Curriculum Structure for

M. Tech. Production Engineering

(In light of NEP2020)

NCrF Level 7

For students admitted in 2023-24 onwards

Govt. College of Engineering, Amravati
(*An Autonomous Institute of Govt. of Maharashtra*)
Near Kathora Naka, Amravati, Maharashtra

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www.gcoea.ac.in

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Specialization: PRODUCTION ENGINEERING

PROGRAM OBJECTIVES:

I. To enhance professional skills to meet global standards with ethical responsibility

II. To develop ability among the students to design, develop, analyze, test and implement Industrial system.

III. To inculcate the student lifelong learning, skill development and leadership qualities.

IV. To develop ability of research and innovations.

PROGRAM OUTCOMES (POs):

PO1: Ability to independently carry out research investigation and development work to solve practical problems

PO2: Ability to write and present a substantial technical report/document

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

PO4: Ability to identify and provide feasible solution to the problems in product Development and manufacturing sector

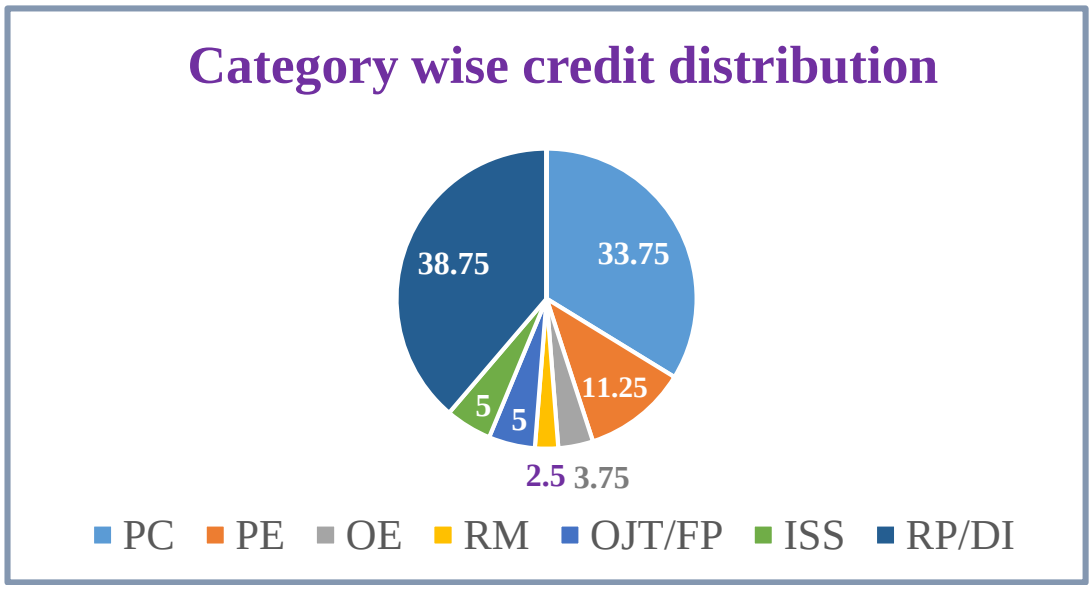
PO5: Ability to apply and use modern tools in the area of Production Engineering

Curriculum Structure for M. Tech. Production Engineering (In light of NEP 2020)

Category wise credit distribution:

Semester	PC	PE	OE	RM	OJT / FP	ISS	RP / DI	Total
I	15	03	---	---	---	02	---	20
II	12	03	---	02	---	02	---	19
III	---	03	03	---	04	---	13	23
IV	---	---	---	---	---	---	18	18
Total	**27**	**09**	**03**	**02**	**04**	**04**	**31**	**80**

SN	Abbreviation	Meaning	Credits	Percentage
01	PC	Programme Core	27	33.75
02	PE	Programme Elective	09	11.25
03	OE	Open Elective	03	03.75
04	RM	Research Methodology	02	02.50
05	OJT	On-Job Training/ Internship	04	05.00
06	FP	Field Projects		
07	ISS	Independent Study & Seminar	04	05.00
08	RP	Research Project	31	38.75
09	DI	Dissertation		
		Total	80	100.00



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General Instructions:

1) 10% content of syllabus of each theory course of first, second and third semesters shall be completed by the students with self-study. The 10% portion of each course (for self-study) shall be declared by the concerned course-coordinator at the beginning of teaching of the course.

2) Student can complete any two theory courses of second semester, if desired, in "online" mode, offered through SWAYAM/ NPTEL. In this case –

i) Students can register and complete these online courses any time after beginning of first semester, however, the student must successfully complete and pass the course, and submit the score card/ certificate before declaration of result of second semester.

ii) In case if a student registers for a course in online mode but fails in the course the student will have to register for the course in the institute whenever it is offered. In this case, the student will have to attend the classes of the course (in order to satisfy the minimum attendance criteria), appear for all the examinations (MSE, TA, ICA, ESE etc) of the course, and successfully complete the course with at least D grade.

3) Student can complete the two theory courses of third semester, if desired, in "online" mode, offered through SWAYAM/ NPTEL. In this case –

i) Students can register and complete these online courses any time after beginning of first semester, however, the student must successfully complete and pass the course, and submit the score card/ certificate before declaration of result of third semester.

ii) In case if a student registers for a course in online mode but fails in the course the student will have to register for the course in the institute whenever it is offered. In this case, the student will have to attend the classes of the course (in order to satisfy the minimum attendance criteria), appear for all the examinations (MSE, TA, ICA, ESE etc) of the course, and successfully complete the course with at least D grade.

4) Students must complete On-the-job training/ Internship/ Field work for a duration of minimum four weeks during summer break, after completion of second semester of first year in the respective major subject. The assessment of the same shall be done in third semester. The company/ organization for On-job training/ Internship/ Field work must be approved by the DFB

5) Students going for industrial project or going for dissertation at some other institute (approved by DFB), during third and fourth semester, shall complete the courses Programme Elective – III and Open Elective in any one of the two modes –

i) Online courses offered through SWAYAM/ NPTEL: In this case the student must complete the course and submit the score card/ certificate before commencement of fourth semester. Students can register and complete these courses any time after beginning of first semester

In case if a student registers for a course in online mode but fails in the course the student will have to register for the course in the institute whenever it is offered. In this case, the student will have to appear for all the examinations (MSE, TA, ICA, ESE etc) of the course, and successfully complete the course with at least D grade.

ii) Self-study mode: In this case the student will have to study the course of his/her own. The student shall appear for all the college assessments/ examinations (MSE, TA and ESE) personally as per the schedule declared by the institute.

6) Maximum period for completion of M. Tech. programme:

The maximum duration for completion of the PG full time programme is eight semesters from the date of initial registration. The maximum duration of the programme includes the period of withdrawal, absence and different kinds of leaves permissible to a student but it shall exclude the period of rustication of the student from the institute and it shall also exclude the period lapsed between exit after first year (second semester) and reentry at second year (third semester). However, genuine cases on confirmation of valid reasons may be referred to Academic Council for extending this limit by additional one year.

M. Tech. (Production Engineering) Semester-I

Category	Course Code	Name of the course	Teaching Scheme				Examination Scheme						Credits
							Theory			Practical		Total	
			Theory	Tut	Pract	Total	MSE	TA	ESE	ICA	ESE		
PC	ME2141	Computer Aided Design And Manufacturing	04	--	--	04	30	10	60	---	---	100	04
PC	ME2142	Machining Processes And Analysis	04	--	--	04	30	10	60	---	---	100	04
PC	ME2143	Casting & Welding Processes	04	--	--	04	30	10	60	---	---	100	04
PE	ME2144	Programme Elective – I	03	--	--	03	30	10	60	---	---	100	03
PC	ME2145	Laboratory Practice – I	--	--	06	06	--	--	--	50	50	100	03
ISS	ME2146	Seminar – I	--	--	01	01	--	--	--	50	---	50	02
		Total	15	--	07	22	120	40	240	100	50	550	20

List of Programme Electives	
ME2144: Programme Elective – I	
A	Industrial Management
B	Method Engineering And Ergonomics
C	Advanced Operations Research

Note:

I. The contact hours for the students (with concerned supervisor) for Seminar – I shall be one hour per week per student, subject to maximum of four hours per week.

II. The hours shown in the teaching scheme for Seminar I are the contact hours for the students with concerned Supervisor. Each student is expected to devote at least four hours per week for Seminar

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M. Tech. (Production Engineering) Semester II

Category	Course Code	Name of the course	Teaching Scheme				Examination Scheme						Credits
							Theory			Practical		Total	
			Theory	Tut	Pract	Total	MSE	TA	ESE	ICA	ESE		
PC	ME2241	Industrial Inspection and Quality Management	03	--	--	03	30	10	60	--	--	100	03
PC	ME2242	Computer Integrated Manufacturing	03	--	--	03	30	10	60	--	--	100	03
PC	ME2243	Process Engineering	03	--	--	03	30	10	60	--	--	100	03
PE	ME2244	Programme Elective – II	03	--	--	03	30	10	60	--	--	100	03
RM	SH2201	Research Methodology	02	--	--	02	30	20	--	--	--	50	02
PC	ME2245	Laboratory Practice – II	--	--	06	06	--	--	--	50	50	100	03
ISS	ME2246	Seminar – II	--	--	01	01	--	--	--	50	--	50	02
OJT/FP	ME2247	On Job Training /Field Project OJT/FP	--	--	--	--	--	--	--	50	--	50	04
		Total	14	--	07	21	150	60	240	150	50	650	23

List of Programme Electives	
ME2244: Programme Elective – II	
A	Injection Moulding And Mould Design
B	Automation In Manufacturing
C	Rapid Prototyping & Tooling

Note:

I. The contact hours for the students (with concerned supervisor) for Seminar – II, shall be one hour per week per student, subject to maximum of four hours per week.

II. The hours shown in the teaching scheme for Seminar II are the contact hours for the students with concerned Supervisor. Each student is expected to devote at least four hours per week for Seminar II.

III. Individual students are required to choose a topic of their interest for Seminar II. They shall acquire state-of-the art knowledge in that area and shall define the grey area related to topic (gap analysis)

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so as to carry dissertation in that area. The students are required to review literature on the topic and deliver seminar.

Exit option:

- The exit option at the end of one year of the Master's degree program will commence from AY 2024-25.
- Students who have joined a two-year Master's degree program may opt for exit at the end of the first year and he/ she shall be eligible for M. Voc. Degree (Level 6.5)
- The M. Voc. Degree may be awarded to a student provided they have earned all 39 credits of first year (first and second semester) and have earned 04 credits of On-job training / Internship/ Field work during summer break, after completion of the second semester of the first year in the respective Major Subject.
- The student must submit the report of On-job training / Internship/ Field work, in the format prescribed by the institute, as partial fulfilment of award of M. Voc. degree.
- Re-entry to complete the PG degree, after taking the exit option, will be permissible up to 05 years from the date of admission to the PG programme. Such students, after completion of PG degree, shall have to surrender the M. Voc. degree. There shall be a gap of at least six months between exit after first year and re-entry to PG degree at third semester

M. Tech. (Production Engineering) Semester III

Category	Course Code	Name of the course	Teaching Scheme				Examination Scheme						Credits
							Theory			Practical		Total	
			Theory	Tut	Pract	Total	MSE	TA	ESE	ICA	ESE		
PE	ME2341	Programme Elective – III	03	--	--	03	30	10	60	--	--	100	03
OE	SH2301	Open Elective	03	--	--	03	30	10	60	--	--	100	03
RP/DI	ME2342	Dissertation Stage – I	--	--	04	04	--	--	--	150	--	150	13
		Total	06	--	04	10	60	20	120	150	--	350	19

List of Programme Electives			List of Open Electives	
ME2331: Programme Elective – III			SH2301: Open Elective	
A	Artificial Intelligence and Machine Learning		A	Industrial Safety
B	Operation planning and control		B	Operations Research
C	Machine tool design		C	Project Management
D	Design and metallurgy of welded joints		D	Data Structures and Algorithm
			E	Nano Technology

Note: The hours shown in the teaching scheme for Dissertation Stage I are the contact hours for the students with concerned supervisor. The student is expected to devote at least twenty-six hours per week for Dissertation Stage I.

M. Tech. (Production Engineering) Semester IV

Category	Course Code	Name of the course	Teaching Scheme				Examination Scheme						Credits
							Theory			Practical		Total	
			Theory	Tut	Pract	Total	MSE	TA	ESE	ICA	ESE		
RP/DI	ME 2441	Dissertation Stage – II	--	--	36	36	--	--	--	100	200	300	18
		Total	--	--	36	36	--	--	--	100	200	300	18

Note:

I. Dissertation Stage – I is pre-requisite for Dissertation Stage – II

II. The hours shown in the teaching scheme for Dissertation Stage II are the contact hours for the students with concerned supervisor. The student is expected to devote at least thirty-six hours per week for Dissertation Stage II.

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Comparison of existing and new programme structure:

i) On the basis of Marks and Credit:

Semester	Marks		Credits	
	Existing	**New**	**Existing**	**New**
I	610	550	17	20
II	600	600	19	19
III	300	400	16	23
IV	400	300	16	18
Total	**1910**	**1850**	**68**	**80**

ii) On the basis of semester wise number of courses:

	Number of courses									
	Semester I		Semester II		Semester III		Semester IV		Total	
	Existing	New	Existing	New	Existing	New	Existing	New	Existing	New
Theory	05	04	05	05	02	02	---	---	12	11
Practical	01	01	01	01	---	---	---	---	02	02
Seminar	01	01	01	01	---	---	---	---	02	02
Internship	---	---	---	---	---	01	---	---	---	01
Dissertation	---	---	---	---	01	01	01	01	02	02

iii) On the basis of course category:

Course category	Number of courses		Credits	
	Existing	**New**	**Existing**	**New**
PC	08	08	24	27
PE	03	03	09	09
OE	02	01	03	03
RM	01	01	02	02
OJT / FP	---	01	---	04
ISS	02	02	04	04
RP / DI	02	02	26	31
Total	**18**	**18**	**68**	**80**

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Equivalence Scheme
Programme : M.Tech. Production Engineering

Sr. No.	Course code with Name of course (old)		Credit	Course code with Name of course (new)		Credit
1	MEP141	Computer Aided Design and Manufacturing	3	ME2141	Computer Aided Design and Manufacturing	3
2	MEP142	Machining Process and Analysis	3	ME2142	Machining Process and Analysis	3
3	MEP143	Casting and Welding Processes	3	ME2143	Casting and Welding Processes	3
4	MEP144(A)	Industrial Management	3	ME2144(A)	Industrial Management	3
5	MEP144(B)	Method Engineering and Ergonomics	3	ME2144(B)	Method Engineering and Ergonomics	3
6	--	No Equivalance provided		--	No Equivalance provided	
7	MEP144(C)	Advanced Operation Research	3	ME2144(C)	Advanced Operation Research	3
8	MEP145	Lab Practice-I	2	ME2145	Lab Practice-I	2
9	MEP146	Seminar I	2	ME2146	Seminar I	2
10	MEP241	Industrial Inspection and Quality Management	3	ME2241	Industrial Inspection and Quality Management	3
11	MEP242	Computer Integrated Manufacturing	3	ME2242	Computer Integrated Manufacturing	3
12	MEP243	Process Engineering	3	ME2243	Process Engineering	3
13	MEP341(A)	Operation Planning and Control	3	ME2331(B)	Operation Planning and Control	3
14	MEP244(B)	Automation in Manufacturing		ME2244(B)	Automation in Manufacturing	
15	SHP221	Research Methodology	3	SH2201	Research Methodology	3
16	MEP244(A)	Injection Moulding and Mould Design	3	ME2244(A)	Injection Moulding and Mould Design	3
17	MEP244(C)	Rapid Prototyping and Tooling	3	ME2244(C)	Rapid Prototyping and Tooling	3
18	MEP341(C)	Design and Metallurgy of Welded Joint	3	ME2331(D)	Design and Metallurgy of Welded Joint	3
19	MEP341(B)	Machine tool Design	3	ME2331(C)	Machine tool Design	3
20	MEP245	Lab Practice-II	2	ME2245	Lab Practice-II	2
21	MEP246	Seminar II	2	ME2246	Seminar II	2

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M. Tech. (Production Engineering) Semester - I

Course Code	ME2141	Course category	PC
Course Name	COMPUTER AIDED DESIGN AND MANUFACTURING		

Teaching Scheme				Examination Scheme							Credits
Th	Tu	Pr	Total	Theory				Practical		Total	
				MSE	TA	ESE	ESE Duration	ICA	ESE		
04	--	--	04	30	10	60	2 hrs 30 min	--	--	100	04

Course Objectives:

1. Describe the basic principal of CAD/CAM, Product life cycle of product
2. Interpret the 2D & 3D transformations of the basic entities like line, circle, ellipse etc.
3. Study the different geometric modelling techniques like solid modelling, surface modelling, feature based modelling etc. and to visualize how the components look like before its manufacturing or fabrication.
4. Examine the role of computer in manufacturing processes
5. Communicating solid model data to other models of CAD software

Course Contents:

Introduction: CAD/ CAM and Product cycle, CIM role of computers in the design process, new product design and development, benefits of CAD.

CAD hardware and Software: CAD workstation, Graphic Terminals, Computer Graphics, Functions of Graphics packages, database management systems for CAD.

Computer aided drafting: Drafting of machine Elements with dimensions and tolerances using 2D drafting packages, Graphic standards, GKS (Graphical kernel Systems), IGES (initial Graphics Exchange Specifications)

Geometric Modelling: Mathematical representations of curved surfaces and solid modelling, assembly modelling and interface checking. Communicating solid model data to other models of CAD software

Computer Applications in Manufacturing: Computer aided process planning, Computer aided assembly planning, and computer aided inspection & reverse engineering, manufacturing process Simulation, virtual & distributed manufacturing.

Reference Books:

l. CAD/CAM, Computer Aided Design and Manufacturing, Groover, M.P. and Zimmers, E. W. 4rh edition , Prentice Hall of India, ,1986,
2. CAD/CAM Theory and Practice, Ebrahim Zeid, 2nd edition ,McGraw Hill, l99l

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3. Computer Aided Machine Design. Dimarozons..A.D l'r edition ,Prentice Hill,2000
4. Computer Integrated Manufacturing, Ranky. P.G.. l" Edition, Prentice Hall, 1986

Course Outcomes:

On completion of the course, students will be able to:

ME2141.1 Illustrate the fundamentals ol computer aided design, role of computer in design process

ME2141.2 Describe the technique of representation of geometric entities including points, lines, and parametric curves, surfaces and solid

ME2141.3 Describe technique of transformation of geometric entities using transformation matrix

ME2141.4 Identify the role of computer in various applications of manufacturing

ME2141.5 Explain reverse engineering & Simulation Process

CO – PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5
ME2141.1	1	2	2	1	1
ME2141.2	2	3	2	2	2
ME2141.3	2	3	2	1	1
ME2141.4	2	1	3	2	3
ME2141.5	1	2	1	3	1

0 - Not correlated 1 - Weakly Correlated 2 - Moderately Correlated 3 - Strongly Correlated

Course Code	ME2142	Course category	PC
Course Name	MACHINING PROCESSES AND ANALYSIS		

Teaching Scheme				Examination Scheme							Credits
Th	Tu	Pr	Total	Theory				Practical		Total	
				MSE	TA	ESE	ESE Duration	ICA	ESE		
04	--	--	04	30	10	60	2 hrs 30 min	--	--	100	04

Course Objectives:

1. Impart the concept of Machining and Analysis with its scope and importance
2. Prepare students to gain the insight on metal cutting, advanced materials, system of tool wear theories and various calculations related to machining processes
3. Induce the knowledge of theories and techniques related to mechanics of abrasive and high speed machining
4. Impart the knowledge of different machining processes and non-traditional processes with its applications
5. Applications, comparison and characteristic of EDM

Course Contents:

Introduction: Mechanics orthogonal and oblique cutting, methods of metal removal, , nature of contact between chip and tool, stress distribution at chip{ool interface, controlled contact tools, Thermal aspects of metal cutting, Cutting fluids, method of selection of fluids, Tool material and its selection, Machinability

Tool Wear & Tool Life: Types of Tool wear. Tool Wear theories, experimental methods, Tool life calculation. Mechanics of Metal cutting. in conventional processes: Mechanics of Metal cutting, force and torque calculations in turning, shaping, drilling and milling.

Abrasive Machining Processes: Mechanics of grinding process, grinding wheel wear'

High Speed Machining: Types and Mechanics of Honing, Lapping, buffing processes'

Non-Traditional Machining Processes: Working principle, applications, comparison and characteristics EDM, ECM, USM, EBM, AJM. IBM, WJM and LBM.

Reference Books:

1. Metal cutting theory and cutting tool design, Arshinov, MIR Publications
2. Materials and Process in manufacturing, Degarmo E. Paul, J.T. Black 8th Edition, PHI Learning,

3. Processes and mat. of manufacture. ROY A.Lindberg -, 4rh edition' PHI
4. Learning. Fundamentals of metal cutting and m/c tools Juneja, (WEL)
5. Metal cutting theory and practicc, A.Battacharya ,Central book publisher.
6. Tool design, Donaldson, Cyrll Donaldson, G.H.Lecain, Tata Mc Graw Hill

Course Outcomes:

On completion of the course, students will be able to:

ME2142.1 Apply the tools for analysis and design of Machining Processes.
ME2142.2 Analyze various tool wear theories and develop model of machining processes for manufacturing
ME2142.3 Apply the technique and in high speed machining and manufacturing process control
ME2142.4 Identify and provide feasible solution to the problems in nontraditional machining processes in manufacturing sector
ME2142.5 Compare and select EDM, ECM & USM for particular application

CO – PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5
ME2142.1	3	2	2	2	1
ME2142.2	2	1	1	2	1
ME2142.3	3	2	1	2	1
ME2142.4	3	1	1	2	3
ME2142.5	2	3	1	2	1

0 - Not correlated 1 - Weakly Correlated 2 - Moderately Correlated 3 - Strongly Correlated

Course Code	ME2143	Course category	PC
Course Name	CASTING & WELDING PROCESSES		

Teaching Scheme				Examination Scheme							Credits
Th	Tu	Pr	Total	Theory				Practical		Total	
				MSE	TA	ESE	ESE Duration	ICA	ESE		
04	--	--	04	30	10	60	2 hrs 30 min	--	--	100	04

Course Objectives:

1. Provide critical knowledge of casting and welding processes and limitations enabling them to select the most appropriate process and its parameters
2. Prepare students with the ability to design effective gating and rising system for defect free sand casting
3. Prepare students understand working principles of various metal melting furnaces and their selection based on quality and productivity
4. Impart the knowledge of defects testing, inspection and metallurgy of welded joints.
5. Testing and inspection of welded joints.

Course Contents:

Introduction: Brief History, Advantages and Limitations, pattern allowances , preparation and testing of sand, Applications of Sand casting, , directional and progressive solidification, gating and rising system design, casting defects their causes and remedies, cleaning, inspection and testing of casting. foundry mechanization.

Casting Processes: Special sand moulding processes, die casting processes, special casting processes.

Metal Melting: Working and Types of t-furnaces, Selection of furnaces.

Joining of Metals -Conventional and special welding processes. Its principle of working, weld ability of metals, Soldering and Brazing.

Heat Analysis: Parameter and analysis of Heat Affected zone, pre and post treatments of welded joints, metallurgy of welded joint, welding defects. Welding symbols, testing and inspection of welded joints.

Reference Books:

1. The Metallurgy of Welding, Lancaster, 6th Edition, William Andrew Publishing, NY.
2. Principles of Welding (Processes, Physics, Chemistry and Metallurgy), Robert and

Messler, Wiley Interscience Publishers.
3. Welding Hand Book Vol. 5; 7th edition, AWS, 1984.
4. Welding and welding Technology, Little, Ist Edition, McGraw Hill, 2004
5. Welding Metallurgy, S Kou, John Wiley, USA, 2003.

Course Outcomes:

On completion of the course, students will be able to:

ME2143.1 Illustrate the fundamentals of casting, welding processes, their necessity and importance.
ME2143.2 Demonstrate the knowledge of designing effective gating and rising system for defect free sand casting
ME2143.3 Illustrate the working principles of various metal melting furnaces and their selection based on quality and productivity
ME2143.4 Analyze heat affected zone and illustrate the knowledge of defects, testing, inspection and metallurgy of welded joints
ME2143.5 Select special welding process for particular application

CO – PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5
ME2143.1	1	2	1	2	
ME2143.2	3	3	3	2	1
ME2143.3	1	2	2	2	
ME2143.4	3	3	3	3	1
ME2143.5	1	2	1	3	1

0 - Not correlated 1 - Weakly Correlated 2 - Moderately Correlated 3 - Strongly Correlated

Course Code	ME2144 (A)	Course category	PE
Course Name	INDUSTRIAL MANAGEMENT		

Teaching Scheme				Examination Scheme							Credits
Th	Tu	Pr	Total	Theory				Practical		Total	
				MSE	TA	ESE	ESE Duration	ICA	ESE		
03	--	--	03	30	10	60	2 hrs 30 min	--	--	100	03

Course Objectives:

Students will be able to:

1. Contribute to the success of companies through elective problem solving.
2. Design, develop, implement, and improve integrated systems that include people, materials, information, equipment, and environments.
3. Effectively manage business operations and project management teams.
4. Creative problem solving
5. Methods of improving materials and capital productivity.

Course Contents:

Management and Productivity: Basic concepts of Management, evolution of management thought. functions of management, management and administration, principles of management, productivity concepts, phases of productivity management, issues of productivity management in manufacturing and service organizations, productivity measurement and evaluation models, theories of human motivation, methods of improving materials and capital productivity.

Human Resources Management : Nature and scope of human resources development, training and development, human process intervention, intergroup relations, quality of work life, HR interventions: goal setting, career development, stress management, time management; contemporary issues in HRD, workers participation in management & collective bargaining, trade unions and their role in HRD.

Financial Management and Accounting: Basic accounting concepts, preparation of financial statements, classification of costs, allocation, apportionment and absorption, different costing systems. cost analysis for managerial decisions, working capital management, investment analysis, cash floors determination, cost of capital, capital budgeting methods, standard costing, variance analysis. Budgetary control, zero-based budgeting, and contribution analysis, ratio analysis & its significance. Profit and loss statement and balance sheet.

Materials Management and Inventory Control: Basic material and information flow, material requirements planning and lot sizing, just-in-time production, capacity planning: tools and techniques, production control principles and techniques. short-range

forecasting techniques, independent demand inventory management. EOQ Models and order timing decisions, safety stock and reorder level decisions, order quantity and reorder point spare parts inventory control. Vendor rating, Incoming material inspection and acceptance sampling, control of level of inventory and frequency of purchase, static and dynamic models under certain risk and uncertain conditions of demand. MRP and JlT.

Maintenance Management: Types of maintenance, maintainability analysis, Markov models for reliability, availability and MTTF computations. renewal theory approach, maintainability design considerations, life cycle costs, optimal inspection, overhaul, replacement or repair strategies, maintainability test and demonstration, various case studies in local industries.

Project Engineering and Management: introduction to project networks, PERT / CPM models, linear programming and network flow formulations. PERT / CPM accounting, scheduling with limited resources. resource planning. resource allocation. network crashing, precedence diagrams, generalized activity networks GERT. project feasibility. appraisal, and selection, prospects and case studies, recent trends in project management

Environmental Management: Environmental impact analysis IEIA - need and importance, steps involved methods of EIA, Environmental Management Plan (EMP), Environmental Legislation Acts, Statutes and regulations in India, Environmental Audit and various case studies in regional & local industries.

Reference Books:

l. Environmental and Pollution Awareness, B.R. Sharma,4'h Edition, Satya Prakashan, New Delhi, 2017.
2. Managerial Economics, Christopher R. Thomas, lOth Edition, McGraw-Hill / Irwin , U.S., 2013.
3. Industrial Management, Dr. B. Narayan, A. P. H. Publishing House, New Delhi I10002.
4. Industrial Management, N.C.Kale, M.Ahmed, Vipul Prakashan, Mumbai,20l5.
5. Industrial Engineering and Management, O.P. Khanna , l5'h Edition, Dhanpaf Rai Publications, Delhi.20l6.

Course Outcomes:

On completion of the course, students will be able to:

ME2144(A).1	Describe a system. component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability. And sustainability.
ME2144(A).2	Develop, formulate. And solve engineering problems.
ME2144(A).3	Adapt the techniques. Skills, and modem engineering tools necessary for engineering practice.
ME2144(A).4	Apply CPM/PERT in project management.
ME2144(A).5	Prepare maintenance strategy

CO – PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5
ME2144 (A).1	2	2	2	2	1
ME2144 (A).2	2	2	3	2	1
ME2144 (A).3	2	3	2	2	1
ME2144 (A).4	1	2	3	2	1
ME2144 (A).5	1	2	1	2	1

0 - Not correlated 1 - Weakly Correlated 2 - Moderately Correlated 3 - Strongly Correlated

Course Code	ME2144(B)	Course category	PE
Course Name	METHOD ENGINEERING AND ERGONOMICS		

Teaching Scheme				Examination Scheme							Credits
Th	Tu	Pr	Total	Theory				Practical		Total	
				MSE	TA	ESE	ESE Duration	ICA	ESE		
03	--	--	03	30	10	60	2 hrs 30 min	--	--	100	03

Course Objectives:

Students will be able to:

1. Identify potential and current occupational health & safety hazards in the workplace relating to ergonomic issues;
2. Recommend systematic approach to control and develop effective prevention programs For the workplace;
3. Design physical and psychosocial work systems and workplaces:
4. Evaluate human information systems, including decision making;
5. Understand causes of fatigue and stress in the workplace, including impacts shift work.

Course Contents:

Introduction to work study: - Productivity - scope of motion and time study, work methods design, motion study-process analysis - process chart - flow diagram - assembly process chart - man and machine chart - two handed process chart - micro motion and memo motion study.

Work measurement and its methods. Work psychology and method of measurement of work, paced & un-paced performance, design & selection of displays and controls, application of anthropometric data and design of work place layouts, Environmental studies, industrial safety & train ing, case studies.

Motion economy- Ergonomics practices - human body measurement - layout of equipment -seat design - design of controls and compatibility - environmental control - vision and design of displays, design of work space, chair table.

Job evaluation: Basic concepts, objective and subjective methods, compensation schemes, relationship of work study to incentive schemes, wage incentive plans
Ergonomics: Fundamental concepts, issues in work system design, measuring work by physiological means, work posture, fatigue measurement and evaluation, environmental Factors and work systems, industrial product design.

Bio-mechanics and ergonomics: Human biological, ergonomic, and psychological capabilities and limitations. Analysis and design of job requirements. Work place

arrangements, materials handling devices-systems and machine controls for the improvement of human work place. Advances in applied bio-mechanics and ergonomics.

Reference Books:

1 Motion & Time Study: Design and Mcasurement of Work, Barnes Ralph M., Wiley Text Book, 2011
2. Methods Standards & Work Design, Benjamin E Niebel and Freivalds Andris, Mc Graw Hill, 2009.
3. lntemational Labour organization, Work-study, Oxford and IBH publishing company Pvt. Ltd., N.Delhi. 2015.
4. A Guide to the Ergonomics of Manufacturing, Martin Heylander, East West Press, Taylor & Francis.2009.
5. Motion & Time Study: Improving Productivity, Marvin E, Mundel and David L, Pearson Education.2009.

Course Outcomes:

On completion of the course, students will be able to:

ME2144(B).1	Calculate the basic work content of a specific job for employees of an organization, thereby. they will be able to calculate the production capacity of man power of an organization.
ME2144(B).2	Analyze and calculate the level of risk in a job causing stress, fatigue and musculoskeletal disorders and design appropriate work systems.
ME2144(B).3	Analyze the existing methods of working for a particular job and develop an improved method through questioning technique.
ME2144(B).4	Devise appropriate wage and incentive plan for the employees of an organization
ME2144(B).5	Assess the occupational environmental factors like heat stress, noise, and vibrations in the industry.

CO – PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5
ME2144(B).1	3	2	2	2	1
ME2144(B).2	2	3	2	2	1
ME2144(B).3	2	3	3	2	1
ME2144(B).4	3	2	2	2	1
ME2144(B).5	2	2	3	2	1

0 - Not correlated 1 - Weakly Correlated 2 - Moderately Correlated 3 - Strongly Correlated

Course Code	ME2144(C)	Course category	PE
Course Name	ADVANCED OPERATIONS RESEARCH		

Teaching Scheme				Examination Scheme							Credits
Th	Tu	Pr	Total	Theory				Practical		Total	
				MSE	TA	ESE	ESE Duration	ICA	ESE		
03	--	--	03	30	10	60	2 hrs 30 min	--	--	100	03

Course Objectives:

Students will be able to:

1. Formulate a real world problem as a mathematical programming model.
2. Solve linear programming problem using OR tools.
3. Formulate and solve project network model.
4. Solve waiting line, replacement and inventory model using OR techniques
5. Learn and apply simulation technique for optimization of industry problems.

Course Contents:

Introduction to mathematical programming models and computational techniques, linear programming, duality in LP, Dual simplex method, sensitivity analysis,

Integer programming: problem formulation, Branch and Bound technique, Zero-one implicit enumeration technique.

Dynamic programming: Formulation of DP problem, Decision trees, Application of DP. Goal programming: Geometric programming and applications.

Network analysis: Application of PERT and CPM, Crashing ofl project network.

Waiting line models: Single and multiple channel models, Priority queues, Application of waiting line models.

Replacement Analysis: Replacement of items that deteriorate with time, Replacement of items that fail completely and suddenly.

Inventory model: Inventory model with deterministic and probabilistic demand.

Simulation: Basic concepts, discrete event simulation, generation of random numbers, Application of simulation to business, industry and service systems. Multiple objective decision-making and fuzzy sets

Reference Books:

l. Introduction to Operations Research, Billy E. Gillett ,Tata McGraw Hill, 2nd Edition
2. Operations Research, Natarajan, Balasubramani, and Tamilarasi, Pearson Education, 3'd Edition, 2008
3. Operations Research, H. A. Taha, , PHI,7th Edition.
4. Operations Research, Panneerselvam, PHI, 3nd Edition

Course Outcomes:

On completion of the course, students will be able to:

ME2144(C).1 Analyze the results and propose recommendations in language understandable to the decision-making processes in Management Engineering.
ME2144(C).2 Select techniques of OR to solve and optimize real life problems in industry
ME2144(C).3 Construct CPM and PERT Models for Project Management.
ME2144(C).4 Analyze the Concept of Replacement Model and inventory Model for Cost Analysis.
ME2144(C).5 Formulate and Simulate various Queuing Models for given situations.

CO – PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5
ME2144(C).1	2	3	3	3	2
ME2144(C).2	3	3	2	2	3
ME2144(C).3	3	1	2	3	3
ME2144(C).4	2	3	2	1	2
ME2144(C).5	2	3	2	1	2

0 - Not correlated 1 - Weakly Correlated 2 - Moderately Correlated 3 - Strongly Correlated

Course Code	ME2145	Course category	PC
Course Name	LAB PRACTICE 1		

Teaching Scheme				Examination Scheme							Credits
Th	Tu	Pr	Total	Theory				Practical		Total	
				MSE	TA	ESE	ESE Duration	ICA	ESE		
--	--	06	06					50	50	100	03

Course Objectives:

1. To acquire knowledge of experimental methods and their applications
2. To get insight into design, simulation and programming tools
3. To apply experimental and modern advanced techniques to solve practical problems

Laboratory Practice shall constitute laboratory experiments, design, simulation, programming assignments, industrial visits with reports and its outcome. The tutorials and experiments shall decide by the course teachers of the Program Core Courses (PCC) namely Computer Aided Design & Manufacturing, Machining Process & Analysis, Casting and Welding Processes and Elective l. The students shall perform minimum of8 experiments based on following courses,

MEPl4l Computer Aided Design & Manufacturing
MEP142 Machining Process & Analysis
MEPl43 Casting and Welding Processes
MEPl44 Elective I

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

ME2145.1 Formulate problems, perform experimental investigations, interpret and analyze the data using modern mathematical and scientific methods

ME2145.2 Identify and interpret the effect of various parameters on the system performance and correlate these parameters.

ME2145.3 Provide feasible solution to the real problems faced by industry and research organization.

CO – PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5
ME2145.1	2	3	3	3	2
ME2145.2	3	3	2	2	3
ME2145.3	3	1	2	3	3

Course Code	ME2146	Course category	ISS
Course Name	SEMINAR -I		

Teaching Scheme				Examination Scheme							Credits
				Theory				Practical		Total	
Th	Tu	Pr	Total	MSE	TA	ESE	ESE Duration	ICA	ESE		
	--	01	01					50	--	50	02

Course Objectives:

1. To Promote and develop effective communication and presentation skills
2. To utilize technical resources
3. To identify, evaluate and synthesize information from a range of sources to enhance knowledge of current developments in the field of production engineering

Topic of the seminar shall be a general topic. Evah-ration would be done by three member committee. Evaluation would be based on the seminar report submitted by the student and on the presentation made by him.

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

ME2146.1 Collect and review the relevant literature from various sources
ME2146.2 Discover development in the topic of interest and inculcate self learning
ME2146.3 Write technical report and give presentation

CO – PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5
ME2146.1	3	3	2	3	2
ME2146.2	2	2	3	2	2
ME2146.3	3	3	2	2	2

Sign
Member Secretary

Sign
BoS Chairperson

Sign
Dean (Academics)

Sign
Principal

M. Tech. (Production Engineering) Semester - II

Course Code	ME2241	Course category	PC
Course Name	INDUSTRIAL INSPECTION AND QUALITY MANAGEMENT		

Teaching Scheme				Examination Scheme							Credits
Th	Tu	Pr	Total	Theory				Practical		Total	
				MSE	TA	ESE	ESE Duration	ICA	ESE		
03	--	--	03	30	10	60	2 hrs 30 min	--	--	100	03

Course Objectives:

1. Learn application of various measuring instruments for dimensional and surface measurement.
2. Understand the concept of Quality Assurance, Total Quality Management, Quality System and Quality Audit.
3. Learn various statistical tools for Quality monitoring.
4. Understand the concept and process of sampling inspection and design of sampling plan.
5. Learn the concept of reliability and its application in product design and development

Course Contents:

Introduction to dimensional metrology, limits, fits and tolerances, application of tolerances. limit gauging, design of Gauges, comparators and their design considerations,

Industrial Inspection: auto collimators and interferometers. Dimensional inspection, measurement of screw threads, thread Gauges, gear inspection, feature inspection, straightness. flatness. parallelism, squareness, circularity and roundness, automated dimensional measurements, measurement with coordinate measuring machines.

Inspection of surface quality, parameters fbr assessing surface finish and experimental methods of surface tlnish measurements.

Quality Management Attributes of Quality, Evolution of Philosophy of Quality Management, Quality Assurance and Total Quality Management, Models of Quality Management, Customer Value, Product Quality Improvement, QFD, Taguchi Methods, T QC tools, Six sigma

Quality management, Service Quality, Quality Costs, Quality System Implementation: ISO 9000, Quality Information Systems, Quality Audit & Reporting Statistical Process

Control, Process control charts for variables and attributes. Control chart parameters, Process capability studies, Capability indices,

Acceptance Sampling, Sampling inspection for product acceptance, Single, double, multiple & sequential sampling schemes, OC, AOQ, ASN, and ATI curves, Design of sampling plans,

Reliability Engineering: Concept of Reliability, Reliability Models, Failure data analysis, failure rate and its relations to reliability, design reliability, Reliability testing..

Reference Books:

l. Total Quality Control, A.V.Feigenbann , 3rd Edition, McGraw Hill, 2001
2. Quality planning and analysis, Juran , 2nd Edition, Tata McGraw Hill, l999
3. Principal of Total Quality, Vincent K. Omachonu, CRC press,2002

Course Outcomes:

On completion of the course, students will be able to:

- **ME2241.1** Select techniques of geometric dimensioning and tolerance to ensure that product components conform to design requirements, dimensional measurement and industrial inspection.
- **ME2241.2** Propose the principles and techniques of Total Quality Management in improving quality practices within an industrial or service organization.
- **ME2241.3** Recommend the concept of sampling inspection for product acceptance
- **ME2241.4** Apply principles and techniques of reliability engineering to predict product and system performance.
- **ME2241.5** Apply the concept of Reliability and Failure data analysis.

CO – PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5
ME2241.1	2	3	3	3	2
ME2241.2	3	3	2	2	3
ME2241.3	3	1	2	3	3
ME2241.4	2	3	2	1	2
ME2241.5	1	3	2	2	2

0 - Not correlated 1 - Weakly Correlated 2 - Moderately Correlated 3 - Strongly Correlate

Course Code	ME2242							Course category			PC
Course Name	COMPUTER INTEGRATED MANUFACTURING										
Teaching Scheme				Examination Scheme							Credits
Th	Tu	Pr	Total	Theory				Practical		Total	
				MSE	TA	ESE	ESE Duration	ICA	ESE		
03	--	--	03	30	10	60	2 hrs 30 min	--	--	100	03

Course Objectives:

Students will be able to:

1. To impart the concept of computer integrated manufacturing and its implications
2. To inculcate the knowledge of Group Technology and product flow analysis and its applications.
3. Prepare the students to gain insight on the process planning and concurrent engineering. Implementation considerations, manufacturing system components.
4. To induce the knowledge of Robots and its programming
5. Implementation considerations, manufacturing system components.

Course Contents:

Concept and scope of CIM: components of CIM, benefits, limitations. Introduction to Group Technology, Limitations of traditional manufacturing systems, characteristics and design of groups.

Group Technology: benefits of GT and issues in GT. Part families, classification and coding, Production flow analysis, Machine cell design, Benefits.

Flexible Manufacturing System: application work stations, Computer control and functions, Planning, scheduling and control of FMS. Scheduling, Knowledge based scheduling, Hierarchy of computer control, Supervisory computer. Manufacturing data systems, data flow, CAD/CAM considerations, Planning FMS database. Automated material handling systems, AS/RS, general considerations, selection, evaluation and control.

Process Planning: Introduction, Process Planning and Production Planning , Process Planning and Concurrent Engineering, CAPP, Variant process planning, Generative approach , Forward and Backward planning, Input format, Logical Design of a Process Planning , Implementation considerations, manufacturing system components.

Integrated process planning: Modulus structure, Data Structure, operation, Report Generation, Expert process planning. Agile manufacturing, Nano Manufacturing.

Robotics: Introduction, Classification, Programing.

Reference Books:

l. Systems Approach to Computer Integrated Design and Manufacturing", NanuaSingh,"John
2. Wiley & Sons, 1996. "Automation, Production Systems and Computer Integrated Manufacturing", Groover M.P,Prentice-Hall of lndia Pvt. Ltd., New Delhi, 2002
3. "Handbook of Flexible Manufacturing Systerns" Jha, N.K, Academic Press Inc.,1991.
4. "Group Technology in Engineering Industry". Burbidge, J.L.Mechanical Engineering pub. London, 1979.

5. "G.T Planning and Operation, in The automated factory-HandBook: Technology and Management" Askin, R.G. and Vakharia, A.J, Cleland, D.I. and Bidananda, B (Eds). TAB Books, NY, 1991.

6."Cellular Manufacturing Systems" Irani, S.A. Hand Book

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

ME2242.1 Understand the concept of CIM and apply them in the integration of various Manufacturing processes.

ME2242.2 Implement the various classification and coding technique of GT in production flow Analysis.

ME2242.3 Apply the Knowledge based scheduling. Hierarchy of computer control, Supervisory computer. Manufacturing data systems, data flow and CAD/CAM.

ME2242.4 Ability to apply and use modern tools of integrated process planning in the area of agile manufacturing, Nano Manufacturing.

ME2242.5 Ability to identify and provide feasible solution to the problems in robot programming Generative approach. Forward and backward planning, Input format, Logical Design of Process Planning.

CO – PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5
MEP242.1	1	3	1	1	2
MEP242.2	3	3	1	3	1
MEP242.3	2	2	2	2	1
MEP242.4	2	2	1	1	1
MEP242.5	1	2	3	2	1

0 - Not correlated 1 - Weakly Correlated 2 - Moderately Correlated 3 - Strongly Correlated

Course Code	ME2243	Course category	PC
Course Name	PROCESS ENGINEERING		

Teaching Scheme				Examination Scheme							Credits
Th	Tu	Pr	Total	Theory				Practical		Total	
				MSE	TA	ESE	ESE Duration	ICA	ESE		
03	--	--	03	30	10	60	2 hrs 30 min	--	--	100	03

Course Objectives:

1. Impart the concept of Process Engineering its scope and importance
2. Prepare students gain the insight of part prints, system of dimensioning and tolerance stacks in manufacturing
3. Inculcate the knowledge of theories and techniques to maintain work piece control IV. Impart the knowledge of various classes of operations,
4. Machine process selection and study of preparation of process picture and operation routing in manufacturing
5. Process planning-Structure of CAPP system

Course Contents:

Process Engineering functions, Degrees of freedom and datum surfaces, Errors in manufacturing, factors affecting manufacturing accuracy preliminary part print analysis, approaches to process planning. Dimensional analysis, Theory of dimension chains Tolerances analysis. Tolerance chart, purpose utilization.

Work piece control: Equilibrium theories, gauging, classifying operations. Detailed selection and planning of manufacturing process: determining manufacturing sequence Selection of equipment's, standard and special equipment's, classification of tooling Process picture, operation routing, computer aided process planning, structure of CAPP, limitations, process planning system and their selection criteria,

Production techniques for typical components and tools: Jigs and fixture design and manufacture. Computer aided, limitations of cad based process planning, forward and backward planning, implementation, criteria consideration, process planning system and their selection criteria, case studies.

Reference Books:

1. Process Engineering For Manufacturing Eary and Johnson, PHI Publication, 2000
2. Dimensional Control in Precision Manufacturing, Gadzala 1.1.2002
3. Tolerance Control in Design and Manufacturing, Wade O.R, 1998
4. Computer Integrated Design and Manufacturing, David D. Bedworth TataM/c Grawills, 2005

Course Outcomes:

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

ME2243.1 Illustrate the fundamentals of process engineering in engineering applications

ME2243.2 Develop part print and tolerance chart for a part being manufactured

ME2243.3 Apply the techniques of work piece control and to finalise the sequence of operators in manufacturing

ME2243.4 Illustrate process picture, operation routine and proper selection of tooling in manufacturing.

ME2243.5 Apply the concept of Computer aided process planning

CO – PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5
ME2243.1	3	1	1	2	
ME2243.2	3	3	2	2	1
ME2243.3	3	3	3	2	1
ME2243.4	3	3	3	2	1
ME2243.5	1	1	2	1	1

0 - Not correlated 1 - Weakly Correlated 2 - Moderately Correlated 3 - Strongly Correlated

Course Code	ME2244(A)							Course category		PE
Course Name	INJECTION MOULDING AND MOULD DESIGN									
Teaching Scheme				Examination Scheme						Credits
Th	Tu	Pr	Total	Theory				Practical		Total	
				MSE	TA	ESE	ESE Duration	ICA	ESE		
03	--	--	03	30	10	60	2 hrs 30 min	--	--	100	03

Course Objectives:

1. Educate students about the processing behavior and applications of different class of plastics materials
2. Impart insight of different Polymer processing techniques and Constructional features of mould.
3. Inculcate the knowledge of design of mould for plastic processing and use of mould simulation software's for mould flow and defect analysis
4. Impart insight knowledge of injection moulding machine and its process parameters.
5. Standards for Tolerances on moulded articles

Course Content:

Plastic materials: Classification of plastic materials, their physical and mechanical properties. selection of plastics for various applications, advantages and limitations of using plastics.

Melt processing techniques: Polymer processing techniques such as extrusion, compression and transfer moulding. Injection moulding, blow moulding, thermoforming. Rotational moulding. Calendaring. Bag moulding reaction moulding. Classification of polymer processing operations. Simple model flows for analyzing processing operations with examples.

Constructional features of mould: constructional features of core and cavity plates, mold size and strength, cavity material, and fabrication, mold placement, constructional features and layout of runners and gates.

Product design of moulded products: Various considerations such as wall thickness, fillets and radii, ribs, under, cuts, drafts, holes, threads, inserts parting lines, etc. surface treatment mould design for avoiding warpage, Standards for Tolerances on moulded articles.

Design of mould for plastic processing: Methodical mould design, determination of economical number of cavities, melt rheology, temperature control of injection molds,

calculation of mold opening force and ejection force. Detail design of cooling system, ejection system and gating system. Moulding thermoplastics, thermosets, expandable polystyrene, foamed engineering plastics moulds for reaction injection moulding.

Computer applications in plastic moulding: Use of various software's for mold flow analysis, optimum gate location and defect analysis, design of component for balanced flow, optimization of process parameters of plastic moulding.

Injection Moulding: Principles of Injection Moulding, Injection moulding machine and types, capacity & clamping tonnage, mold size, plasticating extruder concepts, moulding properties and control parameters, moulding cycle.

Reference Books:

1. Plastics Engineering, R. J. Crawford
2. Industrial Plastics: Theory and Applications, ITerry L. Richardson and Erik Lokensgard
3. Handbook of Thermoplastics Injection Mould Design, P.S. Cracknell: R.W. Dyson,
4 Injection Mold Design Engineering, David O. Kazmer
5 J.E. Mark, R. West, "Inorganic Polymers", H.P Alocock, Prentice Hall, 1992.

Course Outcomes:

After Completion of Course, the students will able to:

ME2244(A).1 Illustrate on physical properties, processing behavior and applications of different class of plastics materials
ME2244(A).2 Apply the knowledge of polymer processing techniques and Constructional features of mould in product design.
ME2244(A).3 Demonstrate design of mould for plastic processing and using different simulation software's for mould flow and defect analysis Identify optimized control parameters and illustrate the knowledge of injection molding machine.
ME2244(A).4 Identify optimized control parameters and illustrate the knowledge of injection moulding machine
ME2244(A).5 Apply the various software's for mold flow analysis

CO – PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5
ME2244(A).1	3	3	2		
ME244(A).2	3	3	3	3	2
ME2244(A).3	3	3	3	3	3
ME2244(A).4	3	3	2	3	1
ME2244(A).5	1	2	2	3	1

0 - Not correlated 1 - Weakly Correlated 2 - Moderately Correlated 3 - Strongly Correlated

Course Code	ME2244(B)	Course category	PE
Course Name	AUTOMATTON IN MANUFACTURING		

Teaching Scheme				Examination Scheme							Credits
Th	Tu	Pr	Total	Theory				Practical		Total	
				MSE	TA	ESE	ESE Duration	ICA	ESE		
03	--	--	03	30	10	60	2 hrs 30 min	--	--	100	03

Course objective:

1. To impart the concept of its implications of automation in manufacturing systems.
2. To inculcate the knowledge of Production systems hard fixed automation and process automation.
3. Acquire the fundamental concepts of actuators their design and control devices, sequence and their operation.
4. To induce the knowledge of PLC programming and automatic assembly
5. To study material handling systems

Course contents:

Introduction: Modern developments in automation in manufacturing and its effect on global competitiveness. Need and implications of automation in Manufacturing.

Types of production systems: Different types of production systems and automation, hard/fixed automation including process automation.

Actuators: Hydraulic and pneumatic actuators, their design and control devices, sequence operation of hydraulic/pneumatic actuators, designing of complete systems with hydraulic, electro-hydraulic and digital control devices, applications in Manufacturing, material handling systems

Feeders and Orientation devices: Different types of feeder, orienting and escapement devices their analysis and design

Automatic assembly machines: Types, designing for automatic assembly.
PLC programming: Introduction, programming.

Reference Books:

1. Hydraulics and Pneumatics. Andrew Parr, 3rd Edition, Butterworth-Heinemann 2011
2. Assembly Automation and Product Design, Geoffrey Boothroyd, 1st Edition, 1992
3. Robot and Manufacturing Automation, C. Ray Asfahl Amazon, 2nd Edition, 1992
4. PLC Programming for Industrial Automation, Kevin Collins.2008

Course Outcomes:

Upon completion of this course the student will be able to:

ME2244(B).1 Able to understand the concept of Automaton and apply them in the integration of various manufacturing processes

ME2244(B).2 Ability to implement the various classification and types of production systems and process automation.

ME2244(B).3 Ability to apply the, Knowledge acquired in the fundamental con actuators their design and control devices, sequence and their operations computer control.

ME2244(B).4 Analyze various automated flow lines. Explain assembly systems in balancing methods and automatic assembly.

ME2244(B).5 Designing systems with hydraulic, electro-hydraulic and digital control devices.

CO – PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5
ME2244(B).1	2	3	1	1	2
ME2244(B).2	2	3	1	2	1
ME2244(B).3	3	2	2	2	2
ME2244(B).4	2	2	1	1	2
ME2244(B).5	1	2	1	2	2

0 - Not correlated 1 - Weakly Correlated 2 - Moderately Correlated 3 - Strongly Correlated

Course Code	ME2244(C)	Course category	PE
Course Name	RAPID PROTOTYPTNG & TOOLING		

Teaching Scheme				Examination Scheme							Credits
Th	Tu	Pr	Total	Theory				Practical		Total	
				MSE	TA	ESE	ESE Duration	ICA	ESE		
03	--	--	03	30	10	60	2 hrs 30 min	--	--	100	03

Course objective:

1. Describe the fundamental of rapid prototyping and automated fabrication, including the generation of suitable CAD models.
2. current rapid prototyping fabrication technologies, and their underlying material science
3. Demonstrate the use of additive manufacturing for rapid prototyping
4. Identify the insight into various modem rapid prototyping techniques,
5. Examine different types of Software used for Rapid Prototyping

Course Contents:

Introduction: Definition of Prototype. Types of prototype. Need for the compression in product development. History of RP systems, Survey of applications, Growth of RP industry, classification of RP systems.

RP Techniques: Various Industrial RP Systems like Sterolithography, Fused Deposition Modelling. Selective Laser Sintering, Laminated Object Manufacturing, 3D Printing. Ballistic particle modelling etc.

Rapid Prototyping and Rapid Tooling in Product Development: Simultaneous Engineering. Process planning for rapid prototyping. STL file generation, Defects in STL files and repairing Slicing and various slicing procedures, Accuracy issues in Rapid Prototyping, Strength of RP Parts, Surface roughness problem in Rapid Prototyping, Part deposition orientation and issues like accuracy, surface finish, build time, support structure, cost etc..

Solid Ground Curing: Principle of operation, Machine details. Applications,

Laminated Object Manufacturing: Principle, of operation, LOM materials, process details, application.

Software for RP: STL files, Overview of Solid view, magics, imics, magic communicator. etc. Internet based software. Collaboration tools

Rapid Manufacturing Process Optimization: factors influencing accuracy, data preparation errors, Part building errors. Error in finishing, influence of build orientation.

Reference Books:

1. Rapid Prototyping Neil Hopkinson, Richard Hague, Philip Dickens (Editors); Wiley; Jan., 2006
2. Rapid Prototyping: Principles and Applications Rafiq 1. Noorani Wiley, 2005 processes
3. Rapid Prototyping: Theory and Practice. Ali Kamrani, Emad Abouel Nasr (Editors), Springer; 1 od.. Jan., 2006
4. Reverse Engineering: An Industrial Perspective Vinesh Raja, Kiran J. Fernandes (Editors).. Springer; 2007
5. Rapid Prototyping: Principles and Applications,Chua Chee Kai, Leong Kah Fai, Lim Chu-Sing 2 edition, World Scientific Pub Co.2003

Course Outcomes:

After completion of course, the student will be able to:

ME2244(C).1	Describe the current available rapid prototyping systems, their fun operating principles, and their characteristics.
ME2244(C).2	Describe complementary, secondary fabrication processes commonly use the above rapid prototyping systems
ME2244(C).3	Select the appropriate fabrication technology, or technologies for a given
ME2244(C).4	Select and use correct CAD formats in the manufacture of a 3D printed part.
ME2244(C).5	Set up and fabricate a 3D part using an additive manufacturing machine.

CO – PO Mapping :

CO	PO1	PO2	PO3	PO4	PO5
ME2244(C).1	1	2	3	3	2
ME2244(C).2	2	3	2	2	1
ME2244(C).3	3	1	2	1	3
ME2244(C).4	2	1	2	3	3
ME2244(C).5	3	2	2	3	1

0 - Not correlated 1 - Weakly Correlated 2 - Moderately Correlated 3 - Strongly Correlated

Course Code	SH2201							Course category		RM
Course Name	RESEARCH METHODOLOGY									
Teaching Scheme				Examination Scheme						Credits
Th	Tu	Pr	Total	Theory				Practical		Total	
				MSE	TA	ESE	ESE Duration	ICA	ESE		
02	--	--	02	30	20	--		--	--	50	02

Course objective:

1. To understand some basic concepts of research and its methodologies
2. To Learn the ethical, political, and pragmatic issues involved in the research process
3. To write a research Proposal
4. Gain a practical understanding of the various methodological tools used for social scientific research
5. To help and encourage the students for startups and innovations.

Course Contents:

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

Literature Review: Effective literature studies approaches, analysis Plagiarism, Research ethics,

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

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

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

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

Text Books:

l. Stuart Melville and Wayne Goddard. "Research methodology: an introduction for science & engineering students"'
2. Wayne Goddard and Stuart Melville, "Research Methodology: An Introduction"
3. Ranjit Kumar. 2nd Edition , "Research Methodology: A Step by Step Guide for beginners"
4. Halben. "Resisting Intellectual Prope(y". Taylor & Francis Ltd,2007.
5. Mayall . "lndustrial Design", McGraw Hill. 1992.

References Books:

1. Asimov. "lntroduction to Design". Prentice Hall, 1962.
2. Robert P. Merges. Peter S. Menell. Mark A. Lemley, "Intellectual Property in New Technological Age", 201 6.
3. T, Ranrappa, "Intellectual Property Rights Undet WTO". S Chand- 2008

Course Outcomes:

At the end of this course, students will be able to:

SH2201.1 Describe research problem formulation.

SH2201.2 Compare research related information.

SH2201.3 Adapt research ethics.

SH2201.4 Interpret that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.

SH2201.5 Describe that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits.

CO – PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5
SH2201.1	2	3	2	2	1
SH2201.2	3	2	3	2	1
SH2201.3	2	3	2	2	1
SH2201.4	3	2	2	3	1
SH2201.5	2	3	2	2	1

0 - Not correlated 1 - Weakly Correlated 2 - Moderately Correlated 3 - Strongly Correlate

Course Code	ME2245	Course category	PC
Course Name	LAB PRACTICE- II		

Teaching Scheme				Examination Scheme							Credits
Th	Tu	Pr	Total	Theory				Practical		Total	
				MSE	TA	ESE	ESE Duration	ICA	ESE		
--	--	06	06	--	--	--	--	50	50	100	03

Course Objectives:

1. To acquire knowledge of experimental methods and their applications
2. To get insight into design, simulation and programming tools
3. To apply experimental and modern advanced techniques to solve practical problem.

Laboratory Practice shall constitute laboratory experiments, design, simulation, programming assignments, industrial visits with reports and outcome etc. The tutorials and experiments shall decide by the course teachers of the Program Core Courses (PCC) namely industrial Inspection and Quality Management, Computer Integrated Manufacturing, Process Engineering, Elective II

The students shall perform minimum of 8 experiments based on following courses,

ME2241 Industrial Inspection and Quality Management
ME2242 Computer Integrated Manufacturing
ME2243 Process Engineering

Course outcomes:

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

ME2245.1 **Formulate** problems, perform experimental investigations, interpret and analyze the data using modern mathematical and scientific methods.
ME2245.2 **Identify** and interpret the effect of various parameters on the system performance and correlate these parameters.
ME2245.3 **Provide** feasible solution to the real problems faced by industry and research organization.

CO – PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5
ME2245.1	2	3	3	3	2
ME2245.2	3	3	2	2	3
ME2245.3	3	1	2	3	3

0 - Not correlated 1 - Weakly Correlated 2 - Moderately Correlated 3 - Strongly Correlated

Course Code	ME2246	Course category	ISS
Course Name	SEMINAR - II		

Teaching Scheme				Examination Scheme							Credits
Th	Tu	Pr	Total	Theory				Practical		Total	
				MSE	TA	ESE	ESE Duration	ICA	ESE		
--	--	01	01	--	--	--	--	50	--	50	02

Course Objective:

1. To expose students to the 'real' working environment and get acquainted with the latest technology in the production engineering field
2. To carry out Literature survey for selected areas.
3. To promote and develop presentation skills and import a knowledgeable society

Course Contents:

Seminar shall be based on Dissertation topic. Evaluation shall be done by three member committee.
Evaluation shall be based on the seminar report submitted by the student and on the presentation made by him time to time.

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

ME2246.1 Identify the advanced areas of interest pertaining to Production Engineering through survey.
ME2246.2 Analyze literature & find gaps on the basis of findings, define objectives and scope of the work.
ME2246.3 Develop method of to meet the objectives.

CO – PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5
ME2246.1	3	3	2	3	2
ME2246.2	2	2	3	2	2
ME2246.3	3	3	2	2	2

0 - Not correlated 1 - Weakly Correlated 2 - Moderately Correlated 3 - Strongly Correlated

Sign Member Secretary | Sign BoS Chairperson | Sign Dean (Academics) | Sign Principal

M. Tech. (Production Engineering) Semester – III

Course Code	ME2342	Course category	RP/DI
Course Name	DISSERTAION STAGE- I		

Teaching Scheme				Examination Scheme							Credits
Th	Tu	Pr	Total	Theory				Practical		Total	
				MSE	TA	ESE	ESE Duration	ICA	ESE		
--	--	04	04	---	---	---	---	150	--	150	13

Course Objectives:

I. Select and develop the topic based on literature survey
II. Decide the scope and boundary of topic
III. Prepare synopsis report
IV. Present the work completed in the prescribed format

Course Contents:

Dissertation Phase-I and Seminar: Student has to submit the report and deliver the seminar based on minimum of 25% of his work on dissertation topic. It is to be evaluated internally by three member panel of examiners headed by HOD wherein guide should be one of the members of a panel. Last date of submission of report shall be two weeks before the end of the semester.

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

ME2342.1 Identify/define problems and generate questions and/or hypotheses
ME2342.2 Review and summarize the literature
ME2342.3 Make the action plan to complete the dissertation work
ME2342.4 Develop and sustain an evidence-based argument and submit the report
ME2342.5 Ability to apply and use modern tools in the area of Production Engineering

CO	PO1	PO2	PO3	PO4	PO5
ME242.1	1	3	1	1	2
ME242.2	3	3	1	3	1
ME242.3	2	2	2	2	1
ME242.4	2	2	1	1	1
ME242.5	1	2	3	2	1

Course Articulation Matrix:

1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

Course Code	ME2441	Course category	RP/DI
Course Name	DISSERTAION STAGE- II		

Teaching Scheme				Examination Scheme							Credits
Th	Tu	Pr	Total	Theory				Practical		Total	
				MSE	TA	ESE	ESE Duration	ICA	ESE		
--	--	36	36	---	---	36	---	100	200	300	18

Course Objectives:

I. Identify research technique and collect the data
II. Organise, interpret, analyse data and compile the factual results
III. Draw the conclusion

Course Contents:

Dissertation Phase-II: Internal assessment of complete work of dissertation is to be carried out by a guide for 100 marks. External assessment of dissertation is to be carried out by a panel of examiners consisting of internal examiner (guide) and external examiner for 200 marks. Candidate shall present the entire work on dissertation, followed by a viva-voce. Last date of submission of dissertation will be the end of the semester. Please see Appendix-C of rules and regulation for further information.

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

ME2441.1 Apply the appropriate research technique and collect the data
ME2441.2 Conduct research responsibly and ethically
ME2441.3 Evaluate, interpret, and analyse data and evidence and discuss findings in the broader context of the field
ME2441.4 Compile the report with critical and coherent documentation and present the work
ME2441.5 Ability to apply and use modern tools in the area of Production Engineering

CO – PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5
ME2441.1	1	3	1	1	2
ME2441.2	3	3	2	3	1
ME2441.3	2	1	2	2	2
ME2441.4	3	2	1	1	1
ME2441.5	2	2	3	1	2

1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

Sign Member Secretary | Sign BoS Chairperson | Sign Dean (Academics) | Sign Principal