

ASHOKRAO MANE GROUP OF INSTITUTIONS



NH - 4, Vathar Tarf Vadgaon, Tal: -Hatkanangale, Dist: - Kolhapur-416112 Website: www.amgoi.edu.in

An Autonomous Institute

Curriculum Structure and Evaluation Scheme for M. Tech. in Mechanical Production Engineering with Multidisciplinary Minor

(To be implemented for 2025-2027 Batch)

DEPT OF MACHANICAL ENGINEERING SHRI BALASAHEB MANE SHIKSHAN PRASARAK MANDALIS ASHOKRAO MANE GROUP OF INSTITUTIONS er. Mrs. S. R. Cheugule

Shri Balasaheb Mane Shikshan Prasarak Mandal's Ashekrae Mane Group Of Institutions Vathar Tarf Vadgaon, Tal. Hatkanangale Dist. Kolhapur, Maharashtra - 416112





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Curriculum Structure and **Evaluation Scheme** for M. Tech. in **Mechanical Production Engineering** with **Multidisciplinary Minor**

(To be implemented for 2025-2027 Batch)



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ABBREVIATIONS

- L: Lecture
- T: Tutorial
- **P:** Practical
- **ISE-I-** In Semester Evaluation I
- **ISE-II-** In Semester Evaluation II
- **MSE:** Mid Semester Exam
- **ESE:** End Semester Exam
- **PCC**: Program Core Course
- **PEC**: Program Elective Course
- **OE**: Open Elective Course
- **AEC:** Ability Enhancement Course
- AC: Audit Course
- **RM:** Research Methodology



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Department: Department of Mechanical Engineering

Semester: I

	Course		Tea	ching	g Sche	me	Evalu	ation S	Schem	ie
Type of Course	Code	Course Name	L	Т	P	Cr	Compone nts	Max		in for ssing
							ISE-I	10		
PCC	P25MP101	Advanced Material and	3	1	_	4	MSE	30		
1 66	1 25M1 101	Processing	3	1	_	T	ISE-II	10		40
							ESE	50	20	10
							ISE-I	10		
PCC	P25MP102	Production and	3	1		4	MSE	30		
PCC		Operation Management	3	1	_	4	ISE-II	10		40
							ESE	50	20	10
							ISE-I	10		
PCC	P25MP103	Metal Casting	3	1		4	MSE	30		
PCC		Technology	3	1	-	4	ISE-II	10		40
							ESE	50	20	40
							ISE-I	10		
DEC	P25MP104	Duo guana Elo ativo I	3			3	MSE	30		
PEC		Program Elective-I	3	ļ -	-	3	ISE-II	10		40
							ESE	50	20	40
							ISE-I	10		
DM	P25MP105	Research Methodology	2			2	MSE	30		
RM		and IPR	Z	-	-	2	ISE-II	10		40
							ESE	50	20	
ELC	P25MP106	Seminar		_	2	1	ISE	50		40
ELC		Semmai		_		1	ESE (OE)	50	20	40
PCC	P25MP107	PG Lab- I		_	4	2	ISE	50		40
1 00		1 С Дар 1			T		ESE (POE)	50	20	10
	P25MP108						-	-		
AC	F 25MF 100	Yoga and Meditation	1	-			-	-		-
							-	-		
		Total	15	3	06	20		700		
				24				, 00		
	Total Contact Hours- 24					otal C	redits- 20			



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Department: Department of Mechanical Engineering

Semester: II

Type of			Te	eachii	ng Scł	neme	Ev	valuati	on Sch	eme
Course	Course Code	Course Name	L	Т	P	Cr	Components	Max		n for sing
							ISE-I	10		
D. G. G.	DOEL (DOO)	Quality Control and					MSE	30		
PCC	P25MP201	Reliability	3	1	-	4	ISE-II	10		40
							ESE	50	20	40
							ISE-I	10		
							MSE	30		
PCC	P25MP202	Advanced CNC Technology	3	1	-	4	ISE-II	10		4.0
		5.7					ESE	50	20	40
							ISE-I	10		
PCC	P25MP203	Advances in Welding	3		_	3	MSE	30		40
rcc	F25MF205	and Joining Technology	3	-	-		ISE-II	10		40
							ESE	50	20	
							ISE-I	10		
PEC	P25MP204	Drogram Floative II	3			3	MSE	30		
PEC	P25MP204	Program Elective-II	3	-	-	3	ISE-II	10		40
							ESE	50	20	10
							ISE-I	10		
OF	DOEMDOOF	0 5 4 4	0			_	MSE	30		
OE	P25MP205	Open Elective-I	3	-	-	3	ISE-II	10		40
							ESE	50	20	40
VEC	P25MP206	Technologies for	2	_	_	2	ISE-I	25	20	
		Industrial Evolution					ISE-II	25		20
							ISE-I	25		
ELC	P25MP207	Mini Project	-	-	2	1	ISE-II	25		40
							ESE (POE)	50	20	
DCC	Database	DC Lab II			_	2	ISE	50		40
PCC	P25MP208	PG Lab- II	-	•	4	2	ESE (POE)	50	20	40
ELC	P25MP209	Internship/Field Training	ı	-	-	-	Will be Evaluated in Sem-III	-		-
Tabel 17 2 06 3			00							
Total 2				25	•	22		750		
	,	1		Т	otal Cı	edits- 22				
Total Contact Hours- 25 Total Credits- 22										



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Department: Department of Mechanical Engineering

Semester: III

Type of			Te	eachii	ng Sch	eme	E	valuati	on Sch	eme
Course	Course Code	Course Name	L	Т	P	Cr	Components	Max	Mir Pass	n for sing
							ISE-I	10		
OE	P25MP301	O Plant . H\$	3		-	3	MSE	30		
OE	P25MP301	Open Elective-II [§]	3			3	ISE-II	10		40
							ESE	50	20	10
	MDM P25MP302 Multi-Disciplinary Minor\$						ISE-I	10		
MDM				3	MSE	30				
MDM		Minor ^{\$}	3	-	-	3	ISE-II	10		40
							ESE	50	20	10
							ISE-I	25		
ELC	P25MP303	Dissertation Phase- I*	-	-	20	10	ISE-II	25		
							ESE(POE)	50	20	40
ELC	P25MP209	Internship/Field Training	-	-		2	ISE-I	50	20	_
				6 - 20						
	Total —			26			350			
	Total Contact Hours- 26 Total Credits- 18									

^{*\$} It is mandatory to opt these courses certification from SWAYAM/NPTEL, MOOC platform.

^{*} It is required to complete 30% work of Dissertation.

[#] It is required to do Four weeks domain specific industrial internship after completing first year of the program evaluated in Semester-III



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Department: Department of Mechanical Engineering

Semester: IV

Type of	Course Code	Course Name	Teaching Scheme				Evaluation Scheme			
Course			L	Т	P	Cr	Components	Max	Mir Pass	n for sing
				ISE-I	50	40				
ELC	P25MP401	Dissertation Phase- II*	-	-	40	20	ISE-II	50	40	
							ESE	100	40	80
Total				40		20		200		
				40		20		200		

It is required to publish/present two papers out of which at least one paper should be in a SCI/ SCIE/ SCOPUS/ Web of Science/ Peer-Reviewed Journal before Thesis Submission.



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Exit Courses after Semester- II - P.G. Diploma

Type of Course Code Course Name		_	Teaching Scheme				Evaluation Scheme			
Course	Course Code	Course Name	ame L		P	Cr	Components	Max	Min for Passing	
4.77.0		Management				_	ISE	50		
AEC P25	P25MP210	Information System	4	-	-	4	ESE	50	40	
ELC	P25MP211	Internship/ Training		_	_	2	ISE-I	50	40	
LIC		mternship/ rranning					ESE	50		
		Transl.	4	0	0			200		
		Total		2		6		200		
	Total Contact Hours- 4 Total Credits- 06									

^{*}It is mandatory to opt this course certification from SWAYAM/NPTEL MOOC platform

[#] Four weeks domain specific industrial internship after successfully completing first year of the program.



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PROGRAM ELECTIVE CORE

(Students have to select any one Program Elective Core course out of 03, for each applicable semester, of their interest, offered by the Department from the table below)

Program Elective Core - I

Sr.	Course Code	Course Name	Semester
1	P25MP 104A	Abrasive Machining and Finishing Processes	
2	P25MP 104B	Sustainable Manufacturing	I
3	P25MP 104C	Manufacturing Planning and Control	

Program Elective Core - II

Sr.	Course Code	rse Code Course Name	
1	P25MP 204 A Computer Integrated Manufacturing		
2	P25MP 204 B	Total Productive Maintenance	II
3	P25MP 204 C	Lasers in Manufacturing	

MULTIDISCIPLINARY MINOR (MDM) BASKET

(Students have to select any one course of their interest (other than a courses offered by their program) for the award of Minor Degree from the table below)

Name o	Name of the MDM Basket- Product Development							
Sr.	Course Code	Course Name	Semester	Offered by the Department				
1	P25MP302	P302 Product Life Cycle Management		Mechanical Engineering				



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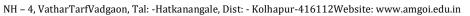
OPEN ELECTIVE COURSES

(Students have to select any one Open Elective course, for each applicable semester, of their interest from the basket below.)

Open Elective – I Semester II				Open Elective – II Semester III				
Sr.	Course Code	Course Name (OE)	Sr.	Course Code	Course Name (OE)			
1	P25MP205A	Environment and Development	1	P25MP301A	Labour Welfare and Industrial Relations			
2	P25MP205B	Engineering Economics	2	P25MP301B	Sustainable Technology			
3	P25MP205C	Project Management	3	P25MP301C	Entrepreneurship Development			
4	P25MP205D	Healthcare Engineering	4	P25MP301D	Industrial Automation			



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Department of Mechanical Engineering

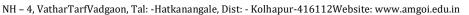
PG Program: Mechanical Production Engineering

Semester: I

	C		Tea		g Sche	me	Evalu	ation S	Chem	ie
Type of Course	Course Code	Course Name	L	Т	P	Cr	Compone nts	Max		in for ssing
							ISE-I	10		
PCC	P25MP101	Advanced Material and	3	1	_	4	MSE	30		
ruu	F Z SMF 101	Processing	3	1	_	4	ISE-II	10		40
							ESE	50	20	10
							ISE-I	10		
PCC	P25MP102	Production and	3	1	_	4	MSE	30		
PCC		Operation Management	3	1	-	4	ISE-II	10		40
							ESE	50	20	
							ISE-I	10		
DCC	P25MP103	Metal Casting	2	1		4	MSE	30		
PCC		Technology	3	1	-	4	ISE-II	10		40
							ESE	50	20	40
							ISE-I	10		
DEC	P25MP104	Program Elective-I	2			2	MSE	30		
PEC			3	3 -	-	3	ISE-II	10		40
							ESE	50	20	40
							ISE-I	10		
0.17	P25MP105	Research Methodology	0				MSE	30		
OE		and IPR	2	-	-	2	ISE-II	10		40
							ESE	50	20	
ELC	P25MP106	Cominou			2	1	ISE	50		40
ELC		Seminar		-		1	ESE (OE)	50	20	40
PCC	P25MP107	PG Lab- I		l _	4	2	ISE-I	50		40
1 66		I d Lau- I			4		ESE (POE)	50	20	40
	D2EMD100						-	-		
AC	P25MP108	Yoga and Meditation	1	-			-	•		-
							-	-		
		Total	15	3	06	20		700		
				24				, 00		
	To	otal Contact Hours- 24			T	otal C	redits- 20			



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Title of the Course Name: Advanced Material and	L	T	P	Credits
Processing Course Code: P25MP101	3	1		4
Course Code: PZ5MP101	ISE	MSE	ESE	Total
	20	30	50	100

Pre-Requisite: Materials, Manufacturing Processes

Course Objectives: The course aims,

- 1. To introduce the classification, composition, structure, and properties of engineering materials
- 2. To familiarize students with advanced manufacturing techniques
- 3.To impart knowledge on micro-machining processes
- 4. To analyze the processing techniques, structural design, and application areas of smart materials

Course	Course Outcomes: At the end of the course, students will be able to:						
C01	Understand the fundamental properties, classifications, and applications of conventional and modern engineering materials.						
C02	Analyze the influence of heat treatment processes on the structure and mechanical properties						
CO3	Evaluate various advanced and non-conventional machining techniques						
CO4	Apply the knowledge of material behavior and processing methods to select suitable materials and processes for engineering design and manufacturing challenges.						

Course Content					
Unit	Unit title and Content	Hrs			
No.					



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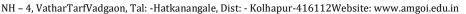
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1	Review of Engineering Materials- metals, alloys- ferrous and non-ferrous, plastics and polymers, ceramics and composites. Dual phase steels, micro alloyed steels, High strength low alloy steels, transformation inducted plasticity (TRIP) steels, Maraging steels. Heat treatment of ferrous and nonferrous alloys for modification of structure and properties.	06
2	Modern materials- Compositions, properties and applications of: Inter-metallics, Ni and Ti aluminides, smart materials, shape memory alloys, Metallic glass- quassi-crystals, semiconductors, conductors & super conducting materials. Magnetic and photoelectric materials, optical materials, Bio materials, nano-materials. Polymer materials, formation of polymer structures, production techniques of fibers, foams, adhesives and coatings. Structure, properties and applications of engineering polymers	06
3	Composites: Fibers-glass, boron, carbon, organic, ceramic and metallic fibers- Matrix materialspolymers, metals and ceramics. Processing of polymer matrix composites: open mould process, bag molding, compression molding with BMC and SM- filament winding, pultrussion-centrifugal casting, injection molding, applications of PMC"s. Processing of metal matrix polymers: solid state fabrication techniques- diffusion bonding, powder metallurgy techniques, plasma spray, chemical and physical vapour deposition, Liquid state fabrication methods, Infiltration, squeeze casting, Rheo casting, compo casting. Applications.	07
4	Advanced Fine Finishing Process: Abrasive Flow Machining; Magnetic Abrasive Finishing; Magneto Rheological Abrasive Finishing: Process principle, process equipment; Analysis and modeling of finishing mechanism; parametric analysis; Applications.	06
5	Micro-Machining: Introduction to micromachining, Micro-electro discharge Machining: Principles of micro-EDM, micro-EDM, micro-WEDM, micro-WEDG, micro-ECM, Principles of micro-turning, micro-drilling and micro- milling, micro grinding, Hybrid micromachining method, films and film depurification, Oxidation, diffusion, ion-implantation, etching, bonding, metallization, surface and bulk machining – LIGA Process, Solid free form fabrication.	06



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	Advances in Non-Conventional Machining Processes:		
	A review of non-conventional machining processes, Analysis of		
(mechanical, thermal and Electro-chemical type non-traditional	06	
6	machining processes. Tool design for selected nontraditional	06	
	machining processes. Modeling and simulation of selected processes. A		
	comparative study of various processes.		

Text Books:

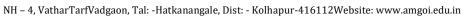
- 1. Chawla K. K., "Composite Materials", Springer-Verlag New York Inc., 2nd edition, 2001.
- 2. Amitabha Ghosh & A. K. Mallik, "*Manufacturing Science*", Affiliated East-West Press, 2nd edition, 2010.
- 3.NishaKumar," Non-Conventional Machining in Modern Manufacturing Systems", IGI Global, 1st Edition, 2018.
- 4. Kalpakjian&Schmid, "Manufacturing Engineering and Technology", Pearson, 8th edition, 2023.

Reference Book:

- 1. Groover, M. P. "Fundamentals of Modern Manufacturing", Wiley India, 4th edition, 2013.
- 2. Kalpakjian, S., "Manufacturing Engineering and Technology". Pearson, 4th edition, 2001.
- 3. Fassi, I. "Micro-Manufacturing Technologies & Applications" Springer, 1st edition 2017.
- 4. Ashby & Jones, "Engineering Materials: An Introduction to Properties, Applications and Design", Elsevier, 5th edition, 2018.



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Department of Mechanical Engineering

Title of the Course Name : Production and Operation	L	T	P	Credits
Management Course Code: P25MP102	3	1		4
Godf Se Gode. 1 25M1 102	ISE	MSE	ESE	Total
	20	30	50	100

Pre-Requisite: Production, Industrial Management

Course Objectives: The course aims,

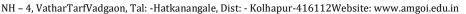
- 1. To evaluate the key factors influencing the design of effective operating systems.
- 2. To compare various operating systems used in firms.
- 3. To predict production outcomes under varying conditions and constraints.
- 4. To develop efficient production planning and operations scheduling systems

Course	Outcomes: At the end of the course, students will be able to:
CO1	Identify and evaluate the key factors and the interdependence of these factors in the design of effective operating systems
CO2	Analysis of operating systems of the firm
CO3	Predict the production using different models
CO4	Design production planning and operations scheduling

Course Content				
Unit	Unit title and Content	Hrs		
No.				
1	Introduction, Product and Service Design: Relation between production and operations and other functions, products and services, impact of information technology on productions and operations management, Business strategy- competitive priorities, developing operations strategy, productivity and competitiveness. Traditional and concurrent product design, design for manufacture, service, assembly, Design of services, types of services, Quality of design, costs of quality	07		



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2	Forecasting Models: Classification, simple and weighted moving average method, exponential smoothening methods: additive model, trends and seasonality model, mixed model, Regression (linear and multiple) models, causal model, measures of forecasting accuracy, reliability of forecasts	06
3	Aggregate Production Planning: Production planning strategies, aggregate production planning model, chase demand and level workforce strategies, and techniques- trial and error, linear programming, transportation model, dynamic programming, Master production schedule, Materials requirement planning - structure and application; Capacity planning- measures and methods to generate capacity, Aggregate planning for services- yield management	06
4	Operations Scheduling : Approaches to scheduling – infinite and finite loading, forward or backward scheduling, Assignment model for assigning jobs to work centers, dispatching rules for scheduling n jobs on one machine, composite rules, scheduling with Johnson"s rule – n jobs-2 stations with same and different sequence, 2 jobs-n stations (graphical method), preparation of Gantt"s chart, job shop scheduling, open shop scheduling, dynamic scheduling in flexible manufacturing systems, employee scheduling for service	06
5	Inventory Management: Classification, EOQ models, order timing decisions, Safety Stock and reorder level decisions. Order quantity and reorder point, Continuous review systems, periodic review systems, selective inventory control - ABC analysis, Multi-item and Coordinated Replenishment Models- Spare parts and maintenance inventory models, Inventory models with probabilistic demands: Single period discrete probabilistic demand model, multiple period probabilistic models	06
6	Theory of constraints: Optimized Production Technology, Drumrope-buffer models, CONWIP models, Planning and Control of JIT.	05

Text Books:

- 1. R. B. Khanna, "Production & Operations Management", PHI 1st edition, 2007.
- 2. Martin K. Starr, "Production & Operations Management", India Edition, Cengage Learning, 1st edition 2007
- 3. Dr. K.C. Arora, "Production & Operations Management", University Science Press , 1st edition, 2009



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Department of Mechanical Engineering

Reference Book:

- 1. Jay Heizer, "Operations Management", Pearson 9th Edition, 2009
- 2. Lee J. Krajewski & Larry P Ritzman, "Operations Management- Strategy & Analysis", Pearson Education, 6^{th} edition, 2001
- 3. E Silver, "Inventory management and Production Planning and Scheduling", Wiley India $,3^{rd}$ edition 1998



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	L	T	P	Credits
Course Code: P25MP103	3	1		4
	ISE	MSE	ESE	Total
	20	30	50	100

Pre-Requisite: Manufacturing Processes, Basic of casting

Course Objectives: The course aims

- 1. To develop foundational knowledge of various casting processes, tools, materials.
- 2. To impart practical knowledge of moulding techniques, tools, pattern types and sand properties
- 3. To enable students to design and analyze gating systems and casting setups
- 4. To familiarize students with industrial melting practices & advanced casting processes

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

C01	Select the appropriate casting process for the manufacturing of a given component
CO2	Design of gating and Risering system
CO3	Analyze the flow of molten metal in gating system
CO4	Describe the need and significance of special casting processes with appropriate inspection methods

	Course Content	
Unit No.	Unit title and Content	Hrs
1	Principles of Metal Casting and Moulding Sand Technology: Different casting processes, Terminology and tools of sand moulding, Moulding sand and design, Moulding sand properties, Moulding sand property testing.	06
2	Pattern Design and Gating System in Sand Casting Different types of Patterns and Allowances, Steps involved in making sand castings, Design of Gating system, design of, Sand Casting defects	06



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3	Melting Practices and Solidification in Casting: Melting, fluidity and solidification, Melting furnaces and practice, Treatment of molten metal, Fluidity of molten metal, solidification.	06
4	Casting Alloys: Types and Applications: Common cast alloys: Cast iron and steels, Aluminum and magnesium cast alloys, Copper, Zinc and Titanium cast alloys.	06
5	Advanced Casting Techniques and Specialized Moulding Methods: Permanent mould and special casting processes: Die casting process, investment casting process, continuous casting process, Evaporative pattern casting and plaster moulding, vacuum sealed moulding and squeeze casting.	06
6	Casting Finishing, Inspection, and Environmental Aspect: Finishing design and environment: shakeout, fettling and finishing, Inspection, testing and quality, design consideration and Economics, Environment, Health and safety aspects.	06

Texts Books:

- 1. Khanna, O. P. "A Text-Book of Foundry Technology "DhanpatRai& Sons,15th edition, 2011.
- 2. Hajra Choudhury, S. K. "Elements of Workshop Technology(Vol. I & II)". Media Promotors, 1st edition, 2001.
- 3. Rao, P. N. "Manufacturing Technology, Volume 1",5th edition, 2024

Reference Books:

- 1.Flinn, "Fundamentals of Metal Casting", Addison Wesley, 1st Edition, 1963.
- 2. Heine, R. W., Loper, "Principles of Metal Casting", McGraw Hill, 2nd Edition, 1967.
- 3. Niebel, Draper, "*Product Design and Process Engineering Practice*", McGraw Hill Foundry / Isaac Pitman, 1st Edition, 1974.



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Title of the Course Name : Abrasive Machining and	L	T	P	Credits
Finishing Processes Course Code: P25MP104A	3			3
	ISE	MSE	ESE	Total
	20	30	50	100

Pre-Requisite: Machine Tool and Manufacturing Processes

Course Objectives: The course aims to:

- 1. To introduce the principles and applications of abrasive machining and grinding fluids.
- 2. To Introduce students with advanced surface finishing techniques
- 3. To provide comprehensive knowledge of non-traditional machining processes
- 4. To explore magnetically assisted abrasive finishing and hybrid machining techniques

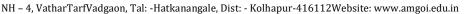
Course Outcomes: At the end of the course, students will be able to:

C01	Describe the fundamental concepts of abrasive machining, grinding fluids, and surface finishing processes
CO2	Classify and compare advanced non-traditional machining processes and magnetic/abrasive flow-based techniques.
C03	Analyze the working mechanisms and performance characteristics of magneto-rheological and hybrid finishing processes
CO4	Evaluate the sustainability and environmental impact of modern machining methods

Course Content				
Unit No.	Unit title and Content	Hrs		
1	Abrasive Machining and Grinding Fluids Introduction to abrasive machining and finishing processes, grinding process, grinding fluids, grinding fluid additives, grinding fluids and its emissions.	06		



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	Advanced Surface Finishing Processes	
2	Honing process, Lapping process, Super finishing and sand blasting,	0.6
	vibratory bowl finishing, rotary barrel finishing or tumbling, drag	06
	finishing, Ice bonded abrasive finishing, pitch polishing, pad polishing	
	Advanced Non-Traditional Machining Processes	
3	Abrasive jet machining, Abrasive water jet machining, Ultrasonic	07
	machining, Electric discharge grinding, Electric discharge diamond	07
	grinding, Electro-chemical machining.	
	Magnetic and Abrasive Flow-Based Finishing Techniques	
4	Abrasive flow machining, Magnetic field assisted abrasive finishing,	06
1	Magnetic abrasive finishing, Magnetic abrasive deburring, Magnetic	
	float finishing.	
	Magneto-Rheological Based Finishing Processes	
5	Magneto rheological finishing, Magneto rheological Abrasive flow	06
	finishing, Rotational Magneto rheological Abrasive flow finishing.	
	Hybrid and Eco-Friendly Precision Machining Methods	
6	Elastic emission machining, Powder mixed EDM, sustainable grinding	05
	process: biodegradation of grinding fluids, MQL in grinding process.	

Texts Books:

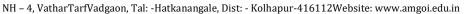
- 1 V. K. Jain," *Micro-manufacturing Processes*", CRC Press, 1st Edition, 2012
- 2 V. K. Jain, "Nanofinishing science and Technology, Basic and Advanced finishing and Polishing Processes", CRC Press, 1st Edition, 2016
- 3 A. Ghosh and A. K. Malik, "Manufacturing Science", East West Press, 2nd Edition, 2010

Reference Books:

- 1 J. A. McGeough, "Advanced Methods of Machining", Springer Science and Business,, $1^{\rm st}$ Edition, 1988
- 2 Zhang, Y., & Li, C "Hybrid-Energy Sustainable Machining: Mechanism and Processability". Springer Nature Singapore,1st Edition, 2025.
- 3V. P. Astakhov and S. Joksch, "*Metalworking fluids for cutting and grinding*", Woodhead Publishing, 1st edition, 2012
- 4 Khan, D. A., Alam, Z., &Iqbal, F. "Magnetic Field Assisted Finishing: Methods, Applications and Process Automation". CRC Press, 1st edition, 2021.



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Title of the Course Name: Sustainable	L	T	P	Credits
Manufacturing Course Code: P25MP104B	3			3
	ISE	MSE	ESE	Total
	20	30	50	100

Pre-Requisite: Product Life cycle, Production Management.

Course Objectives: The course aims to:

- 1.To enable learners to comprehend the fundamentals of sustainable manufacturing
- 2.To develop the ability to perform Life Cycle Assessment of manufacturing processes
- 3. To cultivate skills in modeling green manufacturing systems and Industry 4.0.
- 4. To introduce students to simulation-based decision-making and data analysis using tools.

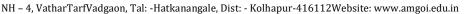
Course Outcomes: At the end of the course, students will be able to:

CO1	Explain the fundamental concepts of sustainable manufacturing
CO2	Apply life cycle assessment procedures and utilize appropriate techniques
CO3	Analyze discrete event simulation models and interpret statistical data
CO4	Evaluate and design smart and sustainable manufacturing systems using Industry 4.0 technologies

Course Content				
Unit	Unit title and Content			
No.				
1	Fundamentals of Sustainable Manufacturing: Basics of production, Sustainability and manufacturing, Introduction to simulation, basic statistical concept for sustainable manufacturing analysis.	05		
2	Life Cycle Assessment: Elements and Procedure Life cycle assessment, Life cycle assessment elements, Life cycle assessment procedure, Quantitative Techniques in LCA, Integration of LCA in Sustainable Manufacturing	06		



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	Green Manufacturing Strategies:	
3	Green manufacturing modeling: metrics for green manufacturing,	06
	Indices for green manufacturing, Developing green manufacturing	
	system, green manufacturing techniques.	
	Simulation and Data Analysis for Sustainable Systems	
	Basics of discrete event simulation and system modeling, Statistical	
4	analysis techniques: regression, ANOVA, hypothesis testing, Design of	07
	experiments (DoE) for sustainability studies, Interpreting simulation	
	data for process improvement	
	Smart and Sustainable Manufacturing Systems	
	Concept of Industry 4.0 and digital transformation in sustainability,	
5	Smart factories: architecture and sustainable benefits, IoT in green	07
	manufacturing, Role of AI/ML in predictive energy/resource	
	management	
	Sustainability Frameworks	
6	Sustainability framework, basic modeling functions for factory	05
	simulation, Productivity and sustainability, Decision Support Systems	US
	for Sustainable Manufacturing.	

Texts Books:

- **1.** Stark, "Sustainable Manufacturing: Challenges, Solutions and Implementation Perspectives", Springer, 1st edition, 2017.
- **2.** Jawahir, I. S, "Sustainable Manufacturing: Fundamentals and Applications", Wiley, 1st edition, 2013
- 3.V. K. Jain, "Sustainable Manufacturing Processes", Springer, 1st edition, 2019

ReferenceBooks:

- 1. Ibrahim Garbie ,"Sustainability in Manufacturing Enterprises", Springer publication, 1st edition, 2016.
- 2.J. Paulo Davim , "Green manufacturing processing and systems" , Springer publication , $1^{\rm st}\,\text{edition,}2013$
- 3. GüntherSeliger, JérémyBonvoisin ," Sustainable Manufacturing", Springer publication, $1^{\rm st}$ edition, 2017



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Title of the Course Name : Manufacturing Planning	L	T	P	Credits
and Control Course Code: P25MP104C	3			3
	ISE	MSE	ESE	Total
	20	30	50	100

Pre-Requisite: Production Systems

Course Objectives: The course aims to:

- 1. To understand the structure and functioning of various manufacturing systems and production models.
- 2. To Apply advanced manufacturing strategies and preplanning methods for effective production control.
- 3. To Implement operations planning and control systems such as MRP, MRP II, and JIT effectively.
- 4. Evaluate quality and cost performance in manufacturing systems using simulation and case studies.
- 5. Analyze and optimize FMS operations through lot sizing, production scheduling, and line of balance.

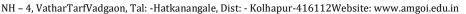
Course Outcomes: At the end of the course, students will be able to:

CO1	Describe the structure, components, and production models of various					
	manufacturing systems.					
CO2	Apply design and decision-making tools such as group technology and line balancing to improve manufacturing system performance.					
C03	Analyze operations planning and control strategies including MRP, ERP.					
CO4	Evaluate quality and cost control techniques and design simulation-based solutions for real-time monitoring and optimization.					

	Course Content	
Unit	Unit title and Content	Hrs
No.		
	Introduction to Manufacturing Systems and Production Models	
1	Overview of manufacturing systems and various issues of interest:	05
	assembly line, repetitive batch manufacturing, Cellular manufacturing	



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2	Advanced Manufacturing Systems and Production Planning FMS, JIT, CIM, preplanning: forecasting, economic analysis, aggregate planning, capacity planning, inventory planning	06
3	Design Decisions in Manufacturing Systems Decision making in design of manufacturing systems: group technology, line balancing, plant layout, Cellular Manufacturing.	06
4	Operations Planning and Control Systems Operations planning: MRP, MRP II, hierarchical planning systems, JIT systems ,Enterprise Resource Planning (ERP) Systems	07
5	FMS Operations and Scheduling Strategies FMS Operation and control: lot sizing decisions, production scheduling, line of balance,Real-Time Monitoring,Multi-objective scheduling	06
6	Quality and Cost Control in Manufacturing Systems Quality planning and control, cost planning and control, Simulation analysis of manufacturing systems, case studies	06

Texts Books:

- 1. Jacobs, "Manufacturing Planning and Control for Supply Chain Management", McGraw-Hill Education, 3rd Edition, 2024.
- 2. Groover, M. P," Fundamentals of Modern Manufacturing: Materials, Processes, and Systems", Wiley & Sons, 7th Edition, 2022
- 3. Chang, "Computer-Aided Manufacturing", Pearson Education, 3rd edition 2005.

References:

- 1.D.D.Bedworth and J.E Bailey, "Integrated Production Control, System-management, Analysis and Design", John Wiley, 1stedition, 1983.
- 2. A.C.Hax and D.Candea," *Production and Inventory Managemeny*", Prentice-Hall, 1st Edition, 1984.
- 3. M.G.Korgaokar," *JIT Manufacturing, Macmillan*", 1st edition,1992



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Title of the Course Name: Research Methodology and IPR	L	T	P	Credits
Course Code:P25MP105	2	-	-	2
	ISE	MSE	ESE	Total
	20	30	50	100

Pre-Requisite: Research

Course Objectives: The course aims:

- 1. To introduce the fundamental principles of research methodology.
- 2. To develop an understanding of research design and analysis.
- 3. To enable formulation of research problems and objectives.
- 4. To provide knowledge about Intellectual Property Rights and their importance.
- 5. To create awareness about patents, copyrights, and trademarks.

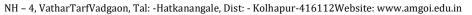
Course Outcomes: At the end of the course, students will be able to:

СО	Course Outcomes	
CO1	Understand the basic concepts and types of research.	
CO2	Identify appropriate research problems and prepare research proposals.	
CO3	Understand the importance of ethics in research and publication.	
CO4	Explain the significance and types of Intellectual Property Rights.	
CO5	Apply for patents and understand processes involved in IPR protection.	
C06	Demonstrate the impact of IPR on innovation and economic growth.	

	Course Content	
Unit	Contents	Hrs
No.		
1	Introduction to Research Methodology	06
	Meaning, Objectives, Motivation, Types of Research, Research	
	Approaches, Research Process, Criteria of Good Research	
2	Research Problem and Design	06
	Identifying Research Problem, Literature Survey, Research Objectives,	
	Research Design Concepts, Features of Good Design	
3	Data Collection and Analysis	06
	Sources of Data, Sampling Methods, Data Processing, Statistical	



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	Techniques, Hypothesis Testing, Report Writing	
4	Ethics in Research	06
	Ethical Principles, Plagiarism, Impact of Misconduct, Ethical Committees,	
	Publishing Ethics	
5	Introduction to IPR	06
	Overview of Intellectual Property, Importance of IPR, Types: Patents,	
	Trademarks, Copyrights, Industrial Designs	
6	IPR Procedures and Case Studies	06
	Patent Filing Procedure, Patentable and Non-patentable Items, Patent	
	Search, Licensing, Case Studies on IPR Disputes	

Text Books:

- 1. C. R. Kothari, "Research Methodology: Methods and Techniques", New Age International, 2nd Edition, 2004.
- 2.P. Pandey and S. Pandey, "Research Methodology: Tools and Techniques", Bridge Center, 1st Edition, 2015.
- 3. NeerajPandey and KhushdeepDharni, "Intellectual Property Rights", PHI Learning, 1st Edition, 2014

Reference Books:

- **1.**Ranjit Kumar, "*Research Methodology: A Step-by-Step Guide*", Sage Publications, 4th Edition, 2014.
- **2.**T. Ramakrishna, "Basic Principles and Acquisition of Intellectual Property Rights", CIPRA, NLSIU, 1st Edition, 2005.
- 3. V. Scaria, "Intellectual Property Rights in the Global Era", LexisNexis, 1st Edition, 2012.

MOOC/NPTEL Platform:

- **1.**NPTEL Course: Research Methodology Prof. RajatAgarwal (IIT Roorkee)
- 2.SWAYAM Course: Understanding IPR Prof. Feroz Ali (IIT Madras)



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Title of the Course Name: Seminar Course Code: P25MP106	L	T	P	Credits
			2	1
	ISE	MSE	ESE	Total
	50	50	50	100

Pre-Requisites: Previously studied courses

Course Objectives: The course aims to:

- 1. To identify and critically compare technical issues within the chosen area of specialization.
- 2. To develop the ability to compile an annotated bibliography showcasing research and scholarly inquiry.
- 3. To enhance skills in writing well-structured technical reports using proper formatting, language, and logic.
- 4. To interpret, evaluate, and analyze technical topics with clarity and depth of understanding

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

CO1	Identify and compare technical issues related to the area of course specialization
CO2	Outline annotated bibliography of research demonstrating scholarly skills.
CO3	Prepare a well organized report employing elements of technical writing & critical Thinking.
CO4	Demonstrate the ability to describe, interpret and analyze technical issues and develop competence in presenting



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Title of the Course Name: PG LAB-I	L	T	P	Credits
Course Code: P25MP107			4	2
	ISE	MSE	ESE	Total
	50		50	100

Course Objectives: The course aims to:

- 1. To enable students to measure and analyze cutting forces in milling operations using experimental methods.
- 2. To develop competency in modeling mechanical components using advanced CAD software.
- 3. To apply knowledge of fluid power systems in designing hydraulic circuits.
- 4. To perform finite element analysis of machine components using simulation tools such as ANSYS and LS-DYNA.

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

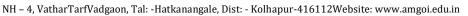
CO1	Measure the cutting forces in machining process
CO2	Apply solid modeling tools to create structural and machine component models and analyze their mechanical behavior using simulation software such as ANSYS or LS-DYNA.
CO3	Design a hydraulic circuit for the given application
CO4	Analyze real-time industrial manufacturing practices and compare them with theoretical concepts

Perform the following experiments (Any Five)

Exp. No.	Content
1	Cutting force determination using force dynamometer.
2	Experimental study in micromachining using photo chemical machining.
3	Analysis of machine components using ANSYS/LS Dyna etc. software
4	Solid modeling of structural components using modeling software.
5	Solid modeling of machine components using modeling software.



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	6	Sequencing of cylinders using hydraulic trainer kit.
	7	Synchronizing of cylinders using hydraulic trainer kit.
-	8	Industrial Visit



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Title of the Course Name: Yoga and Meditation	L	Т	P	Credits
Course Code:P25MP108	1			
	ISE	MSE	ESE	Total

Pre-Requisite: Basic understanding of human anatomy and interest in physical and mental well-being.

Course Objectives:

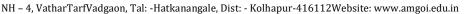
- 1. To explore the philosophical and psychological foundations of Yoga and Meditation.
- 2. To introduce and practice the Eight Limbs of Yoga (*Ashtanga Yoga*) for holistic self-regulation.
- 3. To train students in meditation, breathing, and ethical practices for enhancing clarity, focus, and emotional balance.
- 4.To help students integrate yogic wisdom and mindfulness

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

C01	Comprehend the core teachings of YogaSutras.
CO2	Practice foundational yogic techniques.
CO3	Apply principles of <i>Yama</i> and <i>Niyama</i> for improved discipline, ethics, and self-awareness.
CO4	Develop concentration and mindfulness for stress reduction and productivity.



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Course	Content	
Unit No.	Unit title and Content	Hrs
	Foundations of Yoga Philosophy	
1	Origin and evolution of Yoga; Introduction to Yoga Sutras.Definition of Yoga – "YogasChittaVrittiNirodha".The five Vrittis (mental fluctuations) and their control.	03
2	Ethical and Personal Discipline (Yama &Niyama)	
	The five Yamas – Ahimsa, Satya, Asteya, Brahmacharya, Aparigraha.	
	The five Niyamas – Shaucha, Santosha, Tapas, Svadhyaya,	03
	IshwarPranidhana.Relevance of Yama-Niyama in academic and	
	professional life.	
	Physical & Mental Purification (Asana, Pranayama, Pratyahara)	
3	Asana – Role of posture; stability and comfort in the body	03
	Pranayama - Breath control techniques; calming the nervous system	
	Pratyahara – Withdrawal of senses; mastering inner awareness	
	Concentration, Meditation, and Liberation (Dharana, Dhyana,	
	Samadhi)	
4	Dharana – Developing concentration and focus	03
	Dhyana – The process and practice of meditation	
	Samadhi – State of absorption; experiencing inner peace and unity	

References:

- 1. Swami Satchidananda, "The Yoga Sutras of Patanjali", Integral Yoga Publications, 1st Edition, 2012.
- 2. B. K. S. Iyengar, "Light on the Yoga Sutras of Patanjali", HarperCollins Publishers India, 1st Edition, 2002.
- 3. Swami SatyanandaSaraswati, "Four Chapters on Freedom", Yoga Publications Trust, 1st Edition, 2008.
- 4. Swami Vivekananda, "Raja Yoga", AdvaitaAshrama, 1st Edition, 1896 (Reprint 2020).



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Department: Department of Mechanical Engineering

Semester: II

Type of		e Code Course Name	Teaching Scheme			Evaluation Scheme				
Course	Course Code		L	Т	P	Cr	Components May			lin for ssing
PCC							ISE-I	10		
	P25MP201	Quality Control and Reliability	3	1	-	4	MSE	30		
							ISE-II	10		40
							ESE	50	20	
PCC		Advanced CNC Technology	3	1	-	4	ISE-I	10		40
							MSE	30		
	P25MP202						ISE-II	10		
							ESE	50	20	
		Advances in Welding	3				ISE-I	10		
DCC	P25MP203					3	MSE	30		40
PCC	P25MP205	and Joining Technology	3	-	-	3	ISE-II	10		
							ESE	50	20	
PEC	P25MP204	Program Elective-II					ISE-I	10		- 40
			3			2	MSE	30		
				-	-	3	ISE-II	10		
							ESE	50	20	
	P25MP205	Open Elective-I	3	-	-	3	ISE-I	10		
0.5							MSE	30		
OE							ISE-II	10		40
							ESE	50	20	
VEC	P25MP206	Technologies for	2	_	_	2	ISE-I	25	20	20
		Industrial Evolution					ISE-II	25		20
	P25MP207	Mini Project	•	-			ISE-I	25		40
ELC					2	1	ISE-II	25		
							ESE (POE)	50	20	
DCC	DOEL (DOOG	DOV 1 W				2	ISE	50		40
PCC	P25MP208	PG Lab- II	-	-	4		ESE (POE)	50	20	40
ELC	P25MP209	Internship/Field Training	-	-	-	-	Will be Evaluated in Sem-III	-		-
m . 1			17	2	06	00				
		Total 25			22		750			
	Total Contact Hours- 25				T	otal Cr	edits- 22			



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Title of the Course Name: Quality Control and	L	T	P	Credits
Reliability Course Code: P25MP201	3	1		4
	ISE	MSE	ESE	Total
	20	30	50	100

Pre Requisite:- Machining Processes, industrial management

Course Objectives: The course aims to:

- 1. To explore the foundational philosophies and frameworks of quality management.
- 2 To equip students with the skills to design and analyze experiments for process and quality improvement.
- 3. To develop the ability to apply various quality improvement tools.
- 4. To enable students to understand and apply Statistical Process Control

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

CO1	Explain the principles of Total Quality Management (TQM) and the role of continuous improvement in modern manufacturing.
CO2	Apply statistical tools and techniques such as confidence intervals, hypothesis testing, ANOVA, and factorial design to improve product and process quality.
CO3	Analyze quality improvement tools and models to identify root causes and enhance customer satisfaction.
CO4	Evaluate and design robust manufacturing systems using Statistical Process Control (SPC), Taguchi methods, and reliability engineering principles for long-term product quality and system reliability.



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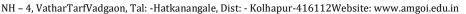
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	Course Content			
Unit No.	Total Quality Management in Manufacturing: Introduction: New culture of TQM, TQM axioms, consequences of total quality managing, cost of total quality, valuable tools for quality, and the Japanese factor. The Deming Approach to management: Deming's fourteen points for management, deadly sins & diseases, implementing the Deming's philosophy, Deming on management.Juran on Quality: Juran's quality trilogy, Juran's Deming.			
1				
2	Quality Leadership and Continuous Improvement Strategies Crosby & the Quality Treatment: Crosby diagnosis of a troubled company, Crosby's quality vaccine, Crosby's absolutes for quality management, Crosby's fourteen steps for quality improvement. Imai's Kaizen: The concept, Kaizen & innovation, the Kaizen management practices.	06		
3	Statistical Analysis and Experimental Design for Quality and Process Improvement Basic Techniques for Statistical Analysis: Introduction, measures of central tendency & dispersion, confidence intervals, hypothesis testing, frequency distributions & histograms, probability distributions, measuring linear associations. Design & Analysis of Experiments: Introductions, factorial experiments, aliasing, constructing fractional designs, analysis of variance.	06		
4	Tools and Techniques for Quality Improvement: Affinity diagram, bar chart, block diagram brain storming, cause and effect analysis, control charts, cost benefit analysis, customer-supplier relationship check list, decision analysis, flow charts, force field analysis, line graph/run charts, pareto analysis, quality costing, quality function development (QFD), quality project approach & problem solving process, risk analysis scatter diagrams.	06		



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5		Statistical Process Control and Taguchi Methods Statistical Process Control: Introduction, data collection plan, variables charts, attributes, interpreting the control charts. Taguchi's Approach to Experimental Design & Offline Quality Control: Introduction, Taguchi's recommended design techniques, from Deming to Taguchi & vice-versa.		
	6	Reliability Engineering Reliability: Introduction, life cycle curves & probability distribution in modeling reliability, system reliability, operating characteristic curves, reliability and life testing plans.	05	

Texts Books:

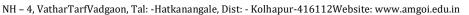
- 1. N. Logothetis, *Managing for Total Quality: From Deming to Taguchi and SPC*, Prentice Hall of India, New Delhi, 1st Edition, 2005.
- 2. A. Mitra, *Fundamentals of Quality Control and Improvement*, Prentice Hall of India, New Delhi, 2nd Edition, 2003.

Reference Books:

1 R.F. Lochner J.E. Matar, "Designing for Quality", Chapman & Hall, 1st Edition, 2001. 2 A. Zaidi, "SPC: Concepts, Methodologies and Tools", Prentice Hall of India, 1st Edition, 1995.



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Title of the Course Name: Advanced CNC	L	T	P	Credits
Technology Course Code: P25MP202	3			3
	ISE	MSE	ESE	Total
	20	30	50	100

Prerequisite: Machine Tools

Course Objectives: The course aims to:

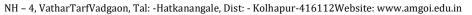
- 1 To understand the significance of CNC machines in modern manufacturing.
- 2 To describe the role and importance of feedback devices in CNC control systems.
- 3 To develop accurate CNC part programs for different machining operations.
- 4 To simulate and verify CNC part programs using relevant simulation software.

CO1	Explain the significance of CNC machines
CO2	Describe the significance of the feedback devices in CNC machines
CO3	Identify the key features of CNC system
CO4	Develop and Simulate CNC part program for a given components

	Course Content	
Unit No.	Unit title and Content	Hrs
1	Fundamentals of CNC and Control Systems Introduction to Numerical Control in computer aided manufacturing, components of a CNC system, types of CNC systems, open loop and closed loop control systems.	06



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2	Drives, Feedback, and CNC Machine Construction Drives and controls, interpolators, feedback devices, CNC machine constructional features.	06
	CNC Tooling, and Advanced System Feature	06
3	CNC design considerations, CNC turret punch press, tooling for CNC, APC, ATC, CNC machine accessories, advanced features of CNC system	
	CNC Programming and Simulation Tools	
4	Conversational and graphics based software, solids based part programming, free form surface machining, simulation and verification of CNC programs, Manual Part Programming,	06
	Advanced CNC Programming and System Utilization	
5	Computer assisted part programming. Maintenance and installation of CNC systems, utilization of CNC machines.	06
	CNC Part Programming for Turning and Milling Applications	
6	CNC part programming for turning and milling, post processors, CNC part programming with CAD-CAM.	06

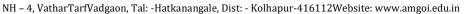
Texts Books:

- **1.**Rao, P. N., "*CAD/CAM: Principles and Applications*", McGraw-Hill, 3rd edition, 2010.
- 2. B. S. Pabla, "CNC Machines", New Age International Pvt. Ltd., 3rd edition, 2018
- 3. V. K. Jain, "Advanced Machining Processes", Allied Publishers Pvt. Ltd., 1st edition, 2007

- 1. S. Krar, A. Gill., "CNC Technology and Programming", McGraw-Hill Publishing Co., 1st edition, 1990.
- 2. P. J. Amic, "Computer Numerical Control Programming", Prentice Hall, 1st edition, 1996.
- 3. K. J.Astrom, B. Wittenmark, "Adaptive Control", 2nd Edition, 1994
- 4. Alan Overby, "CNC Machining Handbook", McGraw-Hill,1st edition, 2010



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Title of the Course Name : Advances in Welding and	L	T	P	Credits
Joining Technology Course Code: P25MP203	3			3
	ISE	MSE	ESE	Total
	20	30	50	100

Prerequisite: Materials, Metallurgy

Course Objectives: The course aims to:

- 1 To introduce the principles, classifications, and applications of conventional and advanced welding and joining processes.
- 2 To develop understanding of modern welding technologies such as laser beam welding, electron beam welding, hybrid welding, and solid-state joining methods.
- 3 To explain the thermal and metallurgical aspects of welding, including heat transfer, solidification, stress analysis, and weld joint design.
- 4 To impart knowledge of weld defect analysis, non-destructive testing methods, and safety practices in welding operations.

CO1	Select the appropriate welding process for the application
CO2	Select the appropriate input parameters for enhancing weld quality
CO3	Describe the melted and heat affected zone of a metal
CO4	Describe the welding defects and Analyze the stresses in welding structures

Course Content				
Unit No.	Unit title and Content			
1	Fundamentals of Welding Processes Welding processes classification, arc welding processes-solid state welding processes, plasma arc welding and ultrasonic welding - Resistance welding process-different types weld joints, welding positions.	06		
2	Secondary Joining Methods Brazing, soldering and adhesive bonding, process principles & applications, Comparison with welding methods, Selection of joining methods for specific applications	06		



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3	Advanced Welding Techniques Electron beam welding -Laser beam welding -Hybrid welding -CMT welding -SpinArc GMAW -Tandem GMAW -Activated TIG welding-Hot wire TIG welding-Diffusion bonding -Weld Surfacing & cladding.	06
4	Solid-State and High-Energy Welding Methods Friction Surfacing, Friction stir spot welding, Explosive Welding, Welding of Al and Mg based alloys -Dissimilar welding of Non-ferrous alloys -Friction welding with Cu interlayer, Magnetically impelled arc butt (MIAB) welding -Under water welding -Welding of Cu, Al, Ti and Ni alloys	07
5	Weld Metallurgy and Thermal Considerations Heat transfer during welding, Solidification mechanisms in welds, Heat Affected Zone, Residual stresses and their effects, Pre-weld and post- weld heat treatments, design consideration in weld joint.	06
6	Inspection, Defects, and Safety in Welding Types and causes of welding defects, Methods of defect prevention and correction, Inspection and testing of welds, Visual, Radiographic, Ultrasonic, Magnetic Particle, Dye Penetrant testing, Safety measures in welding environments, Codes and standards related to welding quality and safety	06

Text Books

- 1 Dr. R.S. Parmar, "Welding Processes and Technology", Khanna Publishers, 3rd ed., 2011.
- 2 H.S. Bawa, "Manufacturing Technology-I", Tata McGraw Hill Publishers, 2007
- 3 P. L. Jain, "Principles of Foundry Technology", Tata McGraw Hill Publishers, 5th ed., 2012.

- 1 S.V. Nadkarni, "Modern Arc Welding Technology", Oxford & IBH Publishing Co. Pvt. Ltd., 2nd ed., 2018.
- 2 Cornu J., "Advanced Welding Systems Volumes I, II and III", JAICO Publishers, 1st ed,1994
- 3. J.F. Lancaster, "Metallurgy of Welding", George Allen & Unwin Publishers, 1980
- 4. Howard B. Cary & Scott C. Helzer, "Modern Welding Technology", Prentice Hall, 5th ed. 2001.



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Department of Mechanical Engineering

Title of the Course Name : Computer Integrated	L	T	P	Credits
Manufacturing Course Code: P25MP204A	3			3
	ISE	MSE	ESE	Total
	20	30	50	100

Prerequisite: Manufacturing Processes, Basic Mathematics and Geometry

Course Objectives: The course aims to:

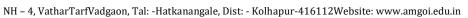
- 1. To explain the importance of sustainable practices in modern manufacturing systems.
- 2. To describe the procedure and key elements involved in life cycle assessment.
- 3. To analyze green manufacturing models for improving process sustainability.
- 4. To apply sustainability frameworks and green manufacturing principles in the development of smart factories.

CO1	Explain the need and significance of sustainable manufacturing processes
CO2	Describe the procedure of life cycle assessment in a manufacturing context
CO3	Analyze the need and significance of green manufacturing modeling
CO4	Interpret the role of renewable energy in green machining
CO5	Apply the sustainability and green manufacturing system in developing a smart factory

Course Content					
Unit No.	Unit title and Content				
1	Introduction to Computer Integrated Manufacturing and Automation Computers and manufacturing systems, Computer numerical control, Automation in Production Systems, automated manufacturing systems- types of automation, reasons for automating, computerized elements of a CIM system, CAD/CAM and CIM. Mathematical models and matrices: production rate, production capacity, utilization and availability, manufacturing lead time, work-in process,	06			



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	Automated Dyadustion and Assembly Line Cystoms Evylander	
	Automated Production and Assembly Line Systems Fundamentals, system configurations, applications, automated flow lines, buffer	
2	storage, control of production line, analysis of transfer lines, analysis of	
	flow lines without storage, partial automation, analysis of automated	06
	flow lines with storage buffer, fundamentals of automated assembly	
	systems, numerical problems.	
	Computer-Aided Design and Geometric Transformations	
	The design process, applications of computers in design, software	
3	configuration, functions of graphics package, constructing the	06
	geometry. Transformations: 2D transformations, translation, rotation	
	and scaling, homogeneous transformation matrix, concatenation,	
	numerical problems on transformations	
	Group Technology, FMS, and Line Balancing Techniques Fundamentals of Group Technology and Flexible Manufacturing	
	Systems, types of FMS, FMS components, Material handling and storage	
4	systems, types of FMS, FMS components, Material handing and storage system, applications, benefits, computer control systems, FMS planning	06
	and design issues, Automated Storage and Retrieval Systems, Line	
	Balancing: Line balancing algorithms, methods of line balancing,	
	Industrial Robotics and Applications	
	Robot anatomy, joints and links, common robot configurations, robot	
_	control systems, accuracy and repeatability, end effectors, sensors in	0.0
5	robotics. Robot programming methods: on-line and off-line methods.	08
	Robot industrial applications: Material handling, processing and	
	assembly and inspection.	
	Computerized Manufacturing Planning and Control Systems	
	Computer Aided Process Planning, Retrieval and Generative Systems,	
	benefits of CAPP, Production Planning and Control Systems, typical	
6	activities of PPC System, computer integrated production management	06
	system, Material Requirement Planning, inputs to MRP system,	
	working of MRP, outputs and benefits, Capacity Planning, Computer	
	Aided Quality Control, Shop floor control	



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Texts Books

1.Rehg, J. A, "Computer-Integrated Manufacturing", Prentice Hall ,3rd edition, 2004. 2.Scheer, A.-W., "CIM: Computer Integrated Manufacturing – Towards the Factory of the Future", Springer, 3rd edition, 1994.

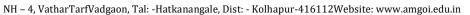
3.Rao, P. N., "CAD/CAM: Principles and Applications", McGraw-Hill, 3rd edition, 2010.

References:

- 1.Groover, M.P.,"*Automation, production systems, and computer-integrated*", Tata McGraw Hill. 5th edition, 2011.
- 2. Weatherall, A." Computer integrated manufacturing: from fundamentals to implementation". Butterworth-Heinemann, 2nd edition, 2013
- 3. Alasdair Gilchrist," *Industry 4.0: The Industrial Internet of Things*", Apress,1st edition, 2017,



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Department of Mechanical Engineering

Title of the Course Name: Total Productive	L	Т	P	Credits
Maintenance Course Code: P25MP204B	3			3
	ISE	MSE	ESE	Total
	20	30	50	100

Prerequisite: Production systems, TQM

Course Objectives: The course aims to:

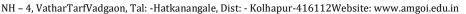
- 1. To impart fundamental knowledge of Total Productive Maintenance.
- 2. To develop the ability to analyze and implement various maintenance models.
- 3. To enable students to plan, implement, and evaluate TPM practices.
- 4. To introduce students with advanced maintenance management techniques.s

CO1	Apply maintenance strategies to increase the productivity of plant and				
	equipment with modest investment.				
CO2	Explain the key operational activities involved in a quality management system.				
CO3	Analyse the causes of accelerated deterioration during the production process.				
CO4	Evaluate the root causes of productivity losses in industrial operations.				
CO5	Employing consultants to create this culture is common practice.				

Course Content			
Unit No.	Unit title and Content	Hrs	
1	Fundamentals of Maintenance and TPM Concepts Outline of TPM. Maintenance Concepts, Objectives and functions, Tero technology, Reliability Centered, Maintenance, (RCM), maintainability prediction, availability and system, effectiveness, organization for maintenance	06	
2	Equipment Effectiveness and Preventive Maintenance Models TPM-challenging limits, maximizing equipment effectiveness, Maintenance Models, Minimal repair, maintenance types, balancing preventive maintenance, and breakdown maintenance, preventive maintenance schedules: deviations on target values, preventive maintenance schedules: functional characteristics, replacement models	06	



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	TPM Structure	
3	Organizing for TPM implementation, PM Concepts, Importance of TPM, Zero breakdown concepts, Zero Defects and TPM, maximizing	06
	equipment effectiveness, autonomous maintenance program, five pillars of TPM, TPM Small group activities	
	TPM Planning, Implementation, and Global Trends	
	TPM implementation and stabilization, TPM Planning and	
4	Implementation, Organization for TPM, management decision,	06
4	awareness and training for TPM, establishment of basic policies and	00
	goals, formation of master plan, TPM implementation, Ongoing global	
	trends in TPM.	
	Human Factors and Maintenance Logistics	
_	TPM small group activities, Maintenance Logistics, Human factors in	0.6
5	maintenance, maintenance manuals, maintenance staffing methods,	06
	queuing applications, simulation, spare parts management,	
	maintenance planning and scheduling Advanced Maintenance Techniques and Condition Manitoning	
	Advanced Maintenance Techniques and Condition Monitoring The DM prige for outstanding TDM plants, Online Manitoring Condition	
6	The PM prize for outstanding TPM plants, Online Monitoring Condition	06
6	Monitoring Techniques, Vibration Monitoring and Signature Analysis.	06
	Wear Debris Monitoring, Maintenance Management Information	
	System, Expert systems, Corrosion Monitoring and Control.	

Text Books:

- 1.R. Srinivasan, "Total Productive Maintenance", Prentice Hall India, 1st Edition, 2006.
- 2.Amit Kumar Gupta and S. Ghosh, "Total Productive Maintenance: A Systematic Approach", Laxmi Publications, 1st Edition, 2012.
- 3. P. A. Kumar, "TPM Implementation: A Practical Approach", Notion Press, 1st Edition, 2018.

- 1. Nahchi-Fujikoshi Corporation, "*Training for TPM*", Japan Institute of Plant Maintenance, 1st Edition, 1990.
- 2.S. Nakajima, "Introduction to TPM: The Purtor Factory", Japan Institute of Plant Maintenance, 1st Edition, 1986.
- 3. S. Nakajima, "TPM: Maintenance Prevention Design", Productivity Press Inc., 1st Indian Edition, 1993.
- 4.K. Shirose, Y. Kimura, and M. Kaneda, "*An Advanced Step in TPM Implementation*", Japan Institute of Plant Maintenance,2nd Edition, 1995.



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Department of Mechanical Engineering

Title of the Course Name: Lasers in Manufacturing	L	T	P	Credits
Course Code: P25MP204C	3	1		4
	ISE	MSE	ESE	Total
	20	30	50	100

Course Objectives: The course aims to:

- 1 To introduce the fundamentals of laser technology and its significance in various manufacturing processes.
- 2 To provide comprehensive knowledge of laser-based processes such as cutting, welding, surface treatment, and forming.
- 3 To expose students to advanced laser applications in additive manufacturing and laser-assisted machining.
- 4 To enable students to understand the integration of lasers with automation systems such as CNC and CAD for modern manufacturing.

CO1	Explain the need and significance of lasers in modern manufacturing processes.
CO2	Describe the mechanism and key parameters of the laser welding process and analyze common defects in welds.
CO3	Illustrate the laser-based surface modification techniques such as hardening, alloying, and cladding, and evaluate their effects on material properties.
CO4	Compare laser-based additive manufacturing and laser-assisted machining processes in terms of working principles, parameters, and outcomes.



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	Course Content	
Unit No.	Unit title and Content	Hrs
1	Fundamentals of Laser Technology in Manufacturing Lasers in manufacturing: Importance and application, Fundamentals of Laser Technology, Laser system: Construction and types, Principle of operation, Types of laser cutting and kerf geometry, Types of Lasers in material removal, process and performance parameters	06
2	Laser Welding and Forming Techniques Mechanisms of laser welding, effects of process parameters during laser welding and study of defects in weld beads, Material forming and fundamental of laser forming, process parameters and their effects on the performance of laser forming.	07
3	Laser Surface Engineering Surface treatment and applications of lasers, laser surface hardening, laser surface alloying, Lasercladding	05
4	Laser-Based Additive Manufacturing Additive manufacturing techniques, Laser scanning stereolithography, selective laser sintering and selective laser melting, process and performance parameters of laser based additive manufacturing techniques	06
5	Automation and Integration in Laser Manufacturing Lasers in manufacturing automation, CNC for laser-based manufacturing, CAD for laser-based manufacturing, Laser assisted material forming, effect of coatings, 3D laser forming and micro forming.	06



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Text Books:

- 1. W. M. Steen, "Laser Material Processing", Springer-Verlag, London, 4th edition. 2005.
- 2. S. N. Joshi and U. S. Dixit, "Laser Based Manufacturing", Springer India, 2015.

- 1. N. B. Dahotre & A. Samant, "Laser Machining of Advanced Materials", CRC Press, London, 1st ed, 2011.
- 2. K. Sugioka, M. Meunier & A. Piqué, "Laser Precision Microfabrication", Springer-Verlag, Berlin/Heidelberg, 2010.
- 3. J. C. Ion," Laser Processing of Engineering Materials", Elsevier, 2005.



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Department of Mechanical Engineering

Title of the Course Name: Environment and	L	Т	P	Credits
Development	3			3
Course Code: P25MD205A				
	ISE	MSE	ESE	Total
	20	30	50	100

Pre-Requisite: Basic knowledge of environmental science and sustainable practices

Course Objectives:

- 1. To understand the interrelationship between environment and development.
- 2. To assess the impact of development activities on ecosystems, biodiversity, and natural resources.
- 3. To analyze sustainable development concepts, environmental ethics, and green technologies.
- 4. To explore national and international environmental policies and enhance awareness on climate change and mitigation strategies.

CO1	Recall and summarize the core concepts of environmental science, sustainable development, climate change, resource degradation, and ecological ethics.		
CO2	Interpret the interrelationships between environment, development, governance policies, and technological strategies for sustainability.		
CO3	Apply the principles of sustainable development, green technologies, and environmental ethics.		
CO4	Evaluate contemporary environmental issues and global case studies to assess the effectiveness of policies, renewable technologies, and sustainable practices.		

Course Content			
Unit No.	Unit title and Content	Hrs	
1	Introduction to Environment and Development	6	
	Definition and Scope, Need for Sustainable Development, Historical		



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	Background, Environmental Movements.	
2	Natural Resources and Environmental Degradation	6
	Types of Natural Resources, Resource Depletion, Land Degradation,	
	Pollution and Biodiversity Loss.	
3	Sustainable Development and Environmental Ethics	6
	Principles of Sustainability, Environmental Ethics, Ecological Footprint,	
	Green and Clean Technologies.	
4	Climate Change and Global Concerns	6
	Climate Change Causes and Impacts, Global Warming, Carbon Cycle,	
	Adaptation and Mitigation Strategies.	
5	Policy and Governance	6
	Environmental Policies, Acts and Protocols (India & Global), Role of	
	Government and NGOs, Environmental Impact Assessment (EIA).	
6	Contemporary Issues and Case Studies	6
	Urbanization and Environment, Renewable Energy, Case Studies on	
	Sustainable Practices in India and Abroad.	

Text Books:

- 1. R. Rajagopalan, "Environmental Studies: From Crisis to Cure", Oxford University Press, 3rd edition, 2016.
- 2. Erach Bharucha, "Textbook of Environmental Studies", UGC Publication, 1st edition, 2005.
- 3. P. D. Sharma, "Ecology and Environment", Rastogi Publications, 11th edition, 2021.

- **1.** W. P. Cunningham and M. A. Cunningham, "Principles of Environmental Science", Tata McGraw-Hill, 7th edition, 2014.
- 2. D. B. Botkin and E. A. Keller, "Environmental Science: Earth as a Living Planet", Wiley India, 8th edition, 2011.
- 3. J. D. Sachs, "The Age of Sustainable Development", Columbia University Press, 1st ed., 2015.



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Course Name: Engineering Economics	L	Т	P	Credits
Course Code: P25MD205B	3			3
	ISE	MSE	ESE	Total
	20	30	50	100

Pre-Requisite: Mathematics, Management Information Systems (MIS)

Course Objectives: The course aims,

- 1. To understand fundamental economic concepts and cost analysis in engineering.
- 2. To apply interest formulas and cash flow techniques to evaluate alternatives.
- 3. To analyse depreciation and asset replacement decisions.
- 4. To evaluate public vs private projects with cost-benefit considerations.

CO1	Recall and define key concepts in engineering economics such as cost elements, interest factors, cash flow models, depreciation techniques, and project financing.				
CO2	Interpret and compare economic decision-making tools including present worth, future worth, annual equivalent, and rate of return across engineering applications.				
CO3	Apply economic analysis techniques to evaluate material selection, make-or-buy decisions, equipment replacement, depreciation schedules, and project investments.				
CO4	Evaluate engineering alternatives and public-private project outcomes using life-cycle costing, value engineering principles, and inflation-adjusted economic assessments.				



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Course Contents

TTer-24		
Unit No.	Contents	Hours
1	Introduction Engineering Economy: Introduction to Economics- Flow in an economy, Law of supply and demand, Concept of Engineering – Economics – Engineering efficiency, Economic efficiency, Scope of engineering economics – Element of costs, Marginal cost, Marginal Revenue, Sunk cost, Opportunity cost, Break-even analysis, P – V ratio, Elementary economic Analysis– Material selection for product, Design selection for a product, Process planning.	6
2	Value Engineering: Make or buy decision, Value engineering – Function, aims, Value engineering procedure. Interest formulae and their applications—Time value of money, Single payment compound amount factor, Single payment present worth factor, Equal payment series sinking fundfactor, Equal paymentseries payment Presentworth factor—equal paymentseries capital recovery factor – Uniform gradient series annual equivalent factor, Effective interest rate, Examples in all the methods.	6
3	Cash Flow: Methods of comparison of alternatives – Present worth method (Revenue dominated cash flow diagram), Future worth method (Revenue dominated cash flow diagram, Cost dominated cash flow diagram), Annual equivalent method (Revenue dominated cash flow diagram, Cost dominated cash flow diagram), rate of return method, Examples in all methods.	6
4	Replacement And Maintenance Analysis: Replacement and Maintenance analysis – Types of maintenance, types of replacement problem, determination of economic life of an asset, Replacement of an asset with a new asset– capital recovery with return and concept of challenger and defender, Simple probabilistic model for items which fail completely.	6
5	Depreciation: Depreciation – Introduction, Straight line method of depreciation, – Declining balance method of depreciation – Sum of the years digits method of depreciation, – Sinking fund method of depreciation/Annuity method of depreciation, service output method of depreciation – Evaluation of public alternatives – Introduction – Examples – Inflation adjusted decisions – Procedure to adjust inflation, Examples on comparison of alternatives and determination of economic life of asset.	6
6	Financing & Public vs Private Projects: Financing sources, economic evaluation in public projects, social costs, and regulatory factors.	6



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Text Books:

- **1.** Panneer Selvam, R, "Engineering Economics", Prentice Hall of India Ltd, New Delhi, 2001.
- 2. Suma Damodaran, "Managerial economics", Oxford university press2006
- 3. Stonier and hauge "A Text book of Economic Theory" by, pearson Publication.

- 1. Sampat Mukherjee, "Modern Economic Theory", New Age International Publisher, 1st edition.
- 2. DeGarmo, "Engineering Economics", Prentice Hall, 1st edition.
- 3. Bo Sodersten, "International Economics", Macmillan, 1st edition



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Department of Mechanical Engineering

Course Name: Project Management L T P Credits

Course Name: Project Management	L	T	P	Credits
Course Code: P25MD205C				3
Course Code: P25MD205C	ISE	MSE	ESE	Total
	20	30	50	100

Pre-Requisite: Knowledge of simple geometrical theories and their constructional procedure.

Course Objectives: The course aims,

- 1. To impart basic concepts Project Management.
- 2. To impart and inculcate proper understanding of the Project Management.
- 3. To improve the visualization skill of Project Management.
- 4. To impart knowledge about standard principles of Project Management.

Course Outcomes: Students will be able to

CO1	Recall and summarize project management fundamentals, work breakdown structures, scheduling tools, resource allocation, and control strategies.
CO2	Interpret and explain the stages of project management, scheduling techniques, cost estimation, and contract and procurement processes.
CO3	Apply project planning, scheduling, resource optimization, and project execution techniques using tools like Gantt charts, CPM/PERT, and cost-time trade-offs.
CO4	Evaluate project success through monitoring, post-project evaluation, financial control, and risk analysis to improve future project outcomes.



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Course Contents

Unit No.	Contents	Hours		
NO.	Introduction to Project management: Definition and objectives of Project			
1	Management, Characteristics of projects, Stages of Project Management, Project Planning Process, Establishing Project organization. Work definition: Defining work content, Time Estimation Method, Project Cost Estimation and budgeting, Project Risk Management, Project scheduling and Planning Tools: Work Breakdown structure, LRC, Gantt charts, CPM/PERT Networks.			
2	Project Planning and Resource Optimization: Developing Project Plan (Baseline), Project cash flow analysis, Project scheduling with resource constraints: Resource Leveling and Resource Allocation. Time Cost Trade off: Crashing Heuristic.	6		
3	Project Execution and Control Strategies: Project Implementation: Project Monitoring and Control with PERT/Cost, Computers applications in Project Management, Contract Management, Project Procurement Management. Post-Project Analysis.			
4	Project Scheduling & Control: Developing Project Plan (Baseline), Project cash flow analysis, Project scheduling with 28 resource constraints: Resource Leveling and Resource Allocation. Time Cost Trade off: Crashing Heuristic.	6		
5	Project Execution, Monitoring & Evaluation: Project Implementation: Project Monitoring and Control with PERT/Cost, Computers applications in Project Management, Contract Management, Project Procurement Management. Post-Project Analysis.	6		

- 1. Shtub, A., Bard, J. F., & Globerson, S., "Project Management: Engineering, Technology and Implementation", Prentice Hall India, 1st edition,
- 2. Lock, D., "Project Management Handbook", Gower Publishing, 1st edition



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Department of Mechanical Engineering

Title of the Course Name: Healthcare Engineering	L	Т	P	Credits
Course Code P2EMD20ED				3
Course Code: P25MD205D	ISE	MSE	ESE	Total
	20	30	50	100

Pre-Requisite: Basics of Management, Market Research Fundamentals, Financial Accounting Basics.

Course Objectives: The course aims:

- 1. To understand how the healthcare system works and what challenges it faces.
- 2. To learn how to improve hospital services using planning and optimization methods.
- 3. To study how patient waiting lines and hospital processes can be modeled and improved.
- 4. To explore new technologies like AI, remote care, and digital tools in future healthcare.

Course Outcomes: Students will be able to					
Recall fundamental components of healthcare systems, including resorblanning, queuing models, data flows, and innovations in digital health.					
CO2	facility layout, patient queuing, and healthcare delivery systems Apply optimization, queuing theory, and simulation methods to ophance				
СО3					
CO4	Evaluate emerging healthcare technologies and simulation outcomes to improve clinical operations, policy design, and access to quality care.				



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Unit	Unit title and Content	Hours			
No.	omi title and content	nours			
1	Introduction to Healthcare System Introduction: Facets of a Healthcare System, Size of a Healthcare System, Health Insurance and Financing, Healthcare Services, Healthcare Ecosystem, Healthcare System Challenges, Access to Healthcare, Healthcare Systems Engineering, Understanding Delivery: Data and Processes: Types of Healthcare Data, National Datasets, Healthcare Delivery Process Data, Process Throughput				
2	Healthcare Resource Workforce and Access to Care Optimization Workforce: Optimization, Supply-Demand Matching, Assignment Models, Optimization: Facility Optimization, Developing Facility Layout to Minimize Travel Wastage, Considering Multiple Conflicting Objectives, Optimization using a Modeling Language				
3	Modeling Patient Queues Kendall's Notation for Queuing Systems, Little's Law, Markovian Queuing Models: M/M/1, M/G/1 Queuing Model, Modeling Interconnected Services using Queuing Networks.				
4	Healthcare System Simulation Building a Simulation Study Framework, Event Calendars in Discrete Event Simulation, Input Modeling in Simulation, Output Analysis in Simulation, Estimation in a Non-Terminating, Non-Stationary System: Emergency Department, Simulation of a Hospital Queuing Network				
5	Future of Healthcare Shifting from Volume to Value, Evidence-Based Medicine, Personalized Medicine, Vision of the Future, Connected Medicine, Disease and Condition Management: Virtual Assistants, Remote Monitoring, Medication Adherence, Accessible Diagnostic Tests, Smart Implantable, Digital Health and Therapeutics, AI, Conversational AI, Making and rationalizing decisions: Drug discovery, 3-D printing, Personalized prosthetics, Bioprinting and tissue engineering, Pharmacology and devices, Education, Gene therapy, Virtual and Augmented Reality, Merged Reality, Pain Management, Physical Therapy, Nursing and Delivery of Medicine, Virtual Appointments and Classrooms, Blockchain, Patient Record Access, Applications of AI in Healthcare	10			

- 1. Sanjay Mehrotra, Kevin Bui, "Healthcare Engineering", Springer, 1st edition, 2022.
- 2. Arjun Panesar, "Machine Learning and AI for Healthcare", Apress, 1st edition, 2019.



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Department of Mechanical Engineering

Title of the Course Name: Technologies for	L	T	P	Credits
Industrial Evolution				
	3			3
Course Code: P25MD206				
	ISE-I	ISE-II	ESE	Total
	25	25	-	50

Pre-Requisite: Knowledge of Automation, IoT and Industrial Engineering.

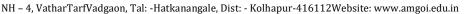
Course Objectives: The course aims,

- 1. To understand the key technologies & impact of technological evolution on modern industries.
- 2. To provide insight into the integration of AI, Big Data, and Cloud Computing in industrial operations.
- 3. To familiarize students with digital twin, predictive maintenance, and robotic process automation.
- 4. To enable students to analyze current trends and future directions in industrial digitization.

Course	Course Outcomes: Students will be able to					
CO1	Recall the evolution, core technologies, digital tools, automation systems, predictive analytics, and future trends shaping Industry 4.0.					
CO2	Interpret the role and integration of smart technologies such as IIoT, AI, cloud computing, and robotics in modern manufacturing ecosystems.					
CO3	Apply digital transformation methods and smart manufacturing tools to solve realworld challenges in automation, condition monitoring, and fault diagnostics.					
CO4	Evaluate the impact of Industry 4.0 initiatives using sustainability frameworks, case study insights, and advanced tools like digital twins and 5G networks.					



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Course Contents

Unit	Contents		
No.	Contents	Hours	
	Introduction to Industrial Evolution Historical Industrial Revolutions,	06	
1	Key Drivers of Industry 4.0, Comparison of Industry 3.0 and 4.0, Global		
	Trends and Indian Scenario.		
2	Core Technologies in Industry 4.0 IIoT, Smart Sensors, Embedded Systems, Cyber Physical Systems (CPS), Edge and Fog Computing.	06	
3	Digital Transformation Tools Cloud Computing, Big Data Analytics, AI & Machine Learning for Industry, Blockchain in Supply Chain.	06	
4	Automation and Smart Manufacturing Additive Manufacturing, Smart Factories, Industrial Robotics, Human-Machine Collaboration.	06	
5	Predictive Maintenance and Digital Twin Condition Monitoring, Real-time Data Acquisition, Digital Twin Modeling, Fault Diagnosis.	06	
6	Future Trends and Case Studies Green Manufacturing, Sustainable Technologies, 5G for Industry, Case Studies on Digital Transformation.	06	

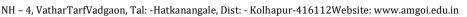
Text Books:

- **1.** Alasdair Gilchrist, "Industry 4.0: The Industrial Internet of Things", Apress, 1st Edi., 2016.
- **2.**SabinaJeschke, "Industrial Internet of Things: Cyber Manufacturing Systems", Springer, 1st Edition, 2017.
- **3.** Markus Brettel," *How Virtualization, Decentralization and Network Building Change the Manufacturing Landscape: An Industry 4.0 Perspective*", Procedia CIRP (Elsevier), 1st Edition, 2014.

- **1.**Douglas M. Considine and Glenn D. Considine, "Standard Handbook of Industrial Automation", Springer, 1st Edition, 1987.
- **2.** Norman A. Anderson, "Instrumentation for Process Measurement and Control", Chilton Company, 3rd Edition, circa 1990.
- **3.**Olushola Akande, "Industrial Automation from Scratch", Packt Publishing,1st Edition, 2023.



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Title of the Course Name: Mini Project	L	Т	P	Credit
Course Code: P25MP207			2	1
	ISE	MSE	ESE	Total
	50		50	100

Pre-Requisites: Previously studied courses.

Course Objectives: The course aims to:

- 1. To identify and define real-time engineering or managerial problems
- 2. To develop innovative solutions using current tools and technologies.
- 3. To enhance teamwork and project execution skills.
- 4. To improve technical documentation and presentation abilities.

CO1	Identify and define an engineering or industrial problem of practical relevance or research interest.
CO2	Analyze the problem systematically and apply domain knowledge to propose viable solutions.
CO3	Document the project findings clearly in a structured report and defend the work through oral presentation.
CO4	Demonstrate initiative, self-learning, and professional responsibility in executing project tasks individually or collaboratively.



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Title of the Course Name: PG LAB-II	L	T	P	Credits
Course Code: P25MP208			4	2
	ISE	MSE	ESE	Total
	50		50	100

Prerequisite:- Basic Geometry, Machine Tools.

Course Objectives: The course aims to:

- 1 To demonstrate the working mechanism of EDM.
- 2 To apply statistical quality control tools and software
- 3 To design and simulate pneumatic circuits for industrial automation applications
- 4 To develop CNC part programs using commercial CAD/CAM software tools.

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

CO1	Explain the working mechanism of EDM
CO2	Use of statistical quality control software to analyze data
CO3	Design a pneumatic circuit for the given application
CO4	Develop a CNC program and simulation of given component.

Perform the following experiments (Any five)

Exp. No.	Content
1	Study of EDM/Wire EDM for metal machining
2	Use of statistical quality control software for process optimization like Minitab, LibreOffice Calc, SOFA Statistics, PSPP, R (with QCC package)
3	Sequencing of cylinders using Pneumatic trainer kit
4	Modelling of component and determination of mass properties
5	Synchronizing of cylinders using Pneumatic trainer kit
6	Develop a CNC program for rough and finish turning of a step shaft.
7	Develop a CNC program for turning operations using canned cycle



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8 Tool Path Simulation Using Software.

Exit Courses after Semester- II - P.G. Diploma

Type of	Type of Course Code Course Name		Teaching Scheme				Evaluation Scheme				
Course	Course Code	Course Name	L	L T P Cr Co	Components	Max	Min f Passir				
PCC		Management Information System	3	1	-	4	ISE-I	50	20		
1 66	1 25WH 209	vir 209 illioi mation system 5 1	1	_	4	ISE-II	50	20			
El C	P25MP210	Laternalia / Trainina			0	4	ISE-I	50	20		
ELC		Internship/ Training		-	8	ð	3 4	ISE-II	50	20	
	Total 3 1 8 8 200										



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Title of the Course Name : Management Information	L	T	P	Credits
System				
Course Code: P25MP210	4	-		4
	ISE	MSE	ESE	Total
	50	-	50	100

Pre-Requisite: Basic computer knowledge, Production and Manufacturing,

Course Objectives: The course aims to:

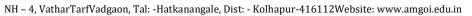
- 1.To introduce key terminologies and foundational concepts in marketing management, IT.
- 2.To equip students with the skills to design, develop, and implement IT solutions to improve overall efficiency.
- 3.To understand and critically evaluate ethical and legal issues in business.
- 4. To develop project planning, teamwork, and time management skills.

CO1	Determine key terminologies and concepts including IT, marketing,
	management, economics, accounting, finance in the major areas of business
CO2	Demonstrate understanding of computer systems, hardware, software, and
	data resource management in enterprise computing environments.
CO3	Analyze the use of telecommunications, networking, and ERP systems in
	developing and managing business/IT solutions across functional areas.
CO4	Evaluate the challenges and best practices in IT security, ethical issues, and
	global management of information technology in organizations.

Course Content				
Unit No.	Unit title and Content	Hrs		
1	Introduction to Information Systems and Business Strategy Organization and Information Systems, Foundation Concepts, Information Systems in Business, The Components of Information Systems, Competing with Information Technology, Fundamentals of Strategic Advantage, Using Information Technology for Strategic Advantage. Changing Environment and its impact on Business, Kinds of Information Systems.	06		



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2	Computer Systems and Data Resource Management Computer Fundamentals, Computer Hardware, Computer Systems: End User and Enterprise Computing, Computer Peripherals: Input, Output, and Storage Technologies, Computer Software, Application Software, System Software, Computer System Management, Data Resource Management, Technical Foundations of Database Management, Managing Data Resources	06
3	Telecommunications and Networking in Business Telecommunication and Networks, Telecommunications and Networks, The Networked Enterprise, Telecommunications Network Alternatives	06
4	Business System Development and Implementation Fundamentals, Implementation Challenges, Developing Business/IT Solutions, Developing Business Systems, Implementing Business Systems.	06
5	Information Systems in Functional Areas and IT Management Manufacturing and Service Systems Information systems for Accounting, Finance, Production and Manufacturing, Marketing and HRM functions, Enterprise Resources Planning (ERP), Choice of IT, Nature of IT decision, Managing Information Technology, Managing Global IT,	06
6	IT Security, Ethics, and Global Management Security and Ethical Challenges, Security and Ethical Challenges, Security and Ethical, and Societal Challenges of IT, Security Management of Information Technology, Enterprise and Global Management of Information Technology	06

Texts Books:-

- 1. MahadeoJaiswal and Monika Mital, "*Management Information Systems*", Oxford University Press, 1st Edition, 2008.
- 2.C.S.V. Murthy, "*Management Information System: Text and Applications*", Himalaya Publishing House, 3rd Edition, 2013.

- **1.** Kenneth J Laudon, "*Management Information Systems*", Pearson/PHI, 10th Edition, 2007.
- 2. W. S. Jawadekar, "Management Information Systems", TMH, 3rd Edition, 2004.