PSN COLLEGE OF ENGINEERING AND TECHNOLOGY

(An Autonomous Institution Recognised by AICTE, New Delhi
and Affiliated to Anna University, Chennai)
Accredited with A+ Grade by NAAC. An ISO 9001:2015 Certified Institution
Melathediyoor, Tirunelveli – 627 152

DEPARTMENT OF MECHANICAL ENGINEERING

Curriculum approved by Board of Studies of
Mechanical Engineering for semester VII to VIII
Under Regulation 2022

INSTITUTE VISION
To emerge as a pioneer institute inculcating engineering education, skills, research, values and ethics.
INSTITUTE MISSION
• To achieve greater heights of excellence in technical knowledge and skill development through innovative teaching and learning practices. • To develop the state of art infrastructure to meet the demands of technological revolution. • To improve and foster research in all dimensions for betterment of society. • To develop individual competencies to enhance innovation, employability and entrepreneurship among students. • To instill higher standards of discipline among students, inculcating ethical and moral values for societal harmony and peace.

DEPARTMENT VISION
To emerge as a preeminent department to produce quality Mechanical Engineering Graduates to meet national and global needs.
DEPARTMENT MISSION
• To educate students to be creative, inquisitive and innovation to become quality engineer and entrepreneurs. • To instil advanced knowledge with research capabilities for global careers and higher studies. • To inculcate moral and ethical standards in life and career.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)	
Sl. No.	**PEOs**
PEO1	The Graduates of Mechanical Engineering program will excel in technical knowledge, innovation and entrepreneurial skills.
PEO2	The Graduates will be able to design and develop various Mechanical Systems for interdisciplinary and multi-disciplinary applications.
PEO3	The Graduates will exhibit ethical attitude, human values, leadership quality and ability to solve engineering problems to a broader social context.

PROGRAM OUTCOMES			
PO'S No.	**KNOWLEDGE**	**STATEMENT**	**APPLIANCE**
1	Engineering Knowledge	Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of Complex engineering problems.	Theory/ Practical / Project work
2	Problem Analysis	Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.	Theory / Practical / Projects
3	Design / Development of Solutions	Design solutions for complex engineering problems and design system components or processes that meet the needs with appropriate consideration for the public health and safety, and the cultural, Societal and environmental considerations.	Theory / Practical / Projects

4	Conduct Investigations of Complex Problems	Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.	Theory / Practical
5	Modern Tool usage	Create, select, and apply appropriate techniques, resources and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.	Theory / Practical / Project work
6	The Engineer and Society	Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.	Theory / Industrial visit / In plant training
7	Environment and Sustainability	Understand the impact of the professional engineering solutions in societal and environmental contexts and demonstrate the knowledge of and need for sustainable development.	Theory / Industrial Visit/ In plant Training
8	Ethics	Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.	Theory / Industrial visit / In plant training
9	Individual and Team Work	Function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary settings.	Projects
10	Communication	Communicate effectively on complex engineering activities with the engineering community and with society at large such as being able to comprehend and write effective reports and design documentation, make effective presentations and give and receive clear instructions.	Projects/ Seminar/ Mini Project
11	Project Management and Finance	Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.	Projects
12	Life-long Learning	Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.	Projects / Higher Studies

PROGRAM SPECIFIC OUTCOMES (PSOs)
PSO1: Design, model and analyse mechanical systems and components using CAD tools and select suitable manufacturing processes. **PSO2:** Formulate, analyze and provide the solution to thermal engineering related problems to meet industrial competitiveness.

SUMMARY SHEET

Semester wise Credits									**Credits Total**
Semester	**I**	**II**	**III**	**IV**	**V**	**VI**	**VII**	**VIII**	
Credits	**21**	**21**	**21.5**	**21.5**	**22**	**22**	**25**	**10**	**165**

Sl.No	Course code	Course Name	Classification		L	T	P	C
SEM - 01								
1	IC610001	Professional English I	IC	Theory	2	0	0	2
2	IC610002	Matrices and Calculus	IC	Theory	2	1	0	3
3	IC610003	Engineering Physics	IC	Theory	3	0	0	3
4	IC610004	Engineering Chemistry	IC	Theory	3	0	0	3
5	CS610005	Problem Solving and 'C' Programming	IC	Theory	3	0	0	3
6	ME610006	Engineering Graphics with CAD	IC	Theory with Practical Component	2	0	2	3
7	IP610101	Physics & Chemistry Laboratory	IC	Practical	0	0	3	1.5
8	IP610102	Programming in 'C' Laboratory	IC	Practical	0	0	3	1.5
9		NCC/NSS/NSO *	IM	Institute Mandatory	1	0	0	0
10	IC610007	tamilmarabu/Heritage of Tamil	IC	Theory	1	0	0	1
		Total			**17**	**1**	**8**	**21**
SEM - 02								
11	IC620008	Professional English II	IC	Theory with Practical Component	2	0	2	3
12	IC620009	Transforms & Partial Differential Equations	IC	Theory	2	1	0	3
13	IC620010	Engineering Materials (for Non Circuit Branches)	IC	Theory	3	0	0	3
	IC620011	Semiconductor Physics(for Circuit Branches)						
14	ME620012	Engineering Mechanics(for Non Circuit Branches)	PC	Theory with project	3	0	0	3
	CS620013	Fundamentals of Artificial Intelligence (for Circuit Branches)						
15	CS620014	Python Programming	IC	Theory	3	0	0	3
16	ME620015	Basic Engineering	IC	Theory	3	0	0	3
17	IP620103	Python Laboratory	IC	Practical	0	0	3	1.5
18	IP620104	Engineering practice laboratory	IC	Practical	0	0	3	1.5
19	IM610401	Environmental Studies	IM	Institute Mandatory	2	0	0	0
20	IC620016	Tamils and technology	IC	Theory	1	0	0	1

		Total			**25**	**1**	**8**	**22**
SEM – 03								
21	IC630017	Numerical Methods and Statistics (Common to MECH & MAE)	IC	Theory	3	0	0	3
22	ME630201	Engineering Thermodynamics (Common to MECH & MAE)	PC	Theory	3	0	0	3
23	ME630202	Fluid Mechanics and Machinery (Common to MECH, Aero and MAE)	PC	Theory	3	0	0	3
24	ME630203	Manufacturing Technology (Common to MECH & MAE)	PC	Theory with project	3	0	0	3
25	ME630204	Strength of materials(Common to MECH & MAE)	PC	Theory with Practical Component	2	0	2	3
26		Professional elective-1	PE	Theory	3	0	0	3
27	ME630301	Fluid Mechanics and Machinery (Common to MECH , MAE &AERO)	PC	Practical	0	0	3	1.5
28	ME630302	Manufacturing Technology Laboratory (Common to MECH & MAE)	PC	Practical	0	0	3	1.5
29	ME630501	Integrated Aptitude Skills - I (Lower)	EEC	skill based course	0	0	1	0.5
30	IM630402	Universal Human Values	IM	Theory	2	0	0	0
		Total			**19**	**0**	**9**	**21.5**
SEM – 04								
31	IC640018	Boundary value problems and probability distributions (Common to MECH & MAE)	IC	Theory	3	0	0	3
32	ME640205	Engineering Materials and Metallurgy (Common to MECH & MAE)	PC	Theory with Practical Component	2	0	2	3
33	ME640206	Thermal Engineering (Common to MECH & MAE)	PC	Theory with project	3	0	0	3
34	EE640901	Electrical Drives and Control (Common to MECH & MAE)	PC	Theory	3	0	0	3
35		Professional elective-2	PE	Theory	3	0	0	3
36		Institute elective -1	IE	Theory	3	0	0	3
37	ME640303	Thermal Engineering Laboratory(Common to MECH & MAE)	PC	Practical	0	0	3	1.5
38	EE640902	Electrical Drives and Control Laboratory (Common to MECH & MAE)	PC	Practical	0	0	3	1.5
39	ME640502	Integrated Aptitude Skills - II (Lower)	EEC	skill based course	0	0	1	0.5
40		Inplant Training (2 Weeks)	IM					0
		Total			**17**	**0**	**9**	**21.5**
SEM – 05								

41	ME650207	Theory of Machines (Common to MECH & MAE)	PC	Theory with Practical Component	2	0	2	3
42	ME650208	Engineering Metrology and Measurements(Common to MECH & MAE)	PC	Theory with project	3	0	0	3
43	ME650209	Design of Machine Elements (Common to MECH & MAE)	PC	Theory	2	1	0	3
44		Institute elective -2	IE	Theory	3	0	0	3
45		Professional elective-3	PE	Theory	3	0	0	3
46		Professional elective-4	PE	Theory	3	0	0	3
47	ME650304	Dynamics of Machinary Laboratory(Common to MECH & MAE)	PC	Practical	0	0	3	1.5
48	ME650305	Computer Numerical Control Laboratary (Common to MECH & MAE)	PC	Practical	0	0	3	1.5
49	ME650503	Integrated Aptitude Skills - I (Higher)	EEC	skill based course	0	0	2	1
50	ME650801	BIS	PM	Theory	2	0	0	0
		Total			**19**	**0**	**10**	**22**
SEM – 06								
51	ME660210	Heat and Mass Transfer (Common to MECH & MAE)	PC	Theory with project	2	1	0	3
52	ME660211	Design of Transmission Systems(Common to MECH & MAE)	PC	Theory with Practical Component	2	0	2	3
53	ME660212	CAD/CAM/CAE(Common to MECH & MAE)	PC	Theory	3	0	0	3
54		Institute elective -3	IE	Theory	3	0	0	3
55		Professional elective-5	PE	Theory	3	0	0	3
56		Professional elective-6	PE	Theory	3	0	0	3
57	ME660306	Heat Transfer Laboratory(Common to MECH & MAE)	PC	Practical	0	0	3	1.5
58	ME660307	CAD/CAM Laboratory (Common to MECH & MAE)	PC	Practical	0	0	3	1.5
59	ME660504	Training in Centre for excellence - BOSCH	EEC	skill based course	0	0	2	1
60	IM660403	Professional Ethics(Common to MECH & MAE)	IM	Theory	2	0	0	0
61		Internship	IM					0
		Total			**19**	**0**	**10**	**22**
SEM – 07								
62	ME670213	Principles of Management	PC	Theory	3	0	0	3
63	ME670214	Finite Element Analysis (Common to MECH & MAE)	PC	Theory with project	3	0	0	3

64	ME670215	Mechatronics and Robotics	PC	Theory with Practical Component	2	0	2	3
65		Institute elective -4	IE	Theory	3	0	0	3
66		Professional elective-7	PE	Theory	3	0	0	3
67		Professional elective-8	PE	Theory	3	0	0	3
68	ME670308	3D Printing (Common to MAE)	PC	Practical	0	0	3	1.5
69	ME670309	Computer Aided Simulation and Analysis Laboratory (Common to MECH & MAE)	PC	Practical	0	0	3	1.5
70	MG670019	Innovation Entrepreneurship and Startups	IC	Theory	3	0	0	3
71	ME670505	Advanced career development	EEC	skill based course	0	0	2	1
		Total			**20**	**0**	**10**	**25**
SEM - 08								
72	ME680506	Project Work	EEC	Practical	0	0	20	10
		Total			**0**	**0**	**20**	**10**

VERTICAL 1: THERMAL SCIENCES (COMMON TO MAE & MECH)								
1	ME606101	Power Plant Engineering	PE	Theory	3	0	0	3
2	ME606102	Heating Ventilation and Air Conditioning	PE	Theory	3	0	0	3
3	ME606103	Thermal Management of Batteries and Fuel Cells	PE	Theory	3	0	0	3
4	ME606104	Refrigeration and Air Conditioning	PE	Theory	3	0	0	3
5	ME606105	Internal Combustion Engine	PE	Theory	3	0	0	3
6	ME606106	Air Breathing Engines	PE	Theory	3	0	0	3
7	ME606107	Design of thermal systems	PE	Theory	3	0	0	3
8	ME606108	Inverse Methods in Heat Transfer (NPTEL)	PE	Theory	3	0	0	3
9	ME606109	Fundamentals of combustion for propulsion (NPTEL)	PE	Theory	3	0	0	3
10	ME606110	Fundamentals of Gas Dynamics (NPTEL)	PE	Theory	3	0	0	3
VERTICAL 2: ENERGY TECHNOLOGIES (COMMON TO MAE&MECH)								
1	ME606201	Fuel Cell and Hydrogen Technology	PE	Theory	3	0	0	3
2	ME606202	Alternate Energy Fuels	PE	Theory	3	0	0	3
3	ME606203	Bio Energy Conversion Technologies	PE	Theory	3	0	0	3
4	ME606204	Energy Storage Devices	PE	Theory	3	0	0	3
5	ME606205	Energy Conservation and Waste heat recovery	PE	Theory	3	0	0	3
6	ME606206	Solar energy technologies	PE	Theory	3	0	0	3
7	ME606207	Green energy sources	PE	Theory	3	0	0	3
8	ME606208	Micro and nano scale energy transport (NPTEL)	PE	Theory	3	0	0	3
9	ME606209	Design and Optimization of Energy systems (NPTEL)	PE	Theory	3	0	0	3
10	ME606210	Electric vehicles and Renewable energy (NPTEL)	PE	Theory	3	0	0	3
VERTICAL 3: LOGISTICS AND SUPPLY CHAIN MANAGEMENT (COMMON TO MAE&MECH)								
1	ME606301	Warehousing Automation	PE	Theory	3	0	0	3
2	ME606302	Business Process Re-engineering	PE	Theory	3	0	0	3
3	ME606303	Total Quality Management	PE	Theory	3	0	0	3
4	ME606304	Project Management (Common to MAE,MECH,AERO)	PE	Theory	3	0	0	3
5	ME606305	Industrial psychology	PE	Theory	3	0	0	3
6	ME606306	Resource management techniques	PE	Theory	3	0	0	3
7	ME606307	Enterprise resource planning	PE	Theory	3	0	0	3
8	ME606308	Business Development: From Start to Scale (NPTEL)	PE	Theory	3	0	0	3
9	ME606309	Patent Law for Engineers and Scientists (NPTEL)	PE	Theory	3	0	0	3
10	ME606310	Business Analysis for Engineers (NPTEL)	PE	Theory	3	0	0	3

VERTICAL 4: COMPUTATIONAL ENGINEERING								
1	ME606401	Computational Solid Mechanics	PE	Theory	3	0	0	3
2	ME606402	Computational Fluid Dynamics and Heat transfer	PE	Theory	3	0	0	3
3	ME606403	Computational Bio Mechanics	PE	Theory	3	0	0	3
4	ME606404	Advanced Statistics and Data Analytics	PE	Theory	3	0	0	3
5	ME606405	Machine Learning for Intelligent Systems	PE	Theory	3	0	0	3
6	ME606406	Theory on Computation and Visualization	PE	Theory	3	0	0	3
7	ME606407	Foundations of Computational Materials Modelling (NPTEL)	PE	Theory	3	0	0	3
8	ME606408	Computational Fluid Dynamics using Finite Volume Method (NPTEL)	PE	Theory	3	0	0	3
9	ME606409	Foundation of Computational Fluid Dynamics (NPTEL)	PE	Theory	3	0	0	3
10	ME606410	Computational Fluid Dynamics for Turbo machinery(NPTEL)	PE	Theory	3	0	0	3
VERTICAL 5: DIVERSIFIED COURSES GROUP I								
1	ME606501	Design of Jigs, Fixtures and Press Tools	PE	Theory	3	0	0	3
2	MA606403	Mechanical Vibrations and Controls	PE	Theory	3	0	0	3
3	ME606502	Instrumentation for engineers	PE	Theory	3	0	0	3
4	ME606503	Automobile Engineering	PE	Theory	3	0	0	3
5	ME606504	Reverse Engineering	PE	Theory	3	0	0	3
6	ME606505	Nuclear Engineering	PE	Theory	3	0	0	3
7	ME606506	Production Planning and Control	PE	Theory	3	0	0	3
8	MA606408	Design for Quality, Manufacturing and Assembly (NPTEL)	PE	Theory	3	0	0	3
9	MA606409	Oil Hydraulics and Pneumatics (NPTEL)	PE	Theory	3	0	0	3
10	MA606410	Advanced Operations Research (NPTEL)	PE	Theory	3	0	0	3
VERTICAL 6: MATERIALS SCIENCES(COMMON TO MAE&MECH)								
1	MA606101	Composite Materials	PE	Theory	3	0	0	3
2	MA606102	Tribology	PE	Theory	3	0	0	3
3	MA606103	Mechanical Behaviour of Materials	PE	Theory	3	0	0	3
4	MA606104	Polymer Technology	PE	Theory	3	0	0	3
5	MA606105	Smart Materials	PE	Theory	3	0	0	3
6	MA606106	Electrical, Electronic and Magnetic materials	PE	Theory	3	0	0	3
7	MA606107	Fracture mechanics	PE	Theory	3	0	0	3
8	MA606108	Basics of Materials Engineering (NPTEL)	PE	Theory	3	0	0	3
9	MA606109	Transport Phenomena in Materials (NPTEL)	PE	Theory	3	0	0	3
10	MA606110	Welding Processes (NPTEL)	PE	Theory	3	0	0	3

VERTICAL 7: MANUFACTURING ENGINEERING(COMMON TO MAE&MECH)								
1	MA606201	Computer Integrated Manufacturing	PE	Theory	3	0	0	3
2	MA606202	Industry 4.0	PE	Theory	3	0	0	3
3	MA606203	Flexible Manufacturing Systems(Common to MAE,MECH,AERO)	PE	Theory	3	0	0	3
4	MA606204	Additive Manufacturing Processes	PE	Theory	3	0	0	3
5	MA606205	Lean Manufacturing	PE	Theory	3	0	0	3
6	MA606206	Rapid Prototyping	PE	Theory	3	0	0	3
7	MA606207	Theory of metal cutting	PE	Theory	3	0	0	3
8	MA606208	Steel Quality : Role of Secondary Refining & Continuous Casting (NPTEL)	PE	Theory	3	0	0	3
9	MA606209	Laser Based Manufacturing (NPTEL)	PE	Theory	3	0	0	3
10	MA606210	Forming (NPTEL)	PE	Theory	3	0	0	3
VERTICAL 8: DIVERSIFIED COURSES GROUP 2								
1	MA606501	Maintenance Engineering	PE	Theory	3	0	0	3
2	MA606502	Design of Pressure Vessels	PE	Theory	3	0	0	3
3	EE606604	Virtual Instrumentation (Common to MAE & EEE)	PE	Theory	3	0	0	3
4	MA606503	Computational Fluid Dynamics	PE	Theory	3	0	0	3
5	MA606504	Fluid Power Control System	PE	Theory	3	0	0	3
6	MA606505	Hydraulics and Pneumatics	PE	Theory	3	0	0	3
7	MA606506	Industrial Networking	PE	Theory	3	0	0	3
8	MA606507	Functional and Conceptual Design (NPTEL)	PE	Theory	3	0	0	3
9	MA606508	Vehicle Dynamics (NPTEL)	PE	Theory	3	0	0	3
10	MA606509	Micro fluidics (NPTEL)	PE	Theory	3	0	0	3

INSTITUTE ELECTIVE I									
S.No	**Course code**	**Course Name**	**Dept**	**Classification**		**L**	**T**	**P**	**C**
1	ME607118	Quality Control & Reliability Engineering	MECH	IE	Theory	3	0	0	3
2	ME607119	Industrial safety	MECH	IE	Theory	3	0	0	3
INSTITUTE ELECTIVE II									
S.No	**Course code**	**Course Name**	**Dept**	**Classification**		**L**	**T**	**P**	**C**
1	ME607218	Space Technology	MECH	IE	Theory	3	0	0	3
2	ME607219	Renewable Energy Technologies	MECH	IE	Theory	3	0	0	3
INSTITUTE ELECTIVE III									
S.No	**Course code**	**Course Name**	**Dept**	**Classification**		**L**	**T**	**P**	**C**
1	ME607317	Nano Technology	MECH	IE	Theory	3	0	0	3
2	ME607318	Standards, Quality Control and Inspection	MECH	IE	Theory	3	0	0	3
INSTITUTE ELECTIVE IV									
S.No	**Course code**	**Course Name**	**Dept**	**Classification**		**L**	**T**	**P**	**S.No**
1	ME607417	Robotics and Mechanical Actuators	MECH	IE	Theory	3	0	0	1
2	ME607418	Failure Analysis and NDT Techniques	MECH	IE	Theory	3	0	0	2

SYLLABUS

SEMESTER VII

ME670213	PRINCIPLES OF MANAGEMENT				
Course Category: Industrial Core	**Course Type: Theory**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

COURSE OBJECTIVES:

The course aims to familiarize the learner with extant and emerging management theories and practices for reflective and holistic thinking on management principles and practices.

UNIT 1: INTRODUCTION TO MANAGEMENT AND ORGANIZATIONS — **9**

Definition of Management — Science or Art — Manager Vs Entrepreneur — types of managers - managerial roles and skills — Evolution of Management — Scientific, human relations, system and contingency approaches — Types of Business organization — Sole proprietorship, partnership, company-public and private sector enterprises — Organization culture and Environment — Current trends and issues in Management.

UNIT 2: PLANNING — **9**

Nature and purpose of planning — planning process — types of planning — objectives — setting objectives — policies — Planning premises — Strategic Management — Planning Tools and Techniques — Decision making steps and process.

UNIT 3: ORGANISING — **9**

Decentralization and Delegation; Factors affecting organisational design; Departmentalization; Organisational structures and Organograms: traditional and modern, comparative suitability and changes over time; formal- informal organisations‟ interface.

UNIT 4: DIRECTING AND CONTROLLING — **9**

Motivation- meaning, importance and factors affecting motivation; Leadership- meaning, importance and factors affecting leadership, leadership styles, and followership. Controlling- Principles of controlling; Measures of controlling and accountability for performance.

UNIT 5: SALIENT DEVELOPMENTS AND CONTEMPORARY ISSUES IN MANAGEMENT — **9**

Management challenges of the 21st Century; Factors reshaping and redesigning management purpose, performance and reward perceptions- Internationalisation, Digitalisation, Entrepreneurship & Innovation, Values & Ethics - Case studies on Indian corporates.

TOTAL: 45 PERIODS

COURSE OUTCOMES: At the end of the course, the student will be able to

CO1: Describe the various levels of management and applicability of management principles.

CO2: Evaluate a company’s competitive landscape as per Porter‟s Five-force model.

CO3: Demonstrate various types of authority, delegation and decentralization in authority.

CO4: Demonstrate various types of leadership styles and identify the motivation techniques used by leaders.

CO5: Discuss the impact of emerging issues in management.

CO-PO MAPPING

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	3	3	3	3	3	1	2	1	-	-	1	3	2	2
CO 2	3	3	1	2	2	2	1	1	-	-	-	3	2	2
CO 3	3	2	3	3	3	3	2	1	-	-	1	3	3	2
CO	3	2	2	1	3	3	1	1	-	-	-	3	3	2

4													
CO 5	3	2	2	2	2	3	2	1	-	-	-	3	3	2

1- low, 2 - medium, 3 - high, '-' no correlation

TEXTBOOKS:

Chhabra, T. N. (2021). Business Organisation and Management. Sun India Publications. New Delhi.

Kumar, P. (2019). Management: Principles and Applications. JSR Publication House LP, Delhi.

Mahajan, J. P., & Mahajan A. (2016). Management Principles and Applications. Vikas Publications.

Tulsian, P. C., & Pandey, V. (2021). Business Organisation& Management. Pearson Education, India

REFERENCE BOOKS:

1. Stephen P. Robbins & Mary Coulter; Management, Pearson Education, 13th Edition, 2017

2. Dr.C.B.Gupta; Principles of Management, Sultan Chand& Sons, 3 rd Edition.

3. Harold Koontz, HienzWeihrich, A RamachandraAryasri; Principles of Management, McGraw Hill, 2nd edition, 2015

WEB RESOURCES:

https://www.toolshero.com/management/14-principles-of-management/

https://open.umn.edu/opentextbooks/textbooks/693

ME670214	FINITE ELEMENT ANALYSIS (Common to MECH & MAE)				
Course Category: Industrial Core	Course Type: Theory	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

To introduce the concepts of Mathematical Modeling of Engineering Problems and to appreciate the use of FEM to a range of Engineering Problems.

UNIT 1:INTEGRAL FORMULATION & VARIATION METHODS — **9**

Methods of engineering analysis –weighted residual methods– general weighted residual statement– weak formulation of the weighted residual statement– principle of stationary total potential (PSTP) – Rayleigh Ritz method– piecewise continuous trial functions– simultaneous linear algebraic equations– Numerical integration – Gaussian quadrature.

UNIT 2:1D BAR & TRUSS ELEMENT — **9**

Introduction to matrix algebra – general steps in FEA – co-ordinates – linear bar element– shape functions– stiffness matrix– application to bar element – quadratic bar element– spring element – truss element – development of element equations– assembly– elemen tconnectivity– global equations.

UNIT 3:PLANE STRESS & PLANE STRAIN ANALYSIS — **9**

Introduction– constant strain triangular element (CST)– strain displacement matrix – stress strain relations– four noded rectangular element – iso-parametric elements– jacobian matrix –natural co-ordinate system and co-ordinate transformation – axisymmetric element.

UNIT 4: DYNAMIC & FLUID FLOW ANALYSIS — **9**

Fundamentals of vibration – equations of motion based on weak form – longitudinalvibration of bars – transverse vibration of beams – consistent & lumped mass matrices – Eigen values & Eigen vectors –Fluid mechanics in 2-D– shape function, stiffness matrix, load vector, assembly – Application.

UNIT 5: HEAT TRANSFER ANALYSIS — **9**

Temperature distribution using weighted residual approach – application to one-dimensional heat transfer problems in bar element – heat transfer analysis in CST element – axisymmetric element – scalarvariable problems in 2-D.

TOTAL: 45 PERIODS

COURSE OUTCOMES: At the end of the course, the student will be able to

CO1: Evaluate the various approximation and elimination methods.

CO2: Explain various numerical engineering problems in 1D bar & Truss element.

CO3: Develop the CST, axisymmetric, iso, super and sub parametric elements.

CO4: Apply the numerical engineering in dynamic and fluid mechanics problems.

CO5: Examine the various applications involved in 1D, 2D heat transfer .

CO-PO MAPPING

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2
CO 1	3	3	3	2	1	-	-	-	-	-	-	2	3	2
CO 2	3	3	3	3	3	-	-	-	-	-	-	2	3	2
CO 3	3	2	3	2	3	-	-	-	-	-	-	2	3	2
CO 4	3	2	1	1	2	-	-	-	-	-	-	2	3	2
CO 5	3	3	3	3	3	-	-	-	-	-	-	2	3	3

2- low, 2 - medium, 3 - high, '-' no correlation

TEXTBOOKS:

Seshu P., **"Text Book of Finite Element Analysis",** Prentice-Hall of India Pvt. Ltd. New Delhi, (2015)

Chennakesava R. Alavala, **"Finite Elements Methods-Basic Concepts and Applications",** Prentice-Hall of India, Eastern Economy Editions, (2016)

REFERENCE BOOKS:
Bhavikatti S.S., **"Finite Element Analysis",** New Age International Publishers, (2017)
Reddy J.N., **"An Introduction to the Finite Element Method",** McGraw-Hill Edition, (2015)
David V. Hutton, **"Fundamentals of Finite Element Analysis",** Tata McGraw-Hill Edition, (2017)
WEB RESOURCES:
https://www.simscale.com/blog/learn-finite-element-analysis-fea/
https://www.ansys.com/en-in/simulation-topics/what-is-finite-element-analysis

ME670215	MECHATRONICS AND ROBOTICS				
Course Category: Industrial Core	**Course Type: Theory**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

COURSE OBJECTIVES:

Learn core concepts of mechatronics and robotics systems design, as well as microcontroller programming using powerful Arm-based platforms. Use industry standard IDEs to program and control a variety of peripherals, including laser distance detectors, optical sensors and smart actuators.

UNIT 1:INTRODUCTION TO INDUSTRIAL ROBOTS **9**

Robotics definition - robot configurations, robot anatomy, joint system, types of joints, work volume, robot drive systems, precision of movement, robotic sensors and actuators, end effectors, grippers, different types of grippers.

UNIT 2:NUMERICAL CONTROL **9**

Introduction-NC procedure, nc coordinate systems, elements of NC systems, classification of nc systems, advantages and dis-advantages of NC systems, applications of NC, NC manual part programming, apt language.

UNIT 3:ROBOT ACTUATORS AND FEED BACK COMPONENTS **9**

Actuators- pneumatic-hydraulic actuators, electric & stepper motors, comparison, position sensors – potentiometers- resolvers- encoders – velocity sensors-tactile sensors proximity sensors, robot applications in manufacturing.

UNIT 4: CONTROL SYSTEMS IN MECHATRONICS AND ROBOTICS **9**

Open-loop and Closed-loop Control Systems, PID Controllers: Tuning and Implementation, Adaptive and Intelligent Control, Motion Control in Robotics.

UNIT 5: MACHINE VISION AND ARTIFICIAL INTELLIGENCE IN ROBOTICS **9**

Basics of Image Processing, Object Recognition and Pattern Matching, AI Techniques in Robotics: Fuzzy Logic, Neural Networks, Introduction to Machine Learning in Robotics.

TOTAL: 45 PERIODS

COURSE OUTCOMES: At the end of the course, the student will be able to

CO1: Understand robot anatomy of robot, configuration of different robots, and Describe construction and working of different types of robots.

CO2: Understand the basics of Numerical Control machines and part programming of simple geometries.

CO3: Select appropriaterobot actuator and feedback components such as stepper motor, encoder, resolver.

CO4: Design and implement control strategies for mechatronic and robotic applications.

CO5: Apply AI and machine vision techniques in robotic systems.

CO-PO MAPPING

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	3	3	2	2	2	-	1	-	-	-	1	3	2	1
CO 2	2	2	1	2	3	1	-	-	-	-	-	2	2	3
CO 3	3	2	2	2	3	-	-	-	-	-	1	2	3	2
CO 4	3	2	3	2	3	1	1	-	-	-	-	2	3	2
CO 5	3	2	2	2	3	1	1	-	-	-	1	2	3	3

3- low, 2 - medium, 3 - high, '-' no correlation

TEXTBOOKS:

Automation, Production Systems and CIM, Mikell P. Groover, Prentice-Hall of India Pvt. Ltd, 2016.

Industrial Robotics -Technology, Programming and Applications (SIE), Nicholas Odrey, Mitchell Weiss,

Mikell Groover, Roger Nagel, Ashish Dutta, McGraw-Hill 2nd Edition, 2017.
Introduction to robotics: analysis, control, applications. Niku, S. B, John Wiley & Sons, 2020.
REFERENCE BOOKS:
Robotics and Control, Mittal R.K & Nagrath IJ, McGraw-Hill, 2017.
An introduction to robot technology. Coiffet, P., &Chirouze, M., Springer Science & Business Media, 2012.
Robotics: Control Sensing, K.S.Fu., R.C.Gonzalez, C.S.G. Lee, Vision and Intelligence Indian Edition, McGraw Hill Book Co., 2008.
WEB RESOURCES:
https://nptel.ac.in/courses/108105063
https://www.arm.com/resources/education/online-courses/mechatronics-and-robotics

ME670308 3D PRINTING LABORATORY					
Course Category: Program Core	**Course Type: Practical**	**L**	**T**	**P**	**C**
		0	**0**	**3**	**1.5**

COURSE OBJECTIVES:

The student will be able to

- To gain knowledge and skills related to 3D printing technologies.
- To learn the selection of material, equipment and development of a product for Industry 4.0 environment.
- To understand the various software tools, processes and techniques for digital manufacturing.
- To apply these techniques into various applications.

LIST OF EXPERIMENTS

1. 3D Modelling of a single component.
2. Assembly of CAD modelled Components.
3. Exercise on CAD Data Exchange.
4. Generation of .stl files
5. Identification of a product for 3D printing and its process plan.
6. Printing of identified products on an available 3D printing machine.
7. Post processing of 3D printed product.
8. Inspection and defect analysis of the additively manufactured product.

TOTAL: 45 PERIODS

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

CO1: Develop CAD models for 3D printing.

CO2: Import and Export CAD data and generate .stl file.

CO3: Select a specific material for the given application.

CO4: Select a 3D printing process for an application.

CO5: Produce a product using 3D Printing or Additive Manufacturing (AM).

CO's PO's&PSO's MAPPING

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P010	P011	PO12	PSO1	PSO2
CO1	2	2	2	2	3	-	-	-	-	-	-	2	-	-
CO2	2	2	-	-	3	-	-	-	-	-	-	-	-	-
CO3	2	1	-	-	3	-	-	-	-	-	-	-	-	-
CO4	2	1	-	1	3	-		-	-	-	-	-	-	-
CO5	2	1	-	2	3	-		-	-	-	-	-	-	-

ME670309 COMPUTER AIDED SIMULATION AND ANALYSIS LABORATORY

Course Category: Program Core	Course Type: Practical	L	T	P	C
		0	0	3	1.5

COURSE OBJECTIVES:

To analyzing the force, stress, deflection, thermal stress, heat transfer and vibration in mechanical components.

LIST OF EXPERIMENTS

1. Stress analysis of rectangular L bracket.
2. Stress analysis of Cantilever beams.
3. Stress analysis simply supported beams
4. Stress analysis of Cantilever Fixed End Beams
5. Mode frequency analysis of Cantilever beams
6. Mode frequency analysis simply supported beams
7. Mode frequency analysis Fixed beams
8. Harmonic analysis of a 2D component.
9. Thermal stress analysis of a 2D component.
10. Conductive heat transfer analysis of a 2D component.
11. Stress analysis of an axis symmetric component.
12. Conductive Heat transfer analysis of a 3D component

TOTAL: 45 PERIODS

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

CO1: Find out the effect of force and impact of stress on the mechanical components.

CO2: Calculate the deflection occurring on the mechanical components.

CO3: Get a detailed understanding of the thermal stress creation and its mechanism of spreading in mechanical components.

CO4: Gain knowledge regarding the mechanism of heat transfer in mechanical components.

CO5: Find out the vibration effects on mechanical components.

CO's PO's&PSO's MAPPING

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P010	P011	PO12	PSO1	PSO2
CO1	2	2	2	2	3	-	-	-	-	-	-	2	-	-
CO2	2	2	-	-	3	-	-	-	-	-	-	-	-	-
CO3	2	1	-	-	3	-	-	-	-	-	-	-	-	-
CO4	2	1	-	1	3	-		-	-	-	-	-	-	-
CO5	2	1	-	2	3	-		-	-	-	-	-	-	-

MG670019	INNOVATION, ENTREPRENEURSHIP, AND STARTUPS				
Course Category: Program Core	**Course Type: Theory with Project**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

COURSE OBJECTIVES:

To impart knowledge on the following Topics,

- To Equip students with the knowledge, skills, and mindset necessary to foster innovation, recognize opportunities.
- To develop viable business models, navigate the startup ecosystem.
- To scale entrepreneurial ventures successfully

UNIT 1: FOUNDATIONS OF ENTREPRENEURSHIP AND INNOVATION — **9**

Entrepreneurship: Definitions, Evolution, and Types - Theories of Entrepreneurship - Innovation vs. Invention: Types of Innovation -Product-Process-Business Model - The Role of Startups in Economic Development Case Study: Disruptive Innovation in Startups

UNIT 2: IDEATION, OPPORTUNITY RECOGNITION, AND BUSINESS MODEL DEVELOPMENT — **9**

Ideation Techniques: Brainstorming, Substitute, Combine, Adapt, Modify, Put to another use, Eliminate, and Reverse (SCAMPER), Design Thinking, Theory of Inventive Problem Solving (TRIZ) - Identifying Market Gaps and Unmet Needs - Evaluating Customer Pain Points and Problem-Solution Fit - Business Model Canvas: Deep Dive into the Nine Building Blocks - Value Proposition Design and Customer Segments - Lean Startup Methodology and MVP Development - Case Study: Real-world Startup Examples

UNIT 3: MARKET RESEARCH, CUSTOMER DEVELOPMENT, AND FINANCIAL PLANNING — **9**

Market Research: Tools, Methods, and Best Practices - Customer Behavior and Segmentation - Product-Market Fit: Definition, Importance, and Strategies Financial Planning for Startups: Cash Flow, Unit Economics, and Break-even Analysis Funding Sources - Equity Dilution, Cap Tables, and Investor Negotiations - Case Study: How Startups Achieved Product-Market Fit

UNIT 4: LEGAL, REGULATORY, AND ECOSYSTEM SUPPORT FOR STARTUPS — **9**

Legal Structure - Intellectual Property Rights (IPR), Patents, and Trademarks - Government Policies and Schemes - Role of Incubators, Accelerators, and Angel Investors - Regional vs. Global Startup Ecosystems - Social Entrepreneurship and Impact Ventures Case Study: Successful Social Enterprises

UNIT 5: PITCHING, PRESENTATION SKILLS, AND GROWTH STRATEGIES — **9**

Crafting a Winning Startup Pitch: Key Elements and Structure - Storytelling and Persuasion Techniques for Entrepreneurs - Pitching to Investors: Do's and Don'ts - Managing Investor Q&A and Feedback - Scaling Strategies for Startups - Case Study: How Startups Secured Funding and Scaled

TOTAL: 45 PERIODS

COURSE OUTCOMES: At the end of the course, the student will be able to

CO1: Understand the fundamentals of innovation and entrepreneurship.

CO2: Develop innovative business ideas and identify market opportunities.

CO3: Conduct market research and create financial strategies.

CO4: Navigate legal and regulatory frameworks.

CO5: Develop effective pitching and presentation skills.

CO-PO MAPPING

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	2	2	2	1	1	3	2	2	2	1	1	1	1	1
CO 2	2	3	2	1	1	2	3	2	2	3	2	1	-	2
CO 3	2	3	2	1	1	1	1	2	2	2	2	1	-	-

CO 4	1	2	2	-	-	3	1	3	3	3	2	1	3	1
CO 5	2	1	2	-	-	2	1	3	2	1	2	2	1	-

4- low, 2 - medium, 3 - high, '-' no correlation

TEXTBOOKS:

Michael Laverty, Chris Little, "Entrepreneurship", Openstax 2020, Texas.

Lee Swanson, "Entrepreneurship and Innovation Toolkit", OPENPRESS.USASK.CA 2017, University of Saskatchewan.

REFERENCE BOOKS:

Dr S Senthil M Arokiaraj at John, "Entrepreneurship Development" Suchitra Publication, 2017, Chennai.

Peter F Drucker, "Innovation and Entrepreneurship" T&F publication 2010.

WEB RESOURCES:

https://onlinecourses.nptel.ac.in/noc21_mg63/preview

ME670505 ADVANCED CAREER DEVELOPMENT					
Course Category: Program Core	**Course Type: Practical**	**L**	**T**	**P**	**C**
		0	**0**	**3**	**1.5**

COURSE OBJECTIVES:

To impart knowledge on the following Topics,

•To Help students develop a strong personal and professional brand.

•To provide insights into advanced job search strategies, networking, and industry expectations.

•To prepare students for career advancement through skill development, goal setting, and career planning

LIST OF EXPERIMENTS

1. Defining Your Personal Brand as an Engineer
2. Creating and Optimizing Your LinkedIn and GitHub Profiles
3. Conducting a SWOT Analysis to Identify Unique Skills
4. Crafting an ATS-Friendly Resume for Engineering Careers
5. Developing a Digital Portfolio to Showcase Projects
6. Testing Resume Compatibility with Applicant Tracking Systems (ATS)
7. Aligning Technical Skills and Certifications with Job Roles
8. Designing a Career Roadmap and Job Search Plan
9. Writing Cold Emails and Networking Messages for Job Search
10. Leveraging LinkedIn for Professional Networking and Job Opportunities
11. Leadership and Decision-Making Simulation for Engineers
12. Time Management and Work-Life Balance Planning

TOTAL: 45 PERIODS

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

CO1: Develop and articulate a personal brand for career advancement.

CO2: Create a targeted resume and professional portfolio tailored to desired engineering roles.

CO3: Formulate a strategic career plan, including job search tactics and long-term career goals.

CO4: Build and expand a professional network to leverage career opportunities.

CO5: Develop leadership, communication, and adaptability skills for navigating the workplace.

CO's PO's&PSO's MAPPING

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P010	P011	PO12	PSO1	PSO2
CO1	2	2	2	3	2	3	2	-	2	1	1	1	1	1
CO2	2	3	2	2	1	2	3	1	2	3	2	1	-	2
CO3	2	3	2	1	2	1	1	-	2	2	2	1	-	-
CO4	1	2	2	2	1	3	1	-	3	3	2	1	3	1
CO5	2	1	2	2	1	2	1	-	2	1	2	2	1	-

SYLLABUS

SEMESTER VIII

ME680506	Project Work	L	T	P	C
		0	0	20	10

COURSE OBJECTIVE:

Final year projects represent the culmination of study towards the bachelor of engineering degree. Projects offer the opportunity to apply and extend material learned throughout the program. Assessment is by means of a seminar presentation, submission of a thesis, and a public demonstration of work undertaken.

COURSE CONTENT:

This course will be conducted largely as an individual or small group project under the direct supervision of a member of academic staff. The specific project topic undertaken will reflect the common interests and expertise of the student(s) and supervisor.

1. **Apply Automation Concepts** – Utilize principles of mechanical and automation to develop efficient and sustainable modern solutions.
2. **Analyze AI Impact** – Assess the effects of various AI generation and consumption methods on automation sustainability.
3. **Innovate in automation Technologies** – Develop and implement projects focused on automation solutions such as automobile, and various industries.
4. **Develop Pollution Control Strategies** – Design and evaluate technologies or policies aimed at reducing air, water, and soil pollution caused by industrial and domestic automation use.
5. **Optimize Automation Efficiency** – Explore ways to improve efficiency, reduce carbon foot prints, and enhance efficiency in industrial and house hold systems.
6. **Integrate Smart mechanical Systems** –Investigate the use of smart grids, IOT, and AI-driven energy management systems for optimizing energy usage and reducing waste.
7. **Research Advanced Emission Reduction Technologies** – Study and apply carbon capture, waste-to-energy, and other advanced emission mitigation techniques.
8. **Encourage Circular Economy Practices** – Explore waste recycling, resource recovery, and sustainable manufacturing techniques to minimize pollution.
9. **Strengthen Policy & Regulatory Understanding** – Analyze national and international energy and environmental policies, and propose strategies for effective implementation.
10. **Enhance Problem – Solving & Innovation Skills**– Foster creative solutions to energy and pollution challenges through interdisciplinary research and project- based learning.
11. Provide Solutions for any Problems Identified by Society.
12. Provide Solutions for Problems related to Industrial concern.
13. Additional Features in the existing Devices/Process/Service with creativity and Innovation.

Students will be required to:

- Performa literature search to review current knowledge and developments in the chosen technical area;
- Undertake detailed technical work in the chosen area using one or more of theoretical studies, computer simulations and hardware construction.
- Produce work plan to complete the project within stipulated time
- Deliver a seminar on the general area of work being under taken and specific contributions to that field;
- Prepare an interim report describing the work under taken and results obtained so far; and
- Present the work in a forum involving poster presentations and demonstrations of operational hardware and software

COURSE OUTCOMES:

On successful completion of the course students will be able to:
CO1: Demonstrate a sound technical knowledge of their selected project topic.
CO2: Undertake problem identification, formulation and solution.
CO3: Design engineering solutions to complex problems utilizing a systems approach.
CO4: Conduct an engineering project
CO5: Communicate with engineers and the community at large in written an oral forms.

CO-POMAPPING:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	3	3	2	2		-	-	-	2	2	-	-
CO2	1	1	3	3	2	2		-	1	-	2	2	-	-
CO3	1	1	3	3	2	2		-	2	-	2	2	-	1
CO4	1	1	3	3	2	2		-	1	-	2	2	-	-
CO5	1	1	3	3	1	2		-	1	-	1	2	-	-