensors, Optical fibres as load bearing elements, Crack detection applications, Integration of Fibre optic sensors and shape memory elements.

Teaching-Learning Process	Chalk and talk method and Power Point presentation and YouTube videos, Animation videos, creating right time in classroom discussions. Giving activities &assignments.

Module-3

Vibration Absorbers: Introduction, Parallel Damped Vibration Absorber, Analysis, Gyroscopic Vibration absorbers, analysis & experimental set up and observations, Active Vibration absorbers. Control of Structures: Introduction, Structures as control plants, Modelling structures for control, Control strategies and Limitations. Biomimetics: Characteristics of Natural structures. Fibre reinforced: organic matrix natural composites, Natural creamers, Mollusks. Biomimetic sensing,Challenges and opportunities.

Teaching-Learning Process	Chalk and talk method and Power Point presentation and YouTube videos, Animation videos, creating right time in classroom discussions. Giving activities &assignments.

Module-4

MEMS: History of MEMS, Intrinsic Characteristics, Devices: Sensors and Actuators. Micro fabrication: Photolithography, Thermal oxidation, Thin film deposition, etching types, Doping, Dicing, Bonding. Microelectronics fabrication process flow, Silicon based, Process selection and design. Piezoelectric Sensing and Actuation :Introduction, Cantilever Piezoelectric actuator model, Properties of Piezoelectric materials, Applications. Magnetic Actuation: Concepts and Principles,Magnetization and Nomenclatures,Fabricationandcase studies, Comparison of major sensing and actuation methods

Teaching-Learning Process	Chalk and talk method and Power Point presentation and YouTube videos, Animation videos, creating right time in classroom discussions. Giving activities &assignments.

Module-5

Polymer MEMS& Micro fluidics: Introduction, Polymers in MEMS (Polyimide, SU8,LCP,PDMS, PMMA, Parylene,Others) Applications(Acceleration, Pressure, Flow, Tactile sensors).Motivation for micro fluidics, Biological Concepts, Design and Fabrication of Selective components. Channels and Valves.
Case Studies: MEMS Magnetic actuators, BP sensors, Microphone, Acceleration sensors,Gyro, MEMSProduct development:Performance, Accuracy, Repeatability, Reliability, Managing cost, Market uncertainties

Teaching-Learning Process	Chalk and talk method and Power Point presentation and YouTube videos, Animation videos, creating right time in classroom discussions. Giving activities &assignments.

Assessment Details (both CIE and SEE)

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

Continuous Internal Evaluation:

1. Three Unit Tests each of **20 Marks**
2. Two assignments each of **20 Marks** or **oneSkill Development Activity of 40 marks** to attain the COs and POs
3. The sum of three tests, two assignments/skill Development Activities, will be **scaled down to 50 marks**

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

Semester End Examination:

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

Textbooks

1. "Smart Structures –Analysis and Design", A.V.Srinivasan, CambridgeUniversityPress,NewYork,2001,(ISBN:0521650267).
2. "SmartMaterialsandStructures",M.V.GandhiandB.S.Thompson Chapmen & Hall,London, 1992 (ISBN:0412370107
3. Duerig,T. W., Melton, K. N, Stockel, D. and Wayman, C.M., "Engineering aspects ofShapememory Alloys", Butterworth – Heinemann, 1990.
4. Rogers,C.A.,SmartMaterials,"StructuresandMathematical issues", TechnomicPublishing Co., U.S.A, 1989.
5. MelSchwartz(Ed),EncyclopaediaofSmartMaterials"Volume –I and II, John Wiley &Sons, Inc.2002

Program Outcome of this course

Sl. No.	Description	Pos
1	An ability to independently carry out research/investigation and development work to solve practical problems	PO1
2	An ability to write and present a substantial technical report/document.	PO2
3	To be able to demonstrate a degree of mastery over the area as per the specialization of the program.	PO3
4	Understand contemporary issues in manufacturing engineering and develop relationship between product design and manufacturability to create safe, reliable, and cost-effective products.	PO4
5	Understand the process of converting customer needs into engineering specifications to create product designs that are sensitive to user needs and robust against unanticipated use and misuse	PO5
6	Employ advanced prototyping methods to shorten design cycles and narrow alternatives without restricting innovation.	PO6
7	Understand and debate the roles and responsibilities of a product designer/manufacturer on society.	PO7

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

Mapping of COS and Pos (Note : High – 3, Medium – 2, and Low – 1)

Precision Engineering			
Course Code	MMPM258C	CIE Marks	50
Teaching Hours/Week (L:P:SDA)	00:02/01:00	SEE Marks	50
Total Hours of Pedagogy	30/15	Total Marks	100
Credits	01	Exam Hours	03

Course Learning objectives:

- A basic understanding of Precision Engineering, its machines and the different techniques of super finishing.
- To learn the calculation of allowances, tolerances and DOE techniques.
- To learn about tool materials and its different coating methods for Precision Machining.
- To learn the techniques used for quality control and quality improvement and the different quality standards.
- To learn the importance of reliability concepts and a modern quality systems.

Module-1

CONCEPTS OF ACCURACY AND MACHINETOOLS: Part Accuracy – errors, accuracy of machine tools – spindle accuracy – displacement accuracy – errors due to numerical interpolation – definition of ac curacy of N.C system –errors in the NC machines– feed stiffness – zero stability

Teaching-Learning Process	Chalk and talk method and Power Point presentation and YouTube videos, Animation videos, creating right time in classroom discussions. Giving activities &assignments.

Module-2

STIFFNESS,THERMAL EFFECTS AND FINISH MACHINING:

Overall stiffness of Lathe – compliance of work piece – errors caused by cutting forces – deformation in turning – boring – milling – heat sources – thermal effects – Finish Turning, boring, grinding – Surface

roughness

Teaching-Learning Process	Chalk and talk method and Power Point presentation and YouTube videos, Animation videos, creating right time in classroom discussions. Giving activities &assignments.

Module-3

DIMENSIONING: Definition of terms–Key dimension– Superfluous dimension – dimensional stepped shaft –Assigning tolerances in the constituent dimensions–dimensional chains.

Teaching-Learning Process	Chalk and talk method and Power Point presentation and YouTube videos, Animation videos, creating right time in classroom discussions. Giving activities &assignments.

Module-4

MICRO-MACHININGMICRO-FABRICATION: Micro Machining–Photo resist process–Lithography–LIGA Process– Optical processing of materials–electron beam machining–beam machining–micro forming, diamond turning–micro positioning devices – etching – physical vapour deposition – Chemical vapour deposition.

Teaching-Learning Process	Chalk and talk method and Power Point presentation and YouTube videos, Animation videos, creating right time in classroom discussions. Giving activities &assignments.

Module-5

SMARTSTRUCTURES,MATERIALSANDMICRO

ACTUATORS: Smart structures – Smart materials types and applications – smart sensors – micro valves – MEMS – Micro motors – Micro pumps– micro dynamometer– micro machines– micro optics– micro nozzles

Teaching-Learning Process	Chalk and talk method and Power Point presentation and YouTube videos, Animation videos, creating right time in classroom discussions. Giving activities &assignments.

Assessment Details (both CIE and SEE)

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

Continuous Internal Evaluation:

1. Three Unit Tests each of **20 Marks**
2. Two assignments each of **20 Marks** or **one Skill Development Activity of 40 marks** to attain the COs and POs
3. The sum of three tests, two assignments/skill Development Activities, will be **scaled down to 50 marks**

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

Semester End Examination:

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

Textbooks

1. MurthyR.L.,"Precision Engineeringin Manufacturing",NewAge International Pvt, 2005.
2. JuliarW.Gardner.VijayK.Varadan,"Micro sensors,MEMSand Smart Devices", John Wiley and sons, 2001.
3. StephenA.Campbell,"TheScience and Engineering of Microelectronic Fabrication",Oxford University Press,1996.
4. RaadyFrank,"UnderstandingSmartSensors",Artech.House, Boston, 1996. MEMS HandBook,CRC Press,2001.

Program Outcome of this course

Sl. No.	Description	Pos
1	An ability to independently carry out research/investigation and development work to solve practical problems	PO1
2	An ability to write and present a substantial technical report/document.	PO2
3	To be able to demonstrate a degree of mastery over the area as per the specialization of the program.	PO3
4	Understand contemporary issues in manufacturing engineering and develop relationship between product design and manufacturability to create safe, reliable, and cost-effective products.	PO4
5	Understand the process of converting customer needs into engineering specifications to create product designs that are sensitive to user needs and robust against unanticipated use and misuse	PO5
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Mapping of COS and Pos (Note : High – 3, Medium – 2, and Low – 1)

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

Advanced Processing of Materials			
Course Code	MMPM258D	CIE Marks	50
Teaching Hours/Week (L:P:SDA)	00:02/01:00	SEE Marks	50
Total Hours of Pedagogy	30/15	Total Marks	100
Credits	01	Exam Hours	03

Course Learning objectives:

- Impart knowledge to students in the latest technological topics on Production and Industrial Engineering and to provide them with opportunities in taking up advanced topics in the field of study.
- Create a congenial environment that promotes learning, growth and imparts ability to work with multi-disciplinary groups in professional, industry and research organizations.
- Broaden and deepen their capabilities in analytical and experimental research methods, analysis of data and drawing relevant conclusions for scholarly writing and presentation.
- Provide guidance to students for their choices in research and professional career outlook and to encourage students to take up research.

Module-1

Casting Process: Introduction, various manufacturing processes, convectional casting processes, special casting processes, squeeze casting processes, foam casting, melting processes, Types of furnace, melting using cupola furnace, Resistance furnace, Induction furnace.
Powder Metallurgy Process: Introduction, benefits of power metallurgy process, limitations and applications of process, flow chart of process, various methods of production of powder, powder treatment, powder characteristics, compaction of powder and its methods, pre-sintering, operation before sintering, sintering, operating after sintering.

Teaching-Learning Process	Chalk and talk method and Power Point presentation and YouTube videos, Animation videos, creating right time in classroom discussions. Giving activities &assignments.

Module-2

Mechanical Alloying: Introduction and process of mechanical alloying, milling parameters in mechanical alloying, material synthesizing using mechanical alloying, phase formed in mechanical alloying, mechanical alloying of misciblesystems, mechanical alloying of immiscible systems, oxide dispersion strengthened alloys, reactive milling, phase transition observed in mechanical alloying.

Teaching-Learning Process	Chalk and talk method and Power Point presentation and YouTube videos, Animation videos, creating right time in classroom discussions. Giving activities &assignments.

Module-3

Advance Processing and Forming: Introduction: abrasive finishing, Chemical mechanical polishing (CMP) technology, photochemical machining, high voltage forming of metal, explosive forming or fabrication, Electrochemical hydraulic forming, magnetic pulse forming

Teaching-Learning Process	Chalk and talk method and Power Point presentation and YouTube videos, Animation videos, creating right time in classroom discussions. Giving activities &assignments.
Module-4	
Processing of polymer materials and latest trends in manufacturing processes: Introduction, processing of plastic, compression moulding, injection molding, extrusion molding, blow molding, ageing of polymer, Effect of temperature, UV and solar radiations, Introduction to agile manufacturing and green manufacturing, Advantages and application of agile manufacturing, Advantages and application of green manufacturing	
Teaching-Learning Process	Chalk and talk method and Power Point presentation and YouTube videos, Animation videos, creating right time in classroom discussions. Giving activities &assignments.
Module-5	
Metal injection moulding (MIM) and self-propagating high temperature synthesis processes: Introduction, steps in MIM, Advantages and requirements of MIM, materials processes of MIM, SHS process: Introduction, Types of SHS, reaction mechanics, parameters to be considered in SHS, Types of SHS products and applications microwaves sintering of metals process, Types of SHS products and applications, process parameters for micro wave sintering, Advantages and limitations	
Teaching-Learning Process	Chalk and talk method and Power Point presentation and YouTube videos, Animation videos, creating right time in classroom discussions. Giving activities &assignments.

Assessment Details (both CIE and SEE)

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5. The students will have to answer five full questions, selecting one full question from each module

Textbooks

1. ModernmachiningprocessesbyPCPandeyandshah,TataMc Grew Hill, NewDelhi.
2. PrinciplesofmaterialsscienceandengineeringbyWFSMITH, Tata Mc Grew Hill
3. ManufacturingengineeringandtechnologybyKalpakjain
4. MANUFACTURINGTECHNOLOGYbyROAPN,TATAMc, GrewHill1996

Program Outcome of this course

Sl. No.	Description	Pos
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Mapping of COS and Pos (Note : High – 3, Medium – 2, and Low – 1)

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