Dr. Vasantraodada Patil Shetkari Shikshan Mandal's

PADMABHOOSHAN VASANTRAODADA PATIL INSTITUTE OF TECHNOLOGY, BUDHGAON, SANGLI- 416304.

An Autonomous Institute

Affiliated to Dr. Babasaheb Ambedkar Technological University, Lonere, Raigad

(Accredited by NAAC)

M.Tech. DESIGN ENGINEERING

Curriculum for
M.Tech. DESIGN ENGINEERING

In accordance with the *National Education Policy (NEP) 2020*, including curriculum structure and evaluation scheme

Effective from Academic Year 2025–2026

Dr. Vasantraodada Patil Shetkari Shikshan Mandal's

PADMABHOOSHAN VASANTRAODADA PATIL INSTITUTE OF TECHNOLOGY, BUDHGAON , SANGLI. 416304

An Autonomous Institute, affiliated to Dr.Babasaheb Ambedkar Technological University, Lonere, Raigad

PG- MECHANICAL DESIGN ENGINEERING

Curriculum Structure and Evaluation Scheme

(Academic Year 2025-26 Onwords)

SEMESTER I

Sr. No.	Course Code	Type of Course	Course Name	Teaching Scheme				Evaluation Scheme					Total
								Theory			Practical		
				L	T	P	Cre-dits	Scheme		Minimum Marks for Passing	Max	Min	
1	OMDPC501	PCC	Modern Engineering Design	3	0	0	3	ISE 1 MSE ISE 2 ESE	10 20 10 60	40	-	-	100
2	OMDPC502	PCC	Synthesis and Analysis of Mechanisms	3	1	0	4	ISE 1 MSE ISE 2 ESE	10 20 10 60	40	-	-	100
3	OMDPC503	PCC	Advanced Mechanical Vibrations	3	0	0	3	ISE 1 MSE ISE 2 ESE	10 20 10 60	40	-	-	100
4	OMDPE504	PEC-I	Program Elective Course - I	3	1	0	4	ISE 1 MSE ISE 2 ESE	10 20 10 60	40	-	-	100
5	OMDRM505	RM	Research Methodology	3	1	0	4	ISE 1 MSE ISE 2 ESE	10 20 10 60	40	-	-	100
6	OMDPC506	PCC	Design Engineering Lab	0	0	4	2	ISE 1 MSE ISE 2 ESE	25 0 25 50	-	100	40	100
				15	3	4	20	Total Marks					600

Course Category	Programme Core Course	Programme Elective Course	Research Methodology	Total
	PCC	PEC	RM	
Credit	12	4	4	20

ISE 1:-In semester evaluation 1, ISE 2:- In semester evaluation 2,
MSE: - Mid Semester Examination, ESE: - End Semester Examination.
***Passing Cretria :- ISE + MSE + ESE ≥ 40 % Marks and ESE has sepearte passing ≥ 40 % Marks.**

Program Elective Course -I
A. Experimental Stress analysis
B. Vehicle Dynamics
C. Reverse Engineering

Dr. M.L. Hargude HOD Mech.	Dr. K. K Pandyaji Dean Academics	Dr. S. S. Mohite Director	Prof. R. A. Kanai Executive Director

Zeroth Revision

Dr. Vasantraodada Patil Shetkari Shikshan Mandal's

PADMABHOOSHAN VASANTRAODADA PATIL INSTITUTE OF TECHNOLOGY, BUDHGAON , SANGLI. 416304

An Autonomous Institute, affiliated to Dr.Babasaheb Ambedkar Technological University, Lonere, Raigad

PG- MECHANICAL DESIGN ENGINEERING

Curriculum Structure and Evaluation Scheme

(Academic Year 2025-26 Onwords)

SEMESTER II

Sr. No.	Course Code	Type of Course	Course Name	Teaching Scheme				Evaluation Scheme					Total
								Theory			Practical		
				L	T	P	Credits	Scheme		Minimum Marks for Passing	Max	Min	
1	OMDPC551	PCC	Finite Element Analysis	3	1	0	4	ISE 1 MSE ISE 2 ESE	10 20 10 60	40	-	-	100
2	OMDPC552	PCC	Industrial Product Development	3	1	0	4	ISE 1 MSE ISE 2 ESE	10 20 10 60	40	-	-	100
3	OMDPE553	PEC-II	Program Elective Course - II	3	1	0	4	ISE 1 MSE ISE 2 ESE	10 20 10 60	40	-	-	100
4	OMDPE554	PEC-III	Program Elective Course - III	3	0	0	3	ISE 1 MSE ISE 2 ESE	10 20 10 60	40	-	-	100
5	OMDOE555	OEC-I	Open Elective Course - I	3	0	0	3	ISE 1 MSE ISE 2 ESE	10 20 10 60	40	-	-	100
6	OMDVS556	VSE I	Mini Project	0	0	4	2	ISE 1 MSE ISE 2 ESE	25 - 25 50	-	100	40	100
				15	3	4	20	Total Marks					600

Course Category	Programme Core Course	Programme Elective Course	Open Elective Course	Vocational and skill enhancement course	Total
	PCC	PEC	OEC	VSE I	
Credit	8	7	3	2	20

ISE 1:-In semester evaluation 1, ISE 2:- In semester evaluation 2,
MSE: - Mid Semester Examination, ESE: - End Semester Examination.
***Passing Cretria :- ISE + MSE + ESE ≥ 40 % Marks and ESE has sepearte passing ≥ 40 % Marks.**

Program Elective-II	Program Elective-III	OEC I
A.Noise, Vibration, and Harshness	A.Tribology in Design	A.Theory of Elasticity and Plasticity
B.Nanocomposite Material	B.Engineering Fracture Mechanics	B..Design for sustainability
C.Design for Manufacturing and Assembly	C.Product Life cycle Management	C.Designing with Advanced Materials

Dr. M.L. Hargude HOD Mech.	Dr. K. K Pandyaji Dean Academics	Dr. S. S. Mohite Director	Prof. R. A. Kanai Executive Director

Zeroth Revision

Dr. Vasantraodada Patil Shetkari Shikshan Mandal's

PADMABHOOSHAN VASANTRAODADA PATIL INSTITUTE OF TECHNOLOGY, BUDHGAON , SANGLI. 416304

An Autonomous Institute, affiliated to Dr.Babasaheb Ambedkar Technological University, Lonere, Raigad

PG- MECHANICAL DESIGN ENGINEERING

Curriculum Structure and Evaluation Scheme

(Academic Year 2025-26 Onwords)

SEMESTER III

Sr. No.	Course Code	Type of Course	Course Name	Teaching Scheme				Evaluation Scheme					Total
								Theory			Practical		
				L	T	P	Credits	Scheme		Minimum Marks for Passing	Max	Min	
1	OMDOE601	OEC-II	Open Elective Course - II	3	0	0	3	ISE 1 MSE ISE 2 ESE	10 20 10 60	40	-	-	100
2	OMDPE602	PEC-IV	Professional Elective Course - IV	3	0	0	3	ISE 1 MSE ISE 2 ESE	10 20 10 60	40	-	-	100
3	OMDHS603	EEM	Entrepreneurship/ Economics/ Management Course	3	0	0	3	ISE 1 MSE ISE 2 ESE	10 20 10 60	40	-	-	100
4	OMDIK604	IKS	Indian Knowledge System	3	0	0	3	ISE 1 MSE ISE 2 ESE	10 20 10 60	40	-	-	100
5	OMDVS605	VSE II	Research Paper Publication Ethics & writing	0	0	4	2	ISE 1 MSE ISE 2 ESE	25 - 25 50	-	100	40	100
6	OMDDI606	DIS	Dissertation Phase –I	0	0	0	6	ISE 1 MSE ISE 2 ESE	25 - 25 50	-	100	40	100
7	OMDCC607	CCC	Yoga for stress management	0	0	2	0	ISE 1 MSE ISE 2 ESE	- - - -	-	-	-	0
				12	0	6	20	Total Marks					600

Course Category	Entrepreneurship/ Economics/Management Course	Indian Knowledge System	Vocational and skill enhancement course	Programme Elective Course	Open Elective Course	Co – curricular Courses	Dissertation	Total
	EEM	IKS	VSE II	PEC	OEC	CC	DIS	
Credit	3	3	2	3	3	0	6	20

ISE 1:-In semester evaluation 1, ISE 2:- In semester evaluation 2,
MSE: - Mid Semester Examination, ESE: - End Semester Examination.
***Passing Cretria :- ISE + MSE + ESE ≥ 40 % Marks and ESE has sepearte passing ≥ 40 % Marks.**

Open Elective Course –II	Program Elective-IV	Entrepreneurship/ Economics/Management Course	Indian Knowledge System
A.Additive Manufacturing	A. Modern Engineering Materials	A. Intellectual Proprty Rights	A. IKS: Concepts & Applications in Engineering
B. Supply Chain Management	B.Optimization in Design	B. Entrepreneurship & Start-up	B. Constitution of India
C. Industrial Safety Engineering	C. Engineering Computing	C. Engineering Economics Analysis	C. Ancient Indian Management

Dr. M.L. Hargude HOD Mech.	Dr. K. K Pandyaji Dean Academics	Dr. S. S. Mohite Director	Prof. R. A. Kanai Executive Director

Zeroth Revision

Dr. Vasantraodada Patil Shetkari Shikshan Mandal's

PADMABHOOSHAN VASANTRAODADA PATIL INSTITUTE OF TECHNOLOGY, BUDHGAON , SANGLI. 416304

An Autonomous Institute, affiliated to Dr.Babasaheb Ambedkar Technological University, Lonere, Raigad

PG- MECHANICAL DESIGN ENGINEERING

Curriculum Structure and Evaluation Scheme

(Academic Year 2025-26 Onwords)

SEMESTER IV

Sr. No.	Course Code	Type of Course	Course Name	Teaching Scheme				Evaluation Scheme					Total
								Theory			Practical		
				L	T	P	Credit	Scheme		Minimum Marks for Passing	Max	Min	
1	OMDDI651	DIS	Dissertation Phase – II	0	0	0	20	ISE	100	-	100	40	200
								ESE	100		100	40	
				0	0	0	20	Total Marks					200

Course Category	Dissertation	Total
	DIS	
Credit	20	20

□ **One paper publication in highly reputed jounal (Q1 to Q4/ SCOPUS recommended) and one Conference/papers are mandatory for dissertation submission.**

Summary of Semester-wise Credits

Semester I	Semester II	Semester III	Semester IV	Total Credits
20	20	20	20	80

Dr. M.L. Hargude HOD Mech.	Dr. K. K Pandyaji Dean Academics	Dr. S. S. Mohite Director	Prof. R. A. Kanai Executive Director

Dr. Vasantraodada Patil Shetkari Shikshan Mandal's

PADMABHOOSHAN VASANTRAODADA PATIL INSTITUTE OF TECHNOLOGY (PVPIT), BUDHGAON, SANGLI

An Autonomous Institute, affiliated to Dr. Babasaheb Ambedkar Technological University, Lonere, Raigad (Accredited by NAAC)

M. Tech Mechanical Design Engineering

Curriculum w.e.f. A. Y. 2025-26

SEMESTER I

Modern Engineering Design

Course Code and Course Title		OMDEPC501 Modern Engineering Design			
Semester		I			
Pre-requisites		Machine design, Materials, CAD			
Teaching Scheme (Hours per week)		Lecture	Tutorial	Practical	
		3	-	-	
Credits		3			
Evaluation Scheme		ISE 1	MSE	ISE 2	ESE
		10	20	10	60
Course Outcomes (CO) Upon successful completion of this course, the student will be able to:					BL
1	Explain the engineering design process, various design models (Shigley, Asimov, Norton) and the importance of problem formation in product design.				4
2	Select the most feasible product concept using decision-making tools and selection matrices.				5
3	Apply design considerations for non-metallic components such as plastics, rubber, ceramics, wood, and glass based on their unique properties.				3
4	Evaluate the effects of creep, cumulative fatigue damage, thermal fatigue, and residual stresses on component life.				5
5	Select suitable materials, lubrication, and surface treatments to enhance surface fatigue strength and minimize wear.				4
6	Integrate modern design approaches (concurrent engineering, sustainable design, DFX, CAE) into product development.				5

Course Content

Unit No.	Content	Hrs
Unit 1	**Design Philosophy-** Design process, Problem formation, Introduction to product design, Various design models - Shigley model, Asimov model and Norton model, Need analysis, Strength considerations -standardization. Creativity, Creative techniques, Material selections, design for safety and Reliability	06
Unit 2	**Product Design-** Product strategies, value, planning and specification, concept generation, concept selection, concept testing	05
Unit 3	**Design for Manufacturing-** Forging design, casting design, Design process for non-metallic parts, Plastics, Rubber, Ceramic, Glass parts. Material selection in machine design.	06
Unit 4	**Failure theories-** Static failure theories, Distortion energy theory, Maximum shear stress theory, Coulomb-Mohr's theory, Modified Mohr's theory, Fracture mechanics theory, Fatigue mechanisms, Fatigue failure models, Design for fatigue strength and life, creep: design for fluctuating stresses, design for limited cycles, multiple stress cycles, Fatigue failure theories, cumulative fatigue damage, thermal fatigue and shock, harmful and beneficial residual stresses	07

Dr. M.L. Hargude HOD Mech.	Dr. K. K Pandyaji Dean Academics	Dr. S. S. Mohite Director	Prof. R. A. Kanai Executive Director

Unit 5	**Surface failures-** Surface geometry, mating surfaces, oil film and their effects, design values and procedures, adhesive wear, abrasive wear, corrosion wear, surface fatigue, dynamic contact stresses, surface fatigue failures, surface fatigue strength.	06
Unit 6	**Economic factors influencing design -** Economic analysis, Break-even analysis, Human engineering considerations, Ergonomics, Design of controls, Design of displays. Value engineering, Modern approaches in design	06

Texts Books:

1. Smith Seely, "Advanced Mechanics of Materials", John Willey & Sons Publications.
2. Timoshenko, "Strength of Materials"
3. Kocanda, "Fatigue Failure of Metal", Sijthoff and Noordhoff International Publications.

Reference books

1. Frost N. E., "Metals Fatigue", Oxford University Press, London.
2. Benhan& Crawford, "Mechanics of Engineering Materials", John Willey & Sons Pub.
3. Spotts M. F., "Mechanical Design Analysis", PHI Publications, New Delhi.

Dr. M.L. Hargude HOD Mech.	Dr. K. K Pandyaji Dean Academics	Dr. S. S. Mohite Director	Prof. R. A. Kanai Executive Director

Dr. Vasantraodada Patil Shetkari Shikshan Mandal's

PADMABHOOSHAN VASANTRAODADA PATIL INSTITUTE OF TECHNOLOGY (PVPIT), BUDHGAON, SANGLI

An Autonomous Institute, affiliated to Dr. Babasaheb Ambedkar Technological University, Lonere, Raigad (Accredited by NAAC)

M. Tech Mechanical Design Engineering

Curriculum w.e.f. A. Y. 2025-26

Synthesis and Analysis of Mechanisms

Course Code and Course Title	**OMDPC502 Synthesis and Analysis of Mechanisms**			
Semester	I			
Prerequisites	Engineering Mechanics and Theory of Machines			
Teaching Scheme (hours per week)	**Lecture**	**Tutorial**	**Practical**	
	3	1	-	
Credit	04			
Evaluation Scheme	**ISE 1**	**MSE**	**ISE 2**	**ESE**
	10 Marks	20 Marks	10 Marks	60 Marks

Course Outcomes (COs): -Upon successful completion of this course, the student will able to:		**BL**
CO1	Identify types of mechanisms and calculate their degree of freedom.	3
CO2	Analyse velocity and acceleration of planar mechanisms.	4
CO3	Apply curvature theory to find centrodes and path curvature.	3
CO4	Design and synthesize four-bar and slider–crank mechanisms.	5
CO5	Analyse coupler curves and spatial mechanisms using Denavit–Hartenberg parameters.	4

Course Content

Unit No.	**Contents**	**Hrs.**
Unit 1	**Basic Concepts:** Definitions and assumptions; planar and spatial mechanisms; kinematic pairs; degree of freedom; equivalent mechanisms; Kinematic Analysis of Planar Mechanisms. Review of graphical and analytical methods of velocity and acceleration analysis of kinematically simple mechanisms, velocity-acceleration, analysis of complex mechanisms by the normal acceleration and auxiliary-point methods.	06
Unit 2	**Curvature Theory:** Fixed and moving centrodes, inflection circle, Euler-Savary equation, Bobillier constructions, cubic of stationary curvature, Ball's point, Applications in dwell mechanisms.	06
Unit 3	**Kinematic synthesis of planar mechanisms- Graphical:** Accuracy (precision) points, Chebesychev spacing, types of errors, Graphical synthesis for function generation and rigid body guidance with two, three and four accuracy points using pole method, center and circle point curves	06
Unit 4	**Kinematic synthesis of planar mechanisms- Analytical:** Analytical synthesis of four-bar and slider-crank mechanisms, Freudenstein's equation, synthesis for four and five accuracy points, compatibility condition, synthesis of four-bar for prescribed angular velocities and accelerations using complex numbers, three accuracy point synthesis using complex numbers.	08
Unit 5	**Coupler Curves:** Equation of coupler curve, Robert-Chebychev theorem, double points and symmetry.	04
Unit 6	**Kinematic analysis of spatial mechanism:** Denavit-Hartenberg parameters, matrix method of analysis of spatial mechanisms	06

Dr. M.L. Hargude HOD Mech.	Dr. K. K Pandyaji Dean Academics	Dr. S. S. Mohite Director	Prof. R. A. Kanai Executive Director

List of Tutorials		
Tutorial No.	Title	Hrs.
1	Identification and Classification of Mechanisms	1
2	Velocity Analysis of Four-Bar Mechanism (Graphical Method)	1
3	Acceleration Analysis by Auxiliary Point Method	1
4	Determination of Fixed and Moving Centrodes	1
5	Euler–Savary Equation and Inflection Circle	1
6	Bobillier Construction and Ball's Point Analysis	1
7	Graphical Synthesis for Function Generation (Two & Three Accuracy Points)	1
8	Rigid Body Guidance using Chebyshev Spacing	1
9	Analytical Synthesis using Freudenstein's Equation	1
10	Complex Number Approach for Four-Bar Mechanism Synthesis	1
11	Coupler Curve Generation and Verification of Robert–Chebyshev Theorem	1
12	Kinematic Analysis of Spatial Mechanism using Denavit–Hartenberg Parameters	1

Text Books:

1. R.S. Hartenberg and J. Denavit, "Kinematic Synthesis of Linkages", McGraw-Hill, New York, 1980.
2. Robert L. Nortan ,"Design of Machinery', Tata McGraw Hill Edition
3. Hamilton H. Mabie, "Mechanisms and Dynamics of Machinery", John Wiley and sons New York.
4. S. B. Tuttle, "Mechanisms for Engineering Design" John Wiley and sons New York
5. Ghosh and A.K. Mallik, "Theory of Machines and Mechanisms", Affiliated East- West Press, New Delhi, 1988

Reference Book:

6. A.G. Erdman and G.N. Sandor, "Mechanism Design – Analysis and Synthesis", (Vol. 1 and 2), Prentice Hall India, 1988.
7. A.S. Hall, "Kinematics and Linkage Design", Prentice Hall of India.
8. J.E. Shigley and J.J. Uicker, "Theory of Machines and Mechanisms", 2nd Edition, McGraw-Hill, 1995.

Dr. M.L. Hargude HOD Mech.	Dr. K. K Pandyaji Dean Academics	Dr. S. S. Mohite Director	Prof. R. A. Kanai Executive Director

M. Tech Mechanical Design Engineering

Curriculum w.e.f. A. Y. 2025-26

Advanced Mechanical Vibrations

Course Code and Course Title	**OMDEPC503 Advanced Mechanical Vibrations**			
Semester	I			
Pre-requisites	Kinematics and Dynamics of Machinery			
Teaching Scheme (Hours per week)	**Lecture**	**Tutorial**	**Practical**	
	3	---	-	
Credits	3			
Evaluation Scheme	**ISE 1**	**MSE**	**ISE 2**	**ESE**
	10	20	10	60

Course Outcomes (CO) Upon successful completion of this course, the student will be able to:		**BL**
1	Apply vibration theory to identify, formulate and solve the vibration problem	3
2	Evaluate natural frequencies and mode shapes of the vibratory system	5
3	Analyse the vibration data using various vibration measuring equipment	4
4	Analyse the machine conditions subjected to vibration	4

Unit No.	**Content**	**Hrs**
Unit 1	**Single Degree of Freedom Systems** – Free vibrations. elements of a vibratory system, degrees of freedom, types of vibration, natural frequency, equivalent springs, modelling of a system, formulation of the equation of motion by equilibrium and energy methods. problems with SDOF. natural frequency for longitudinal, transverse, and torsional vibratory systems. different types of damping, free vibrations with viscous damping - over-damped, critically damped, and under-damped systems, logarithmic decrement	07
Unit 2	**SDOF Forced Vibration and 2DOF system:** Forced vibrations of longitudinal and torsional systems, frequency response to harmonic excitation, excitation due to reciprocating and rotating unbalance, base excitation, magnification factor, resonance phenomenon, and phase difference. free vibration of spring-coupled systems – longitudinal and torsional, natural frequency and mode shapes, eigenvalue and eigen vector by matrix method	05
Unit 3	**Multi-degree freedom system** – Equation of motion, influence coefficient, Maxwell reciprocal theorem, and problems, Rayleigh's method, matrix method, and determination of natural frequencies of MDOF.	06
Unit 4	**Vibration Measurement** – Introduction, Transducers - Variable Resistance, Piezoelectric, Electrodynamic, Vibration Pickups – Vibrometer, Accelerometer, Velometer, Frequency-Measuring Instruments, Vibration Exciters - Mechanical Exciters, Electrodynamic Shaker.	05
Unit 5	**Modal Analysis** - Need and use of experimental modal analysis, frequency response functions (FRFs), signal processing for modal analysis, FRF measurement using an impact hammer, FRF measurement using a shaker, modal parameter estimation methods overview, phase resonance testing, operational modal analysis, applications of EMA, overview of the field of modal analysis	07
Unit 6	**Machinery Condition Monitoring** – Introduction to machinery condition monitoring, machine maintenance - reactive, preventive, predictive, principles of	06

Dr. M.L. Hargude HOD Mech.	Dr. K. K Pandyaji Dean Academics	Dr. S. S. Mohite Director	Prof. R. A. Kanai Executive Director

	machine vibration monitoring - misalignment detection, eccentricity detection, cracked shaft, methods in condition monitoring - eddy current testing, ultrasonic testing, radiography, acoustic emission etc.	

Texts Books

1) S.S. Rao, Mechanical Vibrations, Pearson Education India
2) Theory of Vibration with Applications, W. T. Thomson, CBS Publ., 1990
3) Grover G. K. "Mechanical Vibrations", Nem Chand and Bros.,Roorkee
4) Analytical and Experimental Modal Analysis, Subodh V. Modak Taylor & Francis CRC Press 2004
5) Machinery Condition Monitoring Principles and Practices, Amiya R. Mohanty, Taylor & Francis CRC Press

Reference books

1) Thomson,W.T.,"Theory of Vibration with Applications", CBS Publishers and Distributors
2) V P Singh " Mechanical Vibrations DhanpatRai& Sons, New Delhi
3) DrDebabrata, " Mechanical Vibrations", Wiley India Pvt. Ltd, New Delhi.
4) Kelly S. G. "Mechanical Vibrations", Schaum's outlines, Tata McGraw Hill Publishing Co. Ltd., New Delhi.
5) Meirovitch, "Elements of Mechanical Vibrations", McGraw Hill
6) Steinberg, D. S., "Vibration Analysis for Electronic Equipments", John Wiley and Sons.

Useful Links

1) http://www.digimat.in/nptel/courses/video/112107212/L01.html
2) file:///C:/Users/admin/Downloads/Engineering_Vibration_Fourth_Edition.pdf
3) https://archive.nptel.ac.in/courses/112/105/112105048/

Dr. M.L. Hargude HOD Mech.	Dr. K. K Pandyaji Dean Academics	Dr. S. S. Mohite Director	Prof. R. A. Kanai Executive Director

P.V.P. Institute of Technology Budhgaon 6269

Experimental Stress Analysis

Course Code and Course Title	**OMDPE504A Experimental Stress Analysis**			
Semester	I			
Prerequisites	Engineering Mechanics			
Teaching Scheme (hours per week)	**Lecture**	**Tutorial**	**Practical**	
	3	1	-	
Credit	04			
Evaluation Scheme	**ISE 1**	**MSE**	**ISE 2**	**ESE**
	10 Marks	20 Marks	10 Marks	60 Marks

Course Outcomes (COs): -Upon successful completion of this course, the student will able to:		**BL**
CO1	Explain the need for stress analysis and evaluate the merits and limitations of experimental methods.	3
CO2	Apply the fundamentals of elasticity to analyze 2-D stress, strain, and displacement problems.	4
CO3	Select and compare different strain measurement techniques, including strain gauges and grid methods.	3
CO4	Utilize electrical strain gauges, Wheatstone bridge circuits, and rosette methods for practical stress–strain analysis.	3
CO5	Demonstrate the principles of photoelasticity and related optical methods for experimental stress analysis in 2-D problems.	3

Course Content

Unit No.	**Contents**	**Hrs.**
Unit 1	**Experimental methods:** Need of stress analysis; Why experimental methods? Merits and demerits of experimental methods	06
Unit 2	**Basics of Elasticity:** Stress at a point; stress equations of equilibrium; 2-D state of stress; Strains and displacements; Stress strain relationship for 2-D state of stress; Plane stress and plane strain approach	06
Unit 3	**Measurement of Strain:** Strain gauges: Mechanical, optical, electrical, acoustical and semiconductor; Grid method of strain analysis.	06
Unit 4	**Electrical strain gauges:** Gauge construction; Strain gauge adhesives and mounting techniques; Gauge sensitivity and gauge factor; Strain gauge linearity, hysteresis and zero shift; Temperature compensation; Environmental effects: moisture, humidity and hydrostatic pressure, high and cryogenic temperatures; The Wheatstone bridge; Calibration of strain gauge circuit; Strain analysis method: 3-element rectangular rosette, torque gauge	08
Unit 5	**Basics of Optics:** Nature of light; Wave theory of light; Optical instruments; Plane and circular polariscopes.	04

Dr. M.L. Hargude HOD Mech.	Dr. K. K Pandyaji Dean Academics	Dr. S. S. Mohite Director	Prof. R. A. Kanai Executive Director

P.V.P. Institute of Technology 6269 Budhgaon

Unit 6	**Theory of Photoelasticity:** Stress optics law; Effects of a stressed model in a plane polariscope; Effects of principal stress directions; Effects of principal stress difference; Effects of a stressed model in circular polariscope in dark and light field arrangements; 2-D Photoelasticity; Isochromatic and isoclinic fringe patterns; Materials for 2-D Photoelasticity; Introduction to moiré fringe technique and coating methods	06

List of Tutorials

Tutorial No.	Title	Hrs.
1	Tutorial on Experimental methods	02
2	Tutorial on Basics of Elasticity	02
3	Tutorial on Measurement of Strain	02
4	Tutorial on Electrical strain gauges	02
5	Tutorial on Basics of Optics	02
6	Tutorial on Theory of Photoelasticity	02

Text Books

1. Experimental Stress Analysis – James W. Dally & William F. Riley (McGraw-Hill).
2. Experimental Stress Analysis – L.S. Srinath (Tata McGraw-Hill).
3. Photoelasticity – M.M. Frocht (Wiley).
4. Experimental Stress Analysis – Sadhu Singh (Khanna Publishers).

Reference Books

1. Finite Element Method – J.N. Reddy (for hybrid experimental–numerical approach)
2. Experimental Stress Analysis and Motion Measurement – Gary Cloud.
3. Digital Image Correlation and Tracking – M.A. Sutton et al.
4. Stress Analysis of Materials and Structures – Robert M. Jones.
5. Mechanical Measurements – Beckwith, Marangoni & Lienhard.

Useful links /Web Resources

1. NPTEL Courses:
   Experimental Stress Analysis Prof. K. Ramesh– IIT Madras
   https://nptel.ac.in/courses/112106247
2. Society for Experimental Mechanics (SEM): sem.org
3. Correlated Solutions (DIC software): correlatedsolutions.com

Dr. M.L. Hargude HOD Mech.	Dr. K. K Pandyaji Dean Academics	Dr. S. S. Mohite Director	Prof. R. A. Kanai Executive Director

M. Tech Mechanical Design Engineering

Curriculum w.e.f. A. Y. 2025-26

Vehicle Dynamics

Course Code and Course Title	**OMDPE504B Vehicle Dynamics**				
Semester	I				
Prerequisites	Basic Dynamics and Control Systems				
Teaching Scheme (hours per week)	**Lecture**	**Tutorial**	**Practical**		
	3	1	-		
Credit	04				
Evaluation Scheme	**ISE 1**	**MSE**	**ISE 2**	**ESE**	
	10 Marks	20 Marks	10 Marks	60 Marks	

Course Outcomes (COs): -Upon successful completion of this course, the student will able to:		**BL**
CO1	Develop an advanced understanding of vehicle dynamics with emphasis on design engineering.	3
CO2	Analyze longitudinal, lateral, and vertical vehicle behavior using modeling and simulation.	5
CO3	Explore tire mechanics and vehicle handling characteristics.	4
CO4	Apply mathematical models to assess stability, control, and safety.	6
CO5	Integrate theoretical knowledge with practical vehicle design.	5

Course Content

Unit No.	**Contents**	**Hrs.**
Unit 1	**Introduction to Vehicle Dynamics -** Advanced concept of vehicle dynamics – Degrees of freedom – Vehicle coordinate systems – Modeling approaches – Importance in design engineering – Role in safety and performance	06
Unit 2	**Longitudinal Dynamics -** Vehicle load distribution – Acceleration and braking dynamics – Brake force distribution - Braking efficiency and braking distance – Longitudinal dynamics of tractor-semi trailer – Simulation and optimization techniques.	06
Unit 3	**Tire Mechanics – An Introduction -** Mechanical properties of rubber – Slip, grip, and rolling resistance – Tire construction and force development – Contact patch and pressure distribution – Material design aspects.	06
Unit 4	**A Simple Tire Model -** Lateral force generation – Ply steer and conicity – Tire models – Magic Formula – Classification of tire models – Combined slip – Parameter identification.	06
Unit 5	**Lateral Dynamics -** Bicycle model – Stability and steering conditions – Understeer gradient and state space approach – Handling response – Mimuro plot for transient response – Design parameters affecting handling characteristics – Control strategies	07
Unit 6	**Vertical Dynamics -** Rollover prevention – Half car model – Quarter car model – Suspension design – Ride comfort analysis – Integration with active systems.	05

Dr. M.L. Hargude HOD Mech.	Dr. K. K Pandyaji Dean Academics	Dr. S. S. Mohite Director	Prof. R. A. Kanai Executive Director

List of Tutorials		
Tutorial No.	Title	Hrs.
1	Tutorial on Introduction to Vehicle Dynamics	02
2	Tutorial on Longitudinal Dynamics	02
3	Tutorial on Tire Mechanics	02
4	Tutorial on Simple Tire Model	02
5	Tutorial on Lateral Dynamics	02
6	Tutorial on Vertical Dynamics	02

Text Books

1. Wong, J.Y., "Theory of Ground Vehicles", Wiley.
2. Rajesh Rajamani, "Vehicle Dynamics and Control", Springer.
3. Gillespie, T.D., "Fundamentals of Vehicle Dynamics", SAE International.

Reference Books

1. Pacejka, H.B., "Tire and Vehicle Dynamics", Butterworth-Heinemann.
2. Milliken, W.F., "Race Car Vehicle Dynamics", SAE.
3. Reimpell, J., "The Automotive Chassis", Butterworth-Heinemann.

Useful links /Web Resources

4. **NPTEL Courses:**

   Vehicle Dynamics - https://nptel.ac.in/courses/112106270

5. **Society for Experimental Mechanics (SEM):** sem.org

Dr. M.L. Hargude HOD Mech.	Dr. K. K Pandyaji Dean Academics	Dr. S. S. Mohite Director	Prof. R. A. Kanai Executive Director

Reverse Engineering

Course Code and Course Title	OMDPE504C Reverse Engineering			
Semester	I			
Prerequisites	Machine design, CAD			
Teaching Scheme (hours per week)	Lecture	Tutorial	Practical	
	3	1	-	
Credit	04			
Evaluation Scheme	ISE 1	MSE	ISE 2	ESE
	10 Marks	20 Marks	10 Marks	60 Marks

Course Outcomes (COs): -Upon successful completion of this course, the student will able to:		BL
CO1	Introduce the principles and processes of reverse engineering.	3
CO2	Develop understanding of material characterization, durability, and life limitations.	4
CO3	Impart knowledge of dimensional measurements, surface & solid model reconstruction.	4
CO4	Analyze part failure, fatigue, creep, and stress rupture in components.	5
CO5	Integrate modern prototyping and CAD tools for product development.	4

Course Content

Unit No.	Contents	Hrs.
Unit 1	**Reverse Engineering Fundamentals** - Definition, scope, and significance. ,Uses & limitations.The generic RE process & phases., Role of RE in product design and innovation., Emerging tools (3D scanning, digital twins).	06
Unit 2	**Geometric Form & Computer-Aided Reverse Engineering** - Surface and solid model reconstruction. Dimensional measurement techniques. CAD/CAE tools for RE. Rapid prototyping & additive manufacturing for RE. ,AI/ML-assisted model reconstruction (advanced addition).	06
Unit 3	**Material Characteristics, Durability & Life Limitation** - Alloy structure equivalency., Phase formation and identification. Mechanical strength, hardness., Failure analysis: fatigue, creep, stress rupture., Environmentally induced failures (corrosion, wear, oxidation).	06
Unit 4	**Material Identification & Process Verification** - Material specification & composition determination. , Microstructure analysis., Non-destructive testing (NDT) methods. , Manufacturing process verification., Linkage between material/process and design performance.	06
Unit 5	**Data Processing, Reliability & Performance Evaluation** - Statistical & data analysis for RE., Reliability engineering & theory of interference., Weibull analysis, conformity, and acceptance. Performance evaluation criteria & methodologies., System compatibility & design validation.	05
Unit 6	**Acceptance, Legality & Industrial Applications** - Legality of RE: patent, copyright, trade secret., Ethical & IP considerations in RE., Applications in automotive, aerospace, medical devices. , Case studies: component tear-downs & product benchmarking., Sustainability: remanufacturing, recycling, and circular design.	07

Dr. M.L. Hargude HOD Mech.	Dr. K. K Pandyaji Dean Academics	Dr. S. S. Mohite Director	Prof. R. A. Kanai Executive Director

List of Tutorials		
Tutorial No.	Title	Hrs.
1	Tutorial on Reverse Engineering Fundamentals	02
2	Tutorial on Geometric Form & Computer-Aided Reverse Engineering	02
3	Tutorial on Material Characteristics, Durability & Life Limitation	02
4	Tutorial on Material Identification & Process Verification	02
5	Tutorial on Data Processing, Reliability & Performance Evaluation	02
6	Tutorial on Acceptance, Legality & Industrial Applications	02

Text Books

1. Vinesh Raja & Kiran J. Fernandes, Reverse Engineering: An Industrial Perspective, Springer.
2. Starks, M., Reverse Engineering, McGraw-Hill.

Reference Books

1. A. Alavudeen & N. Venkateshwaran, Computer Integrated Manufacturing, PHI.
2. Iyer, N. & Gurumoorthy, B., Reverse Engineering: An Industrial Perspective, Springer.
3. Kai Cheng, Machining Dynamics: Fundamentals, Applications and Practices, Springer.

Useful links /Web Resources

6. **NPTEL Courses:**

   Reverse Courses https://nptel.ac.in/courses/112104265

7. MIT OpenCourseWare – Mechanical Engineering Courses
   https://ocw.mit.edu/courses/mechanical-engineering/

Dr. M.L. Hargude HOD Mech.	Dr. K. K Pandyaji Dean Academics	Dr. S. S. Mohite Director	Prof. R. A. Kanai Executive Director

M. Tech Mechanical Design Engineering

Curriculum w.e.f. A. Y. 2025-26

Research Methodology

Course Code and Course Title	**OMDRM505 Research Methodology**				
Semester	I				
Prerequisites	Computing, Technical Writing				
Teaching Scheme (hours per week)	**Lecture**	**Tutorial**	**Practical**		
	3	1	-		
Credit	04				
Evaluation Scheme	**ISE 1**	**MSE**	**ISE 2**	**ESE**	
	10 Marks	20 Marks	10 Marks	60 Marks	

Course Outcomes (COs): -Upon successful completion of this course, the student will able to:		**BL**
CO1	Formulate a good research problem, hypothesis and objectives.	3
CO2	Identify alternative research methodologies and analytical techniques for a chosen research question.	4
CO3	Analyse basic techniques of quantitative and qualitative data gathering.	5
CO4	Identify the purpose, process, methods and results in preparation of a research report	4

Course Content

Unit No.	**Contents**	**Hrs.**
Unit 1	**Introduction to Research Methodology** - Meaning and Concept of Research, Research Process, Objectives, Motivation, Ethics in Research, Types of Research – Basic, Applied, Descriptive, Analytical, Conceptual, Empirical, Qualitative and Quantitative.	06
Unit 2	**Problem Identification & Formulation** – Introduction, Concept and Need of Research Problem, Literature Survey,hypothesis, characteristics of hypothesis, Steps of Defining a Research Problem, Characteristics of a Good Research Problem, Identifying and Formulating Research Problem	06
Unit 3	**Measurement and Scaling Techniques** – Concept of Measurement, Measurement Scale, Developing Measurement Tools, Basic Criteria of Good Measurement Tools, Errors in Measurement, Concept of Scaling and Types of Scales	06
Unit 4	**Methods of Data Collection-** Concept of Data Collection, Types of Data, Methods of Primary Data Collection, Methods of Secondary Data Collection, Selecting an Appropriate Method of Data Collection.	05
Unit 5	**Test of Significance** - Basic concepts, procedure of hypothesis testing, Tests for Hypotheses I and II, Important parameters, Limitations of the tests of Hypotheses, Parametric tests-chi square, t – Test, F Test, Z Test. Introduction to ANOVA, One way, Two way and three-way ANOVA classification.	07
Unit 6	**Interpretation and Report Writing** - Techniques of interpretation, Structure and components of scientific reports, Layout, structure and language of the report, Illustrations and tables, References and Citations.	06

Dr. M.L. Hargude HOD Mech.	Dr. K. K Pandyaji Dean Academics	Dr. S. S. Mohite Director	Prof. R. A. Kanai Executive Director

List of Tutorials		
Tutorial No.	Title	Hrs.
1	Tutorial on Introduction to Research Methodology	02
2	Tutorial on Problem Identification & Formulation	02
3	Tutorial on Measurement and Scaling Techniques	02
4	Tutorial on Methods of Data Collection	02
5	Tutorial on Test of Significance	02
6	Tutorial on Interpretation and Report Writing	02

Texts Books:

1. Books: C. R. Kothari, —Research Methodologyl, New Age international, 2004.

2. Deepak Chopra and Neena Sondhi, —Research Methodology: Concepts and casesl, Vikas Publishing House, New Delhi, 2008..

3J.W Bames, Statistical Analysis for Engineers and Scientists, McGraw Hill, N.York

References Books:

4. Schank Fr., Theories of Engineering Experiments, Tata McGraw Hill Publication.

5. Willktnsion K. L, Bhandarkar P. L, Formulation of Hypothesis, Himalaya Publication

Dr. M.L. Hargude HOD Mech.	Dr. K. K Pandyaji Dean Academics	Dr. S. S. Mohite Director	Prof. R. A. Kanai Executive Director

P.V.P. Institute of Technology, Budhgaon 6269

M. Tech Mechanical Design Engineering

Curriculum w.e.f. A. Y. 2025-26

Design Engineering Lab

Course Code and Course Title	**OMDPC506 Design Engineering Lab**			
Pre-requisites	Machine Design			
Teaching Scheme (Hours per week)	**Lecture**	**Tutorial**	**Practical**	
	-	-	4	
Credits	2			
Evaluation Scheme	**ISE 1**	**MSE**	**ISE 2**	**ESE**
	25	-	25	50

	Course Outcomes (CO) Upon successful completion of this course, the student will be able to:	**BTL**
1	Solve field problems by using different techniques in advanced machine design	3
2	Design suitable mechanical systems using concepts in advanced machine design	5
3	Prepare and present a detailed technical report based on experiment/ mini project work.	5

Content

List of Lab Activities: The laboratory activities focus on hands-on learning and innovation in the thrust areas of advanced machine design, encompassing the design and fabrication of functional prototypes, development of customized apparatus and small-scale equipment, and creation of innovative experimental setups. Lab activities also include the improvement and innovation of existing products, analytical and simulation-based evaluation of mechanical processes, and validation of fundamental and advanced machine design principles, thereby strengthening the integration of theory, analysis, and practical engineering applications.

Textbooks:
Appropriate textbooks aligned with the objectives and content of the selected experiments.

Reference Books:
Standard reference books relevant to the experimental topics, along with research papers from reputed national and international journals and conference proceedings.

Useful Links:
Relevant online resources and digital links should be selected according to the specific requirements of each experiment.

Dr. M.L. Hargude HOD Mech.	Dr. K. K Pandyaji Dean Academics	Dr. S. S. Mohite Director	Prof. R. A. Kanai Executive Director

M. Tech Mechanical Design Engineering

Curriculum w.e.f. A. Y. 2025-26

SEMESTER II

Finite Element Analysis

Course Code and Course Title	**OMDPC551 Finite Element Analysis**				
Semester	II				
Prerequisites	Engineering Computing				
Teaching Scheme (hours per week)	**Lecture**	**Tutorial**	**Practical**		
	3	1	-		
Credit	04				
Evaluation Scheme	**ISE 1**	**MSE**	**ISE 2**	**ESE**	
	10 Marks	20 Marks	10 Marks	60 Marks	

Course Outcomes (COs): -Upon successful completion of this course, the student will able to:		**BL**
CO1	Explain basic concepts, procedure, and applications of Finite Element Analysis..	3
CO2	Apply FEM principles to solve 1-D structural problems using Rayleigh–Ritz and stiffness methods.	3
CO3	Analyze 2-D elements under plane stress and strain conditions using FEM.	4
CO4	Utilize iso-parametric formulation and convergence tests for accurate FEM modelling.	4
CO5	Evaluate 3-D, plate, and shell problems including dynamic and stability analysis using FEM.	5

Course Content

Unit No.	**Contents**	**Hrs.**
Unit 1	**Introduction:** Introduction to FEA, Brief History, General FEM procedure, Simplification of problem through Symmetry, Various terminologies associated with FEA (Discretization, nodes and element) Stiffness matrix and its properties.) Application of FEM in various fields. Advantages and Disadvantages of FEA	07
Unit 2	**1-D PROBLEMS**: Principles of linear elastic mechanics, principles of virtual displacements and minimum potential energy, Rayleigh Ritz method, exact v/s approximate solution, beam elements.	05
Unit 3	**2-D PROBLEMS:** Plane stress and plane strain conditions, triangular elements, constant strain triangle, linear strain triangle, Boundary conditions, body forces and stress recovery, quadrilateral elements.	06
Unit 4	**2-D PROBLEMS**: Lagrange and Serendipity shape functions, isoparametric formulation, numerical integration, modeling with isoparametric elements, requirements for convergence, patch test, nonconforming elements, reduced integration.	06
Unit 5	**3-D PROBLEMS:** Axisymmetric solids, governing equations, axisymmetric elements and their applications, mixed formulations, bending of flat plates (Kirchhoff Theory), continuity requirements and boundary conditions.	06

Dr. M.L. Hargude HOD Mech.	Dr. K. K Pandyaji Dean Academics	Dr. S. S. Mohite Director	Prof. R. A. Kanai Executive Director

Unit 6	**3-D PROBLEMS**: Discrete Kirchhoff's elements, thick plate elements, plate bending applications, shells as assemblage of flat plates, finite element formulation for dynamic problems, mass properties, introduction to elastic stability for frames and plates.	06

List of Tutorials

Tutorial No.	Title	Hrs.
1	Introduction to Finite Element Method: Basic concepts, need, and applications	01
2	Steps in FEM Procedure and Terminologies	01
3	Derivation of Shape Function for a 1D Bar Element	01
4	Formulation of Stiffness Matrix for 1D Linear Bar Element	01
5	Analysis of Stepped Bar under Axial Load	01
6	Rayleigh–Ritz Method for a 1D Structural Problem	01
7	Plane Stress and Plane Strain Problems Using CST Element	01
8	Quadrilateral Element Formulation and Comparison with Triangular Element	01
9	Isoparametric Formulation Using Lagrange Shape Functions	01
10	Patch Test and Convergence Criteria	01
11	Axisymmetric Solid Element Analysis	01
12	Plate and Shell Element Formulation with Dynamic and Stability Analysis	01

Texts Books:

1. R. D. Cook, Concepts and Applications of Finite Element Analysis, John Wiley and Sons, second edition, 1981..
2. C.S. Krishnamurti, Finite element method, Tata Mc-Graw Hill Publication.
3. K.J. Bathe, Finite Element Method and Procedures, Prentice hall, 1996.
4. Tirupathi, R., and Chandrupatla,Finite Elements in Engineering, PHI Publication, New Delhi.
5. Bruce Irons and SoharabAhmed,Techniques of Finite Elements, John Wiley and Sons, New York.

References Books:

1. K.J. Bathe, Finite Element Method, Prentice Hall, 1987.
2. O.P., Gupta, Finite and Boundary Element Methods in Engineering, Oxford and IBH.
3. J.E. Shigley and J.J. Uicker, "Theory of Machines and Mechanisms", 2nd Edition, McGraw-Hill, 1995.

Dr. M.L. Hargude HOD Mech.	Dr. K. K Pandyaji Dean Academics	Dr. S. S. Mohite Director	Prof. R. A. Kanai Executive Director

Dr. Vasantraodada Patil Shetkari Shikshan Mandal's

PADMABHOOSHAN VASANTRAODADA PATIL INSTITUTE OF TECHNOLOGY (PVPIT), BUDHGAON, SANGLI

An Autonomous Institute, affiliated to Dr. Babasaheb Ambedkar Technological University, Lonere, Raigad (Accredited by NAAC)

M. Tech Mechanical Design Engineering

Curriculum w.e.f. A. Y. 2025-26

Industrial Product Development

Course Code and Course Title	**OMDPC552 Industrial Product Development**			
Semester	II			
Prerequisites	Machine Design, Materials			
Teaching Scheme (hours per week)	**Lecture**	**Tutorial**	**Practical**	
	3	1	-	
Credit	04			
Evaluation Scheme	**ISE 1**	**MSE**	**ISE 2**	**ESE**
	10 Marks	20 Marks	10 Marks	60 Marks

Course Outcomes (COs): -Upon successful completion of this course, the student will able to:		**BL**
CO1	Explain basic concepts, procedure, and applications of Finite Element Analysis..	4
CO2	Apply FEM principles to solve 1-D structural problems using Rayleigh–Ritz and stiffness methods.	3
CO3	Analyze 2-D elements under plane stress and strain conditions using FEM.	4
CO4	Utilize isoparametric formulation and convergence tests for accurate FEM modeling.	4
CO5	Evaluate 3-D, plate, and shell problems including dynamic and stability analysis using FEM.	5
CO6	Apply the economic and environment considerations in Design.	3

Course Content

Unit No.	**Contents**	**Hrs.**
Unit 1	**Introduction:-** Need of Industrial design, Concept development process, Design and development process of industrial products, Assessing the quality of Industrial design, Problems faced by industrial designer, Types of models used in industrial design-Clay studies, Mock ups, scale models, Prototypes.	06
Unit 2	**Industrial Product Design: -** Design of industrial and consumer products, setting specification, requirements and rating, their importance in the design. Study of market requirements and manufacturing aspects of industrial designs, Challenges of Product development.	06
Unit 3	**Aesthetic and Ergonomic Concepts: -** Concept of unity and order with variety, concept of purpose, style and environment. Aesthetic expressions of symmetry, balance, contrast continuity, proportion. Mechanics of seeing, psychology of seeing. Influence of line and form. Effect of color on product, appearance, reactions to color and color combinations. Man-Machine relationship.	06
Unit 4	**New Product Development: -** Initiation, Idea collection, creative design; brain storming; creative thinking; creative development, inventiveness; conception design. Function and use, Legal standard requirement; international standards, prototype design pre-production, inspection.	06
Unit 5	**Economic and Environment Considerations in Design: - Economic Considerations:** Selection of material, Design for Production (DFP), impact of DFP on other factors, Use of standardization, value analysis and cost reduction, break even analysis. **Environment Considerations:** Need, Guidelines, Product Life Cycle assessment, Techniques to reduce environmental impact.	06
Unit 6	**Modern approaches to product design:-** Concurrent Design, Quality Function Deployment (QFD), Computer Aided Industrial Design, Rapid Prototyping.	06

Dr. M.L. Hargude HOD Mech.	Dr. K. K Pandyaji Dean Academics	Dr. S. S. Mohite Director	Prof. R. A. Kanai Executive Director

P.V.P. Institute of Technology, Budhgaon 6269

M. Tech Mechanical Design Engineering

Curriculum w.e.f. A. Y. 2025-26

List of Tutorials		
Tutorial No.	Title	Hrs.
1	Assignment on need of Industrial design.	02
2	Assignment on Industrial product design.	02
3	Assignment based on Aesthetic and Ergonomic Concepts.	02
4	Assignment on new product development.	02
5	Assignment on economic and environment considerations in design.	02
6	Assignment based on modern approaches to product design.	02

Texts Books:

1. Product Design and development – Karl T. Ulrich, Steven D. Eppinger and Anita Goyal, McGill Education, 4th Edition.
2. Product Design – Kevin Otto and Kristin Wood, Pearson Education
3. Product Design and Manufacture- A. K. Chitale and R. C. Gupta, PHI Learning, 5th Edition

References Books:

1. Industrial Design for Engineers – W. H. Mayall, London Liifee books Ltd.

Dr. M.L. Hargude HOD Mech.	Dr. K. K Pandyaji Dean Academics	Dr. S. S. Mohite Director	Prof. R. A. Kanai Executive Director

P.V.P. Institute of Technology 6269 Budhgaon

Dr. Vasantraodada Patil Shetkari Shikshan Mandal's

PADMABHOOSHAN VASANTRAODADA PATIL INSTITUTE OF TECHNOLOGY (PVPIT), BUDHGAON, SANGLI

An Autonomous Institute, affiliated to Dr. Babasaheb Ambedkar Technological University, Lonere, Raigad (Accredited by NAAC)

M. Tech Mechanical Design Engineering

Curriculum w.e.f. A. Y. 2025-26

Noise, Vibration, and Harshness

Course Code and Course Title	**OMDPE553A Noise, Vibration, and Harshness**			
Semester	II			
Prerequisites	Mechanical Vibrations			
Teaching Scheme (hours per week)	**Lecture**	**Tutorial**	**Practical**	
	3	1	-	
Credit	04			
Evaluation Scheme	**ISE 1**	**MSE**	**ISE 2**	**ESE**
	10 Marks	20 Marks	10 Marks	60 Marks

Course Outcomes (COs): -Upon successful completion of this course, the student will able to:		**BL**
CO1	Apply sound and vibration principles to analyze NVH sources and dynamic behavior in automotive systems.	3
CO2	Analyze NVH performance using modern test facilities, instrumentation, and signal processing techniques.	4
CO3	Evaluate vehicle NVH characteristics with respect to comfort, noise quality, and regulatory requirements.	5
CO4	Design effective NVH control strategies using passive, active, and optimization-based approaches.	6

Course Content

Unit No.	**Contents**	**Hrs.**
Unit 1	**Automotive NVH Fundamentals:** Vehicle noise and vibration sources; NVH-based design features and common problems; influence on brand value and sound quality; pass-by noise norms; target vehicle benchmarking; NVH role across vehicle development stages.	06
Unit 2	**Sound and Vibration Principles:** Sound measurement and human auditory response; weighting networks; combination of sound sources; acoustic resonance; acoustic materials; SDOF system response; transmissibility and vibration modes.	06
Unit 3	**NVH Testing and Instrumentation:** NVH simulation facilities (dynamometers, road simulators, semi-anechoic rooms, wind tunnels); transducers; signal conditioning and data acquisition; binaural measurements; sound intensity, acoustic holography, and Statistical Energy Analysis.	07
Unit 4	**NVH Signal Processing:** Sampling, aiiasing, and resolution; statistical and frequency analysis; order analysis using Campbell and cascade plots; coherence and correlation functions.	05
Unit 5	**NVH Control and Vehicle Comfort:** Source ranking and noise path analysis; modal analysis; Design of Experiments and dynamic optimization; vibration absorbers, Helmholtz resonators; basics of active control techniques.	06
Unit 6	**NVH Regulations and Psychoacoustics:** Psychoacoustics and human response to noise; ambient noise standards; automotive pass-by and stationary noise regulations; noise limits for generator sets, firecrackers, and household appliances.	06

List of Tutorials

Tutorial No.	Title	Hrs.
1	Tutorial on Automotive NVH Fundamentals	02
2	Tutorial on Sound and Vibration Principles	02

Dr. M.L. Hargude HOD Mech.	Dr. K. K Pandyaji Dean Academics	Dr. S. S. Mohite Director	Prof. R. A. Kanai Executive Director

3	Tutorial on NVH Testing and Instrumentation	02
4	Tutorial on NVH Signal Processing	02
5	Tutorial on NVH Control and Vehicle Comfort	02
6	Tutorial on NVH Regulations and Psychoacoustics	02

Texts Books:

1. Ewins D. J., Model Testing: Theory and Practice, John Wiley,1995.
2. McConnell K, "Vibration Testing Theory and Practice", John Wiley, 1995.
3. Legislation standard
4. Norton M P, Fundamental of Noise and Vibration, Cambridge University Press,1989
5. Munjal M.L., Acoustic Ducts and Mufflers, John Wiley, 1987

References Books:

1. Baxa, Noise Control of Internal Combustion Engine, John Wiley, 1984.

2. Boris and Kornev, Dynamic Vibration Absorbers, John Wiley, 1993.

M. Tech Mechanical Design Engineering

Curriculum w.e.f. A. Y. 2025-26

Nanocomposite Material

Course Code and Course Title	**OMDPE553B Nanocomposite Material**			
Semester	II			
Prerequisites	Material Science and Metallurgy			
Teaching Scheme (hours per week)	**Lecture**	**Tutorial**	**Practical**	
	3	1	-	
Credit	04			
Evaluation Scheme	**ISE 1**	**MSE**	**ISE 2**	**ESE**
	10 Marks	20 Marks	10 Marks	60 Marks

Course Outcomes (COs): -Upon successful completion of this course, the student will able to:		**BL**
CO1	Apply nanocomposite fundamentals and processing methods to explain structure–property relationships.	3
CO2	Analyze design principles, stability, and mechanical behavior of advanced nanocomposites.	4
CO3	Evaluate synthesis techniques and properties of metal-, polymer-, and bio-based nanocomposites.	5
CO4	Design and apply nanocomposite solutions for industrial and biomedical applications.	6

Course Content

Unit No.	Contents	Hrs.
Unit 1	**Fundamentals of Nanocomposites:** Introduction, nomenclature, classification, and features of nanocomposites. Processing routes, fabrication methods, structure–property relationships. Sample preparation and characterization of structural, mechanical, and physical properties.	06
Unit 2	**Design and Advanced Nanocomposites:** Design principles, stability, and mechanical behavior. Super-hard nanocomposites: synthesis, properties, performance optimization, and applications.	06
Unit 3	**Metal-Based Nanocomposites:** Metal–metal nanocomposites: preparation methods and properties. Metal–oxide and metal–ceramic nanocomposites: synthesis, microstructure, functional properties, and applications. Fractal-based glass–metal nanocomposites, fractal dimension analysis, and core–shell structures.	07
Unit 4	**Polymer-Based Nanocomposites:** Diblock copolymer-based nanocomposites: preparation and characterization. Polymer–carbon nanotube nanocomposites: processing, mechanical properties, and industrial applications.	05
Unit 5	**Bio-Inspired Nanocomposites:** Natural nanocomposites (spider silk, bone, shells). Organic–inorganic self-assembly and biomimetic synthesis. Biomedical applications including bone and dental replacement materials.	06
Unit 6	**Nanocomposite Technology & Applications:** Nanocomposite membranes: fabrication and applications. Nanotechnology in textiles, cosmetics, and food systems—nano-fillers in fibers, lotus effect, functional textile finishes, TiO_2-based sunscreens and cosmetics, nanopackaging, and smart packaging.	06

Dr. M.L. Hargude HOD Mech.	Dr. K. K Pandyaji Dean Academics	Dr. S. S. Mohite Director	Prof. R. A. Kanai Executive Director

List of Tutorials		
Tutorial No.	Title	Hrs.
1	Tutorial on Fundamentals of Nanocomposites	02
2	Tutorial on Design and Advanced Nanocomposites	02
3	Tutorial on Metal-Based Nanocomposites	02
4	Tutorial on Polymer-Based Nanocomposites	02
5	Tutorial on Bio-Inspired Nanocomposites	02
6	Tutorial on Nanocomposite Technology & Applications	02

Texts Books:

1. Nanocomposites Science and Technology - P. M. Ajayan, L.S. Schadler, P. V.Braun 2006.
2. Introduction to Nanocomposite Materials. Properties, Processing, Characterization- Thomas E. Twardowski. 2007. DEStech Publications. USA.
3. Nanometer versus micrometer-sized particles-Christian Brosseau, Jamal BeN Youssef, Philippe Talbot, Anne-Marie Konn, (Review Article) J. Appl. Phys, Vol 93, 2003
4. Physical Properties of Carbon Nanotubes- R. Saito 1998.
5. Carbon Nanotubes (Carbon , Vol 33) - M. Endo, S. Iijima, M.S. Dresselhaus 1997.

References Books:

1. The search for novel, superhard materials- Stan Veprįek (Review Article) JVST A, 1999
2. Bikramjit Basu, Kantesh Balani Advanced Structural Ceramics, A John Wiley & Sons, Inc.,

Dr. M.L. Hargude HOD Mech.	Dr. K. K Pandyaji Dean Academics	Dr. S. S. Mohite Director	Prof. R. A. Kanai Executive Director

P.V.P. Institute of Technology 6269 Budhgaon

M. Tech Mechanical Design Engineering

Curriculum w.e.f. A. Y. 2025-26

Design for Manufacture & Assembly

Course Code and Course Title	**OMDPE553C** **Design for Manufacture & Assembly**			
Semester	II			
Prerequisites	Machine Design, Tolrencing			
Teaching Scheme (hours per week)	**Lecture**	**Tutorial**	**Practical**	
	3	1	-	
Credit	04			
Evaluation Scheme	**ISE 1**	**MSE**	**ISE 2**	**ESE**
	10 Marks	20 Marks	10 Marks	60 Marks

Course Outcomes (COs): -Upon successful completion of this course, the student will able to:		**BL**
CO1	Apply DFM principles to reduce manufacturing cost considering process capabilities and constraints.	3
CO2	Analyze designs for casting, welding, forging, sheet metal, and powder metallurgy to identify defects and improvements.	4
CO3	Evaluate and select materials and manufacturing processes based on performance, cost, and manufacturability.	5
CO4	Apply DFMA principles to improve assembly efficiency, enable automation, and assess process suitability.	5

Course Content

Unit No.	Contents	Hrs.
Unit 1	**Design for Manufacturing (DFM):** Principles of reducing manufacturing cost through effective product design; understanding manufacturing processes and constraints; use of standard components and processes; evaluation of DFM decisions considering technical, economic, and production factors.	06
Unit 2	**Design Considerations in Metal Casting:** Mold and gating system design; principles of directional solidification; identification, analysis, and troubleshooting of common casting defects.	06
Unit 3	**Design for Welding and Related Processes:** Selection of materials for welded joints; prevention of welding defects; methods to minimize residual stresses and distortion; design principles for forging, sheet metal forming, and powder metallurgy processes.	07
Unit 4	**Materials Selection:** Systematic approach to selecting materials based on performance, cost, and application requirements; organization and classification of materials and manufacturing processes.	05
Unit 5	**Application of Design for Manufacturing and Assembly (DFMA):** Integration of DFMA principles with material selection; comparative evaluation and ranking of processes such as casting, injection moulding, sheet metal working, die casting, powder metallurgy, investment casting, and hot forging.	06
Unit 6	**Design for Assembly and Automation:** Principles of efficient assembly design; design strategies to facilitate automation, reduce assembly time, and improve manufacturing productivity.	06

Dr. M.L. Hargude HOD Mech.	Dr. K. K Pandyaji Dean Academics	Dr. S. S. Mohite Director	Prof. R. A. Kanai Executive Director

List of Tutorials		
Tutorial No.	Title	Hrs.
1	Tutorial on Design for Manufacturing (DFM)	02
2	Tutorial on Design Considerations in Metal Casting	02
3	Tutorial on Design for Welding and Related Processes	02
4	Tutorial on Materials Selection	02
5	Tutorial on Application of Design for Manufacturing and Assembly	02
6	Tutorial on Design for Assembly and Automation	02

Texts Books:

1. Robert Matousek, Engineering Design – A Systematic Approach, Blackie & Sons Ltd., 1963.
2. Harry Peck, Design for Manufacture, Pittman Publication, 1983.
3. Swift K. G., Knowledge Based Design for Manufacture, Kogan Page Ltd., 1987.
4. Geoffrey Boothroyd, Peter Dewhurst and Winston Knight, Product Design for Manufacturing and Assembly, 2nd Edition

References Books:

1. James G. Bralla, Hand Book of Product Design for Manufacturing, McGraw Hill Co., 1986.

M. Tech Mechanical Design Engineering

Curriculum w.e.f. A. Y. 2025-26

Tribology in Design

Course Code and Course Title	OMDPE554A Tribology in Design			
Semester	II			
Prerequisites	Machine Design			
Teaching Scheme (hours per week)	Lecture	Tutorial	Practical	
	3	-	-	
Credit	3			
Evaluation Scheme	ISE 1	MSE	ISE 2	ESE
	10 Marks	20 Marks	10 Marks	60 Marks

Course Outcomes (COs): -Upon successful completion of this course, the student will able to:		BL
CO1	Apply viscosity, friction, and wear concepts to analyze lubrication systems.	3
CO2	Analyze hydrodynamic and hydrostatic lubrication mechanisms in bearing design.	4
CO3	Evaluate the performance of gas-lubricated bearings under different operating conditions.	5
CO4	Select suitable lubricants and bearing materials for specific engineering applications.	3

Course Content

Unit No.	Contents	Hrs.
Unit 1	**Viscosity and Flow Characteristics**: Definition of viscosity; Petroff's law; Hagen–Poiseuille law; variation of viscosity with temperature and pressure; viscosity index; effect of pressure on fluid flow through a slot.	06
Unit 2	**Friction and Wear Mechanisms**: Types of wear; theories of friction and wear; dry friction and boundary friction; effect of bearing material composition on friction and wear behaviour.	06
Unit 3	**Hydrodynamic Lubrication Theory**: Reynolds equation and its general form; solutions for long, short, and tapered journal bearings; flow rate and eccentricity; hydrodynamic thrust bearings; tapered land and Rayleigh step bearings.	07
Unit 4	**Performance of Hydrodynamic Bearings**: Behaviour of hydrodynamic bearings under variable loads; squeeze film lubrication; thermal equilibrium of sliding systems; Elasto-hydrodynamic lubrication.	05
Unit 5	**Hydrostatic Lubrication**: Pressure distribution in simple hydrostatic thrust bearings; pumping power and pump capacity; hydrostatic journal and thrust bearings; effect of rotation and compensation methods.	06
Unit 6	**Gas Lubrication, Lubricants, and Bearing Materials**: Principles of gas lubrication; advantages and limitations; aerodynamic and aerostatic bearings; load-carrying capacity of gas bearings; types and properties of lubricants; additives and testing of lubricants; selection of lubricants; bearing materials such as white metals, bronzes, aluminium alloys, silver, Teflon, rubber, and graphite.	06

Textbooks

1. Fuller, D. D., Theory of Lubrication.
2. Cameron, Lubrication.

Reference Books

1. Shaw and Mack, Lubrication and Bearings.

Dr. M.L. Hargude HOD Mech.	Dr. K. K. Pandyaji Dean Academics	Dr. S. S. Mohite Director	Prof. R. A. Kanai Executive Director

M. Tech Mechanical Design Engineering

Curriculum w.e.f. A. Y. 2025-26

Engineering Fracture Mechanics

Course Code and Course Title	**OMDPE554B Engineering Fracture Mechanics**			
Semester	II			
Prerequisites	Machine Design			
Teaching Scheme (hours per week)	**Lecture**	**Tutorial**	**Practical**	
	3	-	-	
Credit	3			
Evaluation Scheme	**ISE 1**	**MSE**	**ISE 2**	**ESE**
	10 Marks	20 Marks	10 Marks	60 Marks

Course Outcomes (COs): -Upon successful completion of this course, the student will able to:		**BL**
CO1	Explain and analyze fracture mechanics concepts such as fracture modes, ideal strength, and energy release rate.	4
CO2	Analyze fracture criteria and crack behavior using stress intensity factors and crack tip parameters.	4
CO3	Apply numerical and experimental methods to evaluate fracture toughness and fatigue performance of materials.	3
CO4	Evaluate fatigue and creep mechanisms and predict their effect on material failure under long-term	5

Course Content

Unit No.	**Contents**	**Hrs.**
Unit 1	**Basics of Fracture Mechanics**: Overview of macroscopic failure behavior; concept of ideal fracture strength; energy release rate; classification of fracture modes.	06
Unit 2	**Fracture Criteria and Crack Behavior**: Griffith and Irwin fracture criteria; stress intensity approach; stress intensity factor; plastic deformation near crack tip; crack opening displacement; effect of plastic constraint.	07
Unit 3	**Methods for Fracture Toughness Evaluation**: Numerical techniques including finite element, finite difference, and boundary integral methods; experimental techniques such as compliance method, photoelasticity, interferometry, and holography.	07
Unit 4	**Experimental Fracture Toughness Concepts**: Plane strain fracture toughness; J-integral approach and its applications.	05
Unit 5	**Fatigue Behavior of Materials**: S–N curves; fatigue limit; fatigue crack growth behavior; Paris law for crack propagation.	05
Unit 6	**Creep Behavior and Interaction Effects**: Fundamentals of creep deformation; creep strength; interaction between creep and fatigue.	06

Dr. M.L. Hargude HOD Mech.	Dr. K. K Pandyaji Dean Academics	Dr. S. S. Mohite Director	Prof. R. A. Kanai Executive Director

Textbooks

1. Kundu, T., Fundamentals of Fracture Mechanics, CRC Press (Taylor and Francis), 2008.
2. Anderson, T. L., Fracture Mechanics: Fundamentals and Applications, CRC Press.
3. Broek, D., Elementary Engineering Fracture Mechanics, 4th Revised Edition, Kluwer Academic Publishers, 1991.
4. Hellan, K., Introduction to Fracture Mechanics, McGraw-Hill, 1984.
5. Maiti, S. K., Fracture Mechanics: Fundamentals and Applications, Cambridge University Press, 2015.
6. Timoshenko, S. P. and Goodier, J. N., Theory of Elasticity, McGraw-Hill, 1970.
7. Rolfe, S. T. and Barsom, J. M., Fracture and Fatigue Control in Structures: Applications of Fracture Mechanics, Prentice Hall, 1977.

Reference Books

1. Sih, G. C., Handbook of Stress Intensity Factors, Institute of Fracture and Solid Mechanics.
2. Broek, D., Elementary Engineering Fracture Mechanics, 4th Edition, Martinus Nijhoff Publishers, 1987.
3. Hellan, K., Introduction to Fracture Mechanics, McGraw-Hill, 1985.

Dr. M.L. Hargude HOD Mech.	Dr. K. K Pandyaji Dean Academics	Dr. S. S. Mohite Director	Prof. R. A. Kanai Executive Director

Product Lifecycle Management

Course Code and Course Title	OMDPE554C Product Lifecycle Management			
Semester	II			
Prerequisites	Product Design, CAD/CAM			
Teaching Scheme (hours per week)	Lecture	Tutorial	Practical	
	3	-	-	
Credit	3			
Evaluation Scheme	ISE 1	MSE	ISE 2	ESE
	10 Marks	20 Marks	10 Marks	60 Marks

Course Outcomes (COs): -Upon successful completion of this course, the student will able to:		BL
CO1	Apply PLM and PDM concepts to manage product data through the lifecycle	3
CO2	Analyze PLM functions and workflows used in industry	4
CO3	Evaluate PLM/PDM software tools for industrial applications	5
CO4	Design a basic PLM integration with CAD, ERP, and legacy systems	6

Course Content

Unit No.	Contents	Hrs.
Unit 1	**Introduction to Product Lifecycle Management (PLM):** Basics of PLM, need and importance, scope and benefits, evolution of PLM, overview of EDM, PDM, cPDM, CPC and their relationship with PLM	06
Unit 2	**PLM and PDM Infrastructure:** PLM/PDM system architecture, network and communication basics, data management concepts, handling heterogeneous data sources, application integration	06
Unit 3	**PLM and PDM Functions:** User functions including data vault and document management, workflow and process management, product structure and classification; utility functions such as communication, notifications, data transfer, translation and system administration	06
Unit 4	**PLM Software, Workflow and Security:** Overview of PLM and PDM software tools, product structure concepts, workflow fundamentals and terminology, link between product data and workflow, PLM/PDM applications and product data security	07
Unit 5	**Technology Forecasting in PLM:** Concepts of technology forecasting, relevance trees, morphological methods, impact of technological change and use of forecasting in manufacturing decisions	05
Unit 6	**PLM Implementation and Integration:** Role of PLM in industries like automotive, aerospace and electronics, PLM strategy and feasibility, change management, financial justification, implementation challenges, benefits of PLM, basics of customization and integration with CAD, ERP and legacy systems	06

Textbooks/ Reference Books

1. Antti Saaksvuori and Anselmi Immonen, Product Lifecycle Management, Springer Publisher, 2008 (3rd Edition).
2. Michael Grieves, Product Life Cycle Management, Tata McGraw Hill, 2006.
3. John Stark, Product Lifecycle Management: 21st Century Paradigm for Product Realisation, Springer Publisher, 2011 (2nd Edition).

Dr. M.L. Hargude HOD Mech.	Dr. K. K. Pandyaji Dean Academics	Dr. S. S. Mohite Director	Prof. R. A. Kanai Executive Director

M. Tech Mechanical Design Engineering

Curriculum w.e.f. A. Y. 2025-26

Theory of Elasticity and Plasticity

Course Code and Course Title	**OMDOE555A Theory of Elasticity and Plasticity**			
Semester	II			
Prerequisites	Engineering Mechanics			
Teaching Scheme (hours per week)	**Lecture**	**Tutorial**	**Practical**	
	3	-	-	
Credit	03			
Evaluation Scheme	**ISE 1**	**MSE**	**ISE 2**	**ESE**
	10 Marks	20 Marks	10 Marks	60 Marks

Course Outcomes (COs): -Upon successful completion of this course, the student will able to:		**BL**
CO1	Apply stress–strain relations and elasticity principles to solve two- and three-dimensional elasticity problems.	3
CO2	Analyze plane stress, plane strain, and three-dimensional elasticity problems involving bending and torsion of structural members.	4
CO3	Evaluate stresses, displacements, and deflections in components using energy methods and elasticity theory.	5
CO4	Apply plasticity concepts and limit analysis to assess elastoplastic behavior of bars under bending and torsion.	3

Course Content

Unit No.	**Contents**	**Hrs.**
Unit 1	**Fundamentals of Elasticity:** Stress and strain transformation at a point; three-dimensional stress–strain relations; rigid body translation and rotation of an element; generalized Hooke's law; separation of elastic strains and rigid body displacement for displacement field (u, v, w); principal stresses and principal strains.	06
Unit 2	**Two-Dimensional Elasticity – Governing Equations:** Plane stress and plane strain problems; differential equations of equilibrium and compatibility; boundary conditions and stress functions; solutions in rectangular and polar coordinates using polynomial methods; symmetric stress distribution about an axis.	06
Unit 3	**Two-Dimensional Elasticity – Applications:** Cantilever beam loaded at the end; simply supported beam under uniformly distributed and linearly varying loads; pure bending of curved bars; displacements for symmetrically loaded cases; circular hole in plate under in-plane loading; stresses in circular disks; concentrated load on straight boundary; forces on end of wedge.	06
Unit 4	**Three-Dimensional Elasticity and Torsion:** Differential equations of equilibrium and compatibility in 3D; determination of displacements; principle of superposition and uniqueness theorem; axial stress in rods; bars under self-weight; pure bending of prismatic rods; torsion of prismatic bars (elliptical, rectangular, triangular sections); membrane analogy; torsion of hollow shafts and thin tubes.	07

Dr. M.L. Hargude HOD Mech.	Dr. K. K Pandyaji Dean Academics	Dr. S. S. Mohite Director	Prof. R. A. Kanai Executive Director

Unit 5	**Bending of Prismatic Bars and Shear Centre:** Bending of prismatic bars as a 3D elasticity problem; stress functions for circular and rectangular sections; bending of non-symmetrical sections; shear centre determination for various cross-sections; calculation of deflections.	06
Unit 6	**Energy Methods and Plasticity:** Energy theorems in elasticity; applications of complementary energy principles; yielding criteria; strain hardening; rules of plastic flow; stress–strain relations; total strain theory; limit analysis theorems; elastoplastic bending and torsion of bars.	05

Texts Books:

1. Timoshenko, "Theory of Elasticity", McGraw hill book Co.
2. J. Chakrabarti, "Theory of Plasticity", McGraw hill book Co.

References Books:

1. Wang, "Applied Elasticity", McGraw hill book Co.

Design for sustainability

Course Code and Course Title	OMDOE555B Design for sustainability			
Semester	II			
Prerequisites	Machine Design			
Teaching Scheme (hours per week)	Lecture	Tutorial	Practical	
	3	-	-	
Credit	03			
Evaluation Scheme	ISE 1	MSE	ISE 2	ESE
	10 Marks	20 Marks	10 Marks	60 Marks

Course Outcomes (COs): -Upon successful completion of this course, the student will able to:		BL
CO1	Apply principles of manufacturability, process economics, and GD&T to develop functionally and dimensionally accurate component designs.	3
CO2	Analyze design requirements for cast, welded, formed, and machined components to improve strength, accuracy, and cost effectiveness.	4
CO3	Apply design for assembly (DFA) and DFMA tools to reduce part count, simplify assembly, and enable automatic assembly.	3
CO4	Evaluate product designs using Design for Environment (DFE) and life cycle assessment methods to minimize environmental impact and ensure sustainability.	5

Course Content

Unit No.	Contents	Hrs.
Unit 1	**Sustainability Aspects -** Economics of process selection; general design principles for manufacturability. Geometric Dimensioning and Tolerancing (GD&T): form tolerancing (straightness, flatness, circularity, cylindricity); profile tolerancing (profile of a line and surface); orientation tolerancing (angularity, perpendicularity, parallelism); location tolerancing (position, concentricity, symmetry); runout tolerancing (circular and total); supplementary symbols.	07
Unit 2	**Design of Cast and Welded Components:** Design considerations for sand casting, die casting, and permanent mold components. Arc welding design considerations for cost reduction, minimizing distortion, weld strength, and weldments. Resistance welding design considerations for spot, seam, projection, flash, and upset weldments.	05
Unit 3	**Design of Formed and Machined Components:** Design considerations for metal extruded parts, impact and cold extruded parts, stamped parts, and forged parts. Design considerations for machined components including turned, drilled, milled, planed, shaped, slotted, and ground parts.	06
Unit 4	**Design for Assembly:** Principles of design for assembly; general assembly recommendations; minimization of number of parts. Design considerations for rivets, screw fasteners, gaskets and seals, press fits, snap fits; design for automatic assembly; computer applications for DFMA.	06
Unit 5	**Design for Environment (DFE):** Environmental objectives; global, regional, and local environmental issues. Basic DFE methods and design guidelines; example applications. Life cycle assessment (LCA): basic method, AT&T's environmentally responsible product assessment,	05

Dr. M.L. Hargude HOD Mech.	Dr. K. K Pandyaji Dean Academics	Dr. S. S. Mohite Director	Prof. R. A. Kanai Executive Director

	weighted sum assessment method, and LCA methodology. Techniques to reduce environmental impact: design to minimize material usage, design for disassembly, recyclability, manufacturability, energy efficiency, and compliance with regulations and standards.	
Unit 6	**Introduction:** Economics of process selection; general design principles for manufacturability. Geometric Dimensioning and Tolerancing (GD&T): form tolerancing (straightness, flatness, circularity, cylindricity); profile tolerancing (profile of a line and surface); orientation tolerancing (angularity, perpendicularity, parallelism); location tolerancing (position, concentricity, symmetry); runout tolerancing (circular and total); supplementary symbols.	07

Texts Books:

1. Boothroyd, G, 2nd Edition 2002, Design for Assembly Automation and Product Design. New York, Marcel Dekker.
2. Bralla, Design for Manufacture handbook, McGrawhill,1999
3. Boothroyd, G, Heartz and Nike, Product Design for Manufacture,MarcelDekker,1994
4. Dickson, John. R, and Corroda Poly, Engineering Design and Design for Manufacture and Structural Approach, Field Stone Publisher,USA,1995
5. Fixel, J. Design for the Environment McGraw Hill., 2nd Edition 2009

References Books:

1. Graedel T. Allen By. B, Design for the Environment Angle Wood Cliff, Prentice Hall. Reason Pub.,1996
2. Kevin Otto and Kristin Wood, Product Design. Pearson Publication,(Fourth Impression) 2009
3. Harry Peck, Designing for manufacture, Pitman–1973

Dr. M.L. Hargude HOD Mech.	Dr. K. K Pandyaji Dean Academics	Dr. S. S. Mohite Director	Prof. R. A. Kanai Executive Director

M. Tech Mechanical Design Engineering

Curriculum w.e.f. A. Y. 2025-26

Designing with Advanced Materials

Course Code and Course Title	**OMDOE555C Designing with Advanced Materials**			
Semester	II			
Prerequisites	Machine Design, Materials			
Teaching Scheme (hours per week)	**Lecture**	**Tutorial**	**Practical**	
	3	-	-	
Credit	03			
Evaluation Scheme	**ISE 1**	**MSE**	**ISE 2**	**ESE**
	10 Marks	20 Marks	10 Marks	60 Marks

Course Outcomes (COs): -Upon successful completion of this course, the student will able to:		**BL**
CO1	Apply reverse engineering methodologies and geometric reconstruction techniques to capture, model, and prototype existing components.	3
CO2	Analyze material characteristics, microstructure, and failure mechanisms to assess part durability and life limitation.	4
CO3	Apply statistical and reliability analysis methods to evaluate part performance, data conformity, and system compatibility.	3
CO4	Evaluate legal, ethical, and industrial aspects of reverse engineering for compliant application in engineering industries.	5

Course Content

Unit No.	**Contents**	**Hrs.**
Unit 1	**Introduction to Reverse Engineering:** Definition, objectives, and uses of reverse engineering; generic reverse engineering process; phases of reverse engineering.	06
Unit 2	**Geometric Form Capture and Reconstruction:** Computer Aided Reverse Engineering (CARE); dimensional measurement techniques; surface and solid model reconstruction; prototyping methods.	06
Unit 3	**Material Characteristics and Life Limitation:** Alloy structure equivalency; phase formation and identification; mechanical strength and hardness; part durability and life limitation.	05
Unit 4	**Failure Analysis and Environmental Effects:** Part failure analysis; fatigue; creep and stress rupture; environmentally induced failures.	05
Unit 5	**Material Identification, Process Verification and Data Processing:** Material specification; composition determination; microstructure analysis; manufacturing process verification. Statistical analysis; reliability and theory of interference; Weibull analysis; data conformity, acceptance, and reporting.	07
Unit 6	**Performance Evaluation, Legality and Industrial Applications:** Performance criteria and methodology of performance evaluation; system compatibility. Legality of reverse engineering including patents, copyrights, trade secrets, and third-party materials; applications in automotive, aerospace, and medical device industries.	07

Dr. M.L. Hargude HOD Mech.	Dr. K. K Pandyaji Dean Academics	Dr. S. S. Mohite Director	Prof. R. A. Kanai Executive Director

Texts Books:

1. George E.Dieter, Mechanical Metallurgy, McGraw Hill, 1988
2. Thomas H. Courtney, Mechanical Behavior of Materials, (2nd edition), McGraw Hill, 2000
3. Willam D. CallisterJr.and David G. Rethwisch, Callister's Materials Science and Engineering,(2nd edition)Wiley Editorial,2018
4. Charles, J.A., Crane, F.A.A. and Fumess, J.A.G., Selection and use of engineering materials,(34d edition), Butterworth-Heiremann, 1997
5. Flinn, R.A., and Trojan, P.K., Engineering Materials and their Applications, (4th Edition) Jaico, 1999

References Books:

1. Metals Hand book, Vol.10, Failure Analysis and Prevention, (10th Edition), Jaico,1999
2. Ashby M.F., materials selection in Mechanical Design 2nd Edition, Butter worth 1999
3. www.astm.org/labs/pages/131350.htm

M. Tech Mechanical Design Engineering

Curriculum w.e.f. A. Y. 2025-26

Mini Project

Course Code and Course Title	**OMDVS556 Mini Project**			
Semester	II			
Prerequisites	Research Methodology, Research Papers			
Teaching Scheme (hours per week)	**Lecture**	**Tutorial**	**Practical**	
	-	-	4	
Credit	2			
Evaluation Scheme	**ISE 1**	**MSE**	**ISE 2**	**ESE**
	25 Marks	-	25 Marks	50 Marks

Course Outcomes (COs): -Upon successful completion of this course, the student will able to:		**BL**
CO1	Illustrate an industrial or in-house project by applying basic engineering concepts.	3
CO2	Identify and analyze industrial or in-house problems.	4
CO3	Apply knowledge from different courses to solve practical engineering problems.	3
CO4	Prepare and present a clear, well-organized project report.	5

Course Content

1. Students shall identify and collect relevant industrial data, in-house project information for the Mini Project.
2. Students shall develop appropriate solutions using suitable techniques.
3. Continuous progress shall be demonstrated through regular reports and at least two presentations during the semester, with proper documentation of activities. Progress will be monitored by the respective responsible faculty and senior expert/course coordinator of design engineering.
4. Students shall submit a Mini Project report in the prescribed format
5. Assessment during the End Semester Examination (ESE) shall be conducted by two examiners - one is guide and other is senior expert/course coordinator of design engineering. Evaluation will be based on work carried out, presentation, documentation, and report quality.

Texts Books

Suitable books based on the contents of the experiment/mini project selected.

Reference books

Suitable books based on the contents of the experiment/mini project selected and research papers from Reputed national and international journals and conferences.

Dr. M.L. Hargude HOD Mech.	Dr. K. K Pandyaji Dean Academics	Dr. S. S. Mohite Director	Prof. R. A. Kanai Executive Director

M. Tech Mechanical Design Engineering

Curriculum w.e.f. A. Y. 2025-26

SEMESTER III

Additive Manufacturing

Course Code and Course Title	**OMDOE601A Additive Manufacturing**			
Semester	III			
Prerequisites	Materials Science And Engineering			
Teaching Scheme (hours per week)	**Lecture**	**Tutorial**	**Practical**	
	3	-	-	
Credit	3			
Evaluation Scheme	**ISE 1**	**MSE**	**ISE 2**	**ESE**
	10 Marks	20 Marks	10 Marks	60 Marks

Course Outcomes (COs): -Upon successful completion of this course, the student will able to:		**BL**
CO1	Explain the principles, process classifications, and materials used in additive manufacturing (AM).	3
CO2	Analyze various additive manufacturing processes for their suitability in product design and development.	3
CO3	Apply design for additive manufacturing (DfAM) principles to create optimized components using CAD and simulation tools.	4
CO4	Evaluate mechanical, thermal, and surface properties of AM-produced components and compare them with conventional manufacturing methods.	5
CO5	Integrate additive manufacturing with digital manufacturing systems (e.g., Industry 4.0, IoT, and AI) for innovative product design and rapid prototyping.	5
CO6	Demonstrate awareness of sustainability, cost-effectiveness, and future trends in additive manufacturing applications across industries.	3

Course Content

Unit No.	**Contents**	**Hrs.**
Unit 1	**Introduction -** Overview - Historical Development - Need – Classification - Additive Manufacturing Technology in product development – Materials for Additive Manufacturing Technology – Traditional v/s Additive Manufacturing – Tooling – Benefits and Applications.	06
Unit 2	**Geometric Model & Reverse Engineering, Basic Concept –** Digitization Techniques – Model Reconstruction – Data Processing for Additive Manufacturing Technology, CAD model preparation – Interface Formats - Part Orientation and support generation – Model Slicing – Tool path generation – Software for Additive Manufacturing Technology: RP software.	07
Unit 3	**Liquid Based Additive Manufacturing Systems Classification –** Liquid based system – Stereo lithography Apparatus (SLA) – Principle, process, advantages and applications.	05
Unit 4	**Solid based Additive Manufacturing Systems Classification system** – Fused Deposition Modeling – Principle, process, advantages and applications, Laminated Object Manufacturing.	05
Unit 5	**Powder Based Additive Manufacturing Systems Selective Laser Sintering (SLS) –** Principle, process, advantages and applications – Three- Dimensional Printing – Principle, process, advantages and applications – Laser Engineered Net Shaping (LENS), Electron Beam Melting – Shape deposition manufacturing, Laser deposition, Lamination, Electro-optical sintering.	07

Dr. M.L. Hargude HOD Mech.	Dr. K. K Pandyaji Dean Academics	Dr. S. S. Mohite Director	Prof. R. A. Kanai Executive Director

Unit 6	**Rapid Casting and Segmental Object Manufacturing:-** Visible Slicing Implementation Rapid casting using wax patterns, acrylic patterns, dense polystyrene patterns – Expanded polystyrene process – 24 Rapid manufacturing of metallic objects, Rapid tooling, Medical and Bio-Additive Manufacturing Customized implants and prosthesis, Design and production, Bio-Additive Manufacturing – Computer Aided Tissue Engineering (CATE) – Case Studies.	06

Text Books:

1. Chua C.K., Leong K.F. and Lim C.S., "Rapid prototyping: Principles and applications", Third Edition, World Scientific Publishers, 2010.
2. Gephardt A., "Rapid Prototyping", Hanser Gardener Publications, 2003.

Reference Book:

1. Liou L.W. and Liou F.W., "Rapid Prototyping and Engineering applications: A tool box for prototype development", CRC Press, 2007.
2. C. P. Paul, A. N. Jinoop , Additive Manufacturing- Principles, Technologies and Applications, 1st Edition, 2021,McGraw Hill

Dr. M.L. Hargude HOD Mech.	Dr. K. K Pandyaji Dean Academics	Dr. S. S. Mohite Director	Prof. R. A. Kanai Executive Director

Supply Chain Management

Course Code and Course Title	OMDOE601B Supply Chain Management			
Semester	III			
Prerequisites	Production Planning And Control			
Teaching Scheme (hours per week)	Lecture	Tutorial	Practical	
	3	-	-	
Credit	3			
Evaluation Scheme	ISE 1	MSE	ISE 2	ESE
	10 Marks	20 Marks	10 Marks	60 Marks

Course Outcomes (COs): -Upon successful completion of this course, the student will able to:		BL
CO1	Explain the fundamental concepts, structure, and strategic role of supply chain management in product design and manufacturing systems.	3
CO2	Analyze the interactions among various supply chain elements such as procurement, production, inventory, logistics, and customer service.	3
CO3	Apply quantitative and qualitative techniques to optimize supply chain performance in terms of cost, quality, responsiveness, and sustainability.	4
CO4	Evaluate the impact of design decisions, product lifecycle management, and technology integration (ERP, IoT, AI) on supply chain efficiency.	5
CO5	Develop integrated supply chain strategies that align with organizational goals, risk management, and global competitiveness.	5
CO6	Design sustainable and resilient supply chain systems that minimize waste, enhance flexibility, and improve overall design-to-delivery efficiency.	3

Course Content

Unit No.	Contents	Hrs.
Unit 1	**Supply Chain Aspects**:- Generic Types of supply chain, Various Definitions and Implications, Major Drivers of Supply chain. Strategic Decisions- in Supply Chain Management Introduction, Business Strategy, Core Competencies in Supply Chain, Strategic SC Decisions, Customer Relationship Management Strategy, Supplier Relationship Management Strategy Source of Management in Supply Chain Introduction, Elements of Strategic Sourcing, A Collaborative Perspective, Development of Partnership.	07
Unit 2	**Inventory Management in Supply Chain:-** Introduction, Types of Inventory, Supply/ Demand Uncertainties, Inventory costs, Selective Inventory Control, Vendor Manage Inventory system, Inventory Performance Measure Logistics In Supply Chain Management Introduction, Strategy, Transportation Selection, Trade-off, Models for Transportation and Distribution, Third Party Logistics,, Overview of Indian Infrastructure for Transportation.	06
Unit 3	**Information Technology in Supply Chain**:- Introduction, Types of IT Solutions like Electronic Data Inter change (EDI), Intranet/ Extranet, Data Mining/ Data Warehousing and Data Marts, E-Commerce, E- Procurement, Bar Coding Technology. Information System in Supply Chain Introduction, Computer Based Information Systems, Computer Models and Perceptions about ERP, ERP & SCM.	06
Unit 4	**Application of Mathematical Modelling**: - in Supply Chain Introduction, Modelling, Consideration in Modelling SCM System, Structuring the Logistic chain, Concept of Modelling.	05

Dr. M.L. Hargude HOD Mech.	Dr. R. K Pandyaji Dean Academics	Dr. S. S. Mohite Director	Prof. R. A. Kanai Executive Director

Unit 5	**Reverse Supply Chain Introduction**: - Reverse Supply Chain v/s Forward Supply Chain, Types of Reverse Flows, Issues in Management of Reverse Supply Chain, Reverse Supply Chain for Food items, Reverse Logistic and Environment Impact. Integration & Collaborative Supply Chain Introduction, Evolution of collaborative SCM, Efficient Customer response, Collaboration at various levels, Imperatives for Successful Integrative Supply Chains.	06
Unit 6	**Agile Supply Chain**: - Introduction, Source of Variability, Characteristics of Agile Supply Chain, Achieving Agility in Supply Chain. Cases of Supply Chain Cases of Supply Chain like, News Paper Supply Chain, Book Publishing, Disaster management, Organic Food, Fast Food.	06

Text Books:

1. Supply Chain Management Theories & Practices, R. P. Mohanty, S. G. Deshmukh, Dreamtech Press, 19-A, Anari Road, Daryaganj, New Delhi.
2. Supply Chain Management, Chopra, Pearson.
3. Logistics Engineering and Management, Blanchard, pearson.

Reference Book:

1. Supply Chain Management Strategy, Planning & Operation by Sunil Chopra, Peter Meindl.
2. Total Supply Chain Management by Ron Basu, J. Nevan Wright.

Dr. M.L. Hargude HOD Mech.	Dr. K. K Pandyaji Dean Academics	Dr. S. S. Mohite Director	Prof. R. A. Kanai Executive Director

M. Tech Mechanical Design Engineering

Curriculum w.e.f. A. Y. 2025-26

Industrial Safety Engineering

Course Code and Course Title	**OMDOE601C Industrial Safety Engineering**			
Semester	III			
Prerequisites	Industrial Engineering			
Teaching Scheme (hours per week)	**Lecture**	**Tutorial**	**Practical**	
	3	-	-	
Credit	3			
Evaluation Scheme	**ISE 1**	**MSE**	**ISE 2**	**ESE**
	10 Marks	20 Marks	10 Marks	60 Marks

Course Outcomes (COs): -Upon successful completion of this course, the student will able to:		**BL**
CO1	Explain the fundamental principles of industrial safety engineering, hazard identification, and risk assessment methods used in design and manufacturing systems.	3
CO2	Analyze the causes of industrial accidents and evaluate the role of human factors, ergonomics, and safety culture in system reliability and performance.	3
CO3	Apply safety-by-design (SbD) and design-for-safety concepts to minimize risks during the product and process design stages.	4
CO4	Evaluate different safety management systems (such as OSHA, OSHAS 18001, ISO 45001) and performance indicators for continuous improvement in industrial safety.	5
CO5	Develop preventive and corrective safety strategies using quantitative tools such as fault tree analysis (FTA), failure mode and effect analysis (FMEA), and reliability assessment.	5
CO6	Design safe engineering systems and layouts that comply with safety regulations and integrate risk control measures effectively.	3

Course Content

Unit No.	**Contents**	**Hrs.**
Unit 1	**Introduction**: - key concepts, terminologies, safety domain ontology, and safety quantification, safety by design, Application of hazard identification techniques (e.g., HAZOP, FMEA, etc.) - preliminary hazard list, preliminary hazard analysis, Risk assessment and Control, Safety engineering and accident causing mechanism.	06
Unit 2	**Fault tree Analysis**- construction, gate by gate method, cut set method, importance measures, and event tree analysis (qualitative & quantitative), Bow-tie tool, common cause cut sets, cut sets for accident scenarios, identification of safety barriers.	06
Unit 3	**Risk assessment, Consequence assessment**, Energy control model and hazard control hierarchy, Safety function deployment, Ranking of design solution using AHP, Safety vs reliability – quantification of basic events (for non-repairable components, hazard rate, exponential distribution, Weibull distribution).	06
Unit 4	**Quantification of basic events** -repair to failure, repair-failure-repair, and combined processes, Computation of combined process parameters – Laplace transform and Markov analysis, Safety vs reliability – quantification of basic events, Systems safety quantification (e.g., truth tables, structure functions, minimal cut sets).	06
Unit 5	**Human error** -classification and causes, Human error identification, Human reliability assessment, analysis and safety.	06

Dr. M.L. Hargude HOD Mech.	Dr. K. K Pandyaji Dean Academics	Dr. S. S. Mohite Director	Prof. R. A. Kanai Executive Director

Unit 6	**Accident investigation and analysis**, control chart analysis, regression and classification tree, OSHAS 18001 and OSHMS- part I, II, III and safety performance indicators, Energy isolations, Application of virtual reality.	06

Text Books:

1. Probabilistic Risk Assessment for Engineering and Scientists, Komamoto and Henley, IEEE Press, 1995.
2. Industrial Accident Prevention, Heinrich et al., McGraw Hill, 1980.

Reference Book:

1. Techniques for safety management - A systems approach, Petersen D, ASSE 1998.

Dr. M.L. Hargude HOD Mech.	Dr. K. K Pandyaji Dean Academics	Dr. S. S. Mohite Director	Prof. R. A. Kanai Executive Director

M. Tech Mechanical Design Engineering

Curriculum w.e.f. A. Y. 2025-26

Modern Engineering Materials

Course Code and Course Title	**OMDOE602A Modern Engineering Materials**			
Semester	III			
Prerequisites	Engineering Materials, Strength Of Materials			
Teaching Scheme (hours per week)	**Lecture**	**Tutorial**	**Practical**	
	3	-	-	
Credit	3			
Evaluation Scheme	**ISE 1**	**MSE**	**ISE 2**	**ESE**
	10 Marks	20 Marks	10 Marks	60 Marks

Course Outcomes (COs): -Upon successful completion of this course, the student will able to:		**BL**
CO1	Explain the composition, properties, and applications of special steels.	3
CO2	Compare and evaluate alloy cast irons for engineering applications.	5
CO3	Apply knowledge of light metal alloys to select materials for engineering use.	3
CO4	Analyze high-temperature performance of superalloys.	4
CO5	Describe and apply nanomaterials and smart materials in engineering systems.	3

Course Content

Unit No.	**Contents**	**Hrs.**
Unit 1	**Special Steels:** Metallurgical aspects, Composition, Properties and applications of: different types of Stainless steels, Dual phase steels, TRIP steels, Maraging steels, High speed steels, Hadfield steels, Free cutting steels, Ausformed steels, Tool Steels, manganese steels, chrome steels, electrical steels, bearing steels, spring steels, heat resistant steels, creep steels, HSLA steels etc.	07
Unit 2	**Alloy cast iron:** Need of alloying. Silal, Nicrosilal, High silicon cast iron, Ni-hard, Heat resistant cast iron: Composition, Properties and their applications.	06
Unit 3	**Light metals and their alloys:** Aluminum, magnesium and titanium alloys: Metallurgical aspects, Properties and applications	06
Unit 4	**Super alloys:** Iron base, nickel base and cobalt base super alloys: Strengthening mechanism, Composition, Properties and their applications.	06
Unit 5	**Nano materials:** Definition, Types, Properties and applications, Carbon nano tubes, Methods of production. Smart materials: Shape memory alloys, Piezoelectric materials, Electro-rheological fluid, Magneto- rheological fluids.	06
Unit 6	**Biomaterials:** Property requirement, biocompatibility, bio-functionality, Important bio metallic alloys like: Ni-Ti alloy and Co-Cr-Mo alloys. Applications	06

Dr. M.L. Hargude HOD Mech.	Dr. K. K Pandyaji Dean Academics	Dr. S. S. Mohite Director	Prof. R. A. Kanai Executive Director

Text Books:

1. The Science and Engineering of Materials by D. R. Askeland and P. P. Phule, Thomson Publication
2. Advances in Material Science by R. K. Dogra and A. K. Sharma
3. Material science by Van Black.
4. Engineering Materials and Applications by R. A. Flinn and P. K. Trojan
5. Materials, their Nature, Properties and Fabrication by R. A. Lindberg and S. D. Sehgal, S Chand & Co.

Reference Book

1. Light Alloys: Metallurgy of Light Metals by I. J. Polmear
2. Engineering Materials: Properties and applications of Metals and alloys by CP Sharma, PHI
3. Engineering Materials: Polymers, ceramics and composites by AK Bhargava, PHI Nano Technology by AK Bandyopadhyay, New age international publishers

Dr. M.L. Hargude HOD Mech.	Dr. K. K Pandyaji Dean Academics	Dr. S. S. Mohite Director	Prof. R. A. Kanai Executive Director

Optimization in Design

Course Code and Course Title	OMDOE602B Optimization in Design			
Semester	III			
Prerequisites	Machine Design			
Teaching Scheme (hours per week)	Lecture	Tutorial	Practical	
	3	-	-	
Credit	3			
Evaluation Scheme	ISE 1	MSE	ISE 2	ESE
	10 Marks	20 Marks	10 Marks	60 Marks

Course Outcomes (COs): -Upon successful completion of this course, the student will able to:		BL
CO1	Formulate and solve single-variable optimization problems using bracketing, region elimination, and gradient-based methods.	3
CO2	Apply multivariable optimization algorithms using direct and gradient-based search techniques for engineering problems.	3
CO3	Analyze and implement constrained optimization methods such as Kuhn–Tucker conditions, feasible direction, and gradient projection methods.	4
CO4	Evaluate and apply special optimization algorithms such as Genetic Algorithms, Simulated Annealing, and Integer or Geometric Programming for global optimization.	5
CO5	Apply optimization techniques to operations research and stochastic programming problems including linear, dynamic, and probabilistic models.	5

Course Content

Unit No.	Contents	Hrs.
Unit 1	**Optimization Aspects:** Optimal problem formulation, engineering optimization problems, optimization algorithms. Single Variable Optimization Algorithms: Optimality criteria, bracketing methods, region elimination methods, point estimation methods, gradient based methods, root finding using optimization techniques.	06
Unit 2	**Multivariable Optimization Algorithms:** Optimality criteria, unidirectional search, direct search methods, gradient based methods, Computer programs on above methods.	06
Unit 3	**Constrained Optimization Algorithms:** Kuhn-Tucker conditions, transformation methods, sensitivity analysis, direct search for constrained minimization, linearized search techniques, feasible direction method, generalized reduced gradient method, gradient projection method, Computer programs on above methods.	06
Unit 4	**Special Optimization Algorithms:** Integer programming, Geometric programming, Genetic Algorithms, Simulated annealing, global optimization, Computer programs on above methods.	06
Unit 5	**Optimization In Operations Research:** Linear programming problem, simplex method, artificial variable techniques, dual phase method, sensitivity analysis.	06

Dr. M.L. Hargude HOD Mech.	Dr. K. K Pandyaji Dean Academics	Dr. S. S. Mohite Director	Prof. R. A. Kanai Executive Director

Unit 6	**Stochastic Programming:** Basic concepts of probability theory, random variables Distributions – mean, variance, Correlation, co variance, joint probability distribution stochastic linear, dynamic programming.	06

Text Books:

1. Deb Kalyanmoy, "Optimization in Engineering Design", PHI, New Delhi
2. Rao S. S. "Engineering Optimization", John Wiley, New Delhi.
3. Deb Kalyanmoy, "Multi-objective Algorithms using Evolutionary Algorithms", John Wiley, New Delhi.

Reference Book

1. Paplambros P. Y. and Wilde D. J., "Principles of Optimum Design: Modeling and Computation", Cambridge University Press, UK
2. Chandrupatla, "Optimization in Design", PHI, New Delhi. 2001

M. Tech Mechanical Design Engineering

Curriculum w.e.f. A. Y. 2025-26

Engineering Computing

Course Code and Course Title	**OMDPE602C Engineering Computing**			
Semester	III			
Prerequisites	Engineering Mathematics			
Teaching Scheme (hours per week)	**Lecture**	**Tutorial**	**Practical**	
	3	-	-	
Credit	3			
Evaluation Scheme	**ISE 1**	**MSE**	**ISE 2**	**ESE**
	10 Marks	20 Marks	10 Marks	60 Marks

Course Outcomes (COs): -Upon successful completion of this course, the student will able to:		**BL**
CO1	Apply numerical techniques for data analysis, interpolation, and curve fitting using various difference and least-square methods.	3
CO2	Solve systems of linear equations and determine eigenvalues and eigenvectors using direct and iterative numerical methods.	3
CO3	Apply numerical methods for differentiation, integration, and solution of ordinary differential equations using Runge-Kutta and Predictor–Corrector techniques.	3
CO4	Analyze and solve boundary value and eigenvalue problems using finite difference, shooting, and power methods.	4
CO5	Formulate and solve partial differential equations and develop mathematical models for physical systems using numerical and analytical approaches.	5

Course Content

Unit No.	**Contents**	**Hrs.**
Unit 1	**Data Analysis and Curve Fitting**: Errors in numerical calculations, Interpolation by central differences, sterling Bessel & Everett Formulae, Interpolation Formula for unequal Intervals, Spline Interpolation, Cubic Splines. Least square method for linear & non-linear functions, weighted least square methods.	06
Unit 2	**Solution of Linear System of Equations**: Gauss Elimination with Pivoting, LU Decomposition method, Iterative methods, Eigen vectors-Jacobi method, Jacob's method, Gauss Siedel method.	06
Unit 3	**Solution of Ordinary Differential Equation, Numerical Differentiation & Integration**: Differentiation by Finite Differences, Numerical Integration by Newton-Cotes formula & Gauss Quadrature. Picard's Method, Euler's & Modified Euler's Method, Runge-KuttaMethod (up to fourth order), Predictor-Corrector Methods, Milne Sompson, Adams Bashforth Moulten Methods.	07
Unit 4	**Boundary value and Eigen value problems:** Shooting method, finite difference method to solve boundary value problems, Polynomial method, power method to solve Eigen value problems.	05
Unit 5	**Solution of Partial differential equations**: Finite difference method, solution of Laplace & Parabolic equations.	06

Dr. M.L. Hargude HOD Mech.	Dr. K. K Pandyaji Dean Academics	Dr. S. S. Mohite Director	Prof. R. A. Kanai Executive Director

Unit 6	**Mathematical Modelling of Physical Problems** : Modelling Concept, Modelling of Linear Differential Equations of Second order.	06

Text Books

1. Dr. B.S. Grewal, Numerical methods for science &Engg., Khanna publications.
2. M.K. Jain, Numerical methods for Scientific &Engg. Computation, New age international publication.
3. E. Balagurusamy, Numerical methods, Tata McGraw Hill Publications.
4. K. Atkinson and W. Han, Elementary Numerical Analysis, 3rd Edition, Wiley-India, 2004.
5. J. D. Hoffman and Steven Frankel, Numerical Methods for Engineers and Scientists, 2nd Edition, McGraw-Hill, 2001

Reference Book

1. S. D. Conte and Carl de Boor, Elementary Numerical Analysis - An Algorithmic Approach, 3rd Edition, McGraw-Hill, 1980.
2. S. S. Shastry, Introductory methods of numerical analysis, Third edition, Prentice hall of India publications pvt. Ltd.
3. Swami, Saran Singh, Computer programming and numerical methods.

M. Tech Mechanical Design Engineering

Curriculum w.e.f. A. Y. 2025-26

Intellectual Property Rights

Course Code and Course Title	**OMDHS603A Intellectual Property Rights**			
Semester	III			
Prerequisites	Product Development			
Teaching Scheme (hours per week)	**Lecture**	**Tutorial**	**Practical**	
	3	-	-	
Credit	3			
Evaluation Scheme	**ISE 1**	**MSE**	**ISE 2**	**ESE**
	10 Marks	20 Marks	10 Marks	60 Marks

Course Outcomes (COs): -Upon successful completion of this course, the student will able to:		**BL**
CO1	Apply basic concepts of Intellectual Property Rights to identify different forms of IPR in engineering and research.	3
CO2	Analyze patent, copyright, trademark, and design systems to understand protection, infringement, and registration processes.	4
CO3	Apply IPR management concepts such as licensing and commercialization in technological and research contexts.	3
CO4	Evaluate real-world IPR case studies to understand legal, ethical, and enforcement issues.	5

Course Content

Unit No.	**Contents**	**Hrs.**
Unit 1	**Introduction to Intellectual Property Rights:** Concept and overview of IPR; importance of IPR in innovation and economic growth; evolution of IPR. IPR systems in India and abroad; international agreements and treaties related to IPR.	06
Unit 2	**Patents and Utility Models:** Definition and objectives of patents; patentable and non-patentable inventions; procedure for patent granting; patent infringement and remedies; patent searching and filing process. Introduction to utility models and their relevance.	06
Unit 3	**Copyrights and Related Rights:** Definition and scope of copyrights; rights granted to authors; registration and protection of copyrights; infringement and remedies; copyright searching and filing procedures; distinction between copyrights and related rights.	06
Unit 4	**Trademarks and Domain Names:** Trademarks—role in commerce, importance, and types; protection and registration of trademarks; infringement and remedies. Domain names—concept, registration, disputes, and their relation with trademarks.	06
Unit 5	**Industrial Designs, Geographical Indications, and Plant Varieties:** Industrial designs and design patents—scope, protection, filing, and infringement; difference between designs and patents. Geographical indications—concept and international protection. Protection of plant varieties and breeder's rights.	06
Unit 6	**IPR Management, Enforcement, and Case Studies:** IPR in biotechnology and research; rights management; licensing and commercialization of IPR; legal issues and enforcement mechanisms. Case studies related to patents, copyrights, trademarks, and designs.	06

Textbooks

1. Deborah, E. Bouchoux, "Intellectual Property Rights", Cengage learning.
2. Prabuddha Ganguli, "Intellectual Property right: Unleashing the knowledge economy", Tata McGraw Hill Publishing Company Ltd.

Dr. M.L. Hargude HOD Mech.	Dr. K. K Pandyaji Dean Academics	Dr. S. S. Mohite Director	Prof. R. A. Kanai Executive Director

M. Tech Mechanical Design Engineering

Curriculum w.e.f. A. Y. 2025-26

Entrepreneurship & Start-up

Course Code and Course Title	**OMDHS603B Entrepreneurship & Start-up**			
Semester	III			
Prerequisites	Industrial Product Design			
Teaching Scheme (hours per week)	**Lecture**	**Tutorial**	**Practical**	
	3	-	-	
Credit	3			
Evaluation Scheme	**ISE 1**	**MSE**	**ISE 2**	**ESE**
	10 Marks	20 Marks	10 Marks	60 Marks

Course Outcomes (COs): -Upon successful completion of this course, the student will able to:		**BL**
CO1	Apply concepts of entrepreneurship and the startup ecosystem to understand startup formation and growth.	3
CO2	Analyze customer needs and market data to generate, validate, and develop startup ideas using design thinking.	4
CO3	Apply planning, operational, and financial tools to develop effective startup and small business plans.	3
CO4	Evaluate innovation, sustainability, and future trends to support scalable and responsible startup development.	5

Course Content

Unit No.	Contents	Hrs.
Unit 1	**Entrepreneurship and Startup Ecosystem:** Concept of entrepreneurship and startups; reasons for rapid startup growth; characteristics and types of entrepreneurs; entrepreneurial mindset. Startup ecosystem components such as incubators, accelerators, investors, mentors, and government support. Case studies from design and engineering sectors.	06
Unit 2	**Idea Generation and Design Thinking:** Design thinking approach; idea generation techniques (brainstorming, SCAMPER, TRIZ); identification of customer needs and pain points; market research and idea validation; concept testing, user feedback, MVP development, and pilot testing.	06
Unit 3	**Soft Skills for Entrepreneurs:** Leadership and team building; negotiation and persuasion; time and stress management; problem-solving and decision-making; communication and presentation skills; pitching, storytelling, networking, and team motivation.	06
Unit 4	**Startup Planning and Operations:** Business Model Canvas and lean startup methodology; business plan preparation; legal compliances (registration, IP, taxation); marketing and branding strategies; customer acquisition; financial management and funding options.	06
Unit 5	**Management of Small Business Enterprises:** Role and importance of SMEs; performance monitoring; identification and prevention of business sickness; rehabilitation, turnaround, scaling, and growth strategies; case studies of SME management.	06
Unit 6	**Innovation, Sustainability, and Future Trends:** Innovation and technology in startups; sustainable and social entrepreneurship; basics of IPR; Industry 4.0 and emerging opportunities; government support schemes; future trends such as green startups, AI-based ventures, and global expansion.	06

Dr. M.L. Hargude HOD Mech.	Dr. K. K Pandyaji Dean Academics	Dr. S. S. Mohite Director	Prof. R. A. Kanai Executive Director

Text Books

1. Poornima M. Charantimath, Entrepreneurship Development and Small Business Enterprises, Pearson Education.
2. Vasant Desai, Dynamics of Entrepreneurial Development and Management, Himalaya Publishing House.
3. Peter F. Drucker, Innovation and Entrepreneurship, Harper Business.
4. Ash Maurya, Running Lean: Iterate from Plan A to a Plan That Works, O'Reilly Media.

Reference Books

1. Prabuddha Ganguli, IPR: Unleashing the Knowledge Economy, Tata McGraw Hill, 2001.
2. Eric Ries, The Lean Startup, Crown Publishing.
3. Guy Kawasaki, The Art of the Start 2.0, Penguin Books.
4. Steve Blank, The Startup Owner's Manual, K&S Ranch Press.
5. David H. Holt, Entrepreneurship: New Venture Creation, Prentice Hall.
6. Graham H. Twelftree, Small Business Management, McGraw Hill Education.

M. Tech Mechanical Design Engineering

Curriculum w.e.f. A. Y. 2025-26

Engineering Economics Analysis

Course Code and Course Title	**OMDHS603C Engineering Economics Analysis**			
Semester	III			
Prerequisites	Engineering Mathematics			
Teaching Scheme (hours per week)	**Lecture**	**Tutorial**	**Practical**	
	3	-	-	
Credit	3			
Evaluation Scheme	**ISE 1**	**MSE**	**ISE 2**	**ESE**
	10 Marks	20 Marks	10 Marks	60 Marks

Course Outcomes (COs): -Upon successful completion of this course, the student will able to:		**BL**
CO1	Apply feasibility study methods and economic concepts to analyze engineering projects.	3
CO2	Analyze cash flows using time value of money and economic equivalence for decision making.	4
CO3	Evaluate money management options in financial planning.	5
CO4	Compare investment alternatives using standard economic evaluation methods to select project.	5

Course Content

Unit No.	**Contents**	**Hrs.**
Unit 1	**Engineering Economics Aspects :** Project life cycle stages; meaning and need of feasibility study; steps in feasibility study; steps involved; basic cost terms.	06
Unit 2	**Time Value of Money:** Concept of time value of money; cash flow diagrams; interest and interest rate; types of interest rates.	06
Unit 3	**Economic Equivalence:** Meaning of economic equivalence; equal series cash flows; unequal cash flows; arithmetic (linear) gradient cash flows.	05
Unit 4	**Advanced Cash Flow Analysis:** Geometric gradient cash flows; composite cash flows; handling mixed and complex cash flow patterns.	05
Unit 5	**Money Management:** Concepts of multiple compounding periods; nominal and effective interest rates; changing interest rates; amortized loans; add-on loans; impact of inflation; customized loan schemes.	07
Unit 6	**Investment Evaluation:** Project cash flows; investment evaluation methods—payback period, net present worth, net future worth, net annual worth, and IRR; IRR solution methods; types of projects; independent and mutually exclusive projects; project ranking and time span equalization.	07

Reference Books

1. Engineering Economic Analysis, Donald G. Newman, Jerome P. Lavalle, and Ted G. Eschenbach, Oxford University Press, 12th Edition.
2. Fundamentals of Engineering Economics, Chan S. Park, Pearson Education.

Reference Books

1. Engineering Economy, William G. Sullivan, Elin M. Wicks, and James T. Luxhoj, Pearson Education.
2. Engineering Economy, Leland T. Blank and Anthony J. Tarquin, McGraw Hill Education.

Dr. M.L. Hargude HOD Mech.	Dr. K. R Pandyaji Dean Academics	Dr. S. S. Mohite Director	Prof. R. A. Kanai Executive Director

M. Tech Mechanical Design Engineering

Curriculum w.e.f. A. Y. 2025-26

IKS: Concepts & Applications in Engineering

Course Code and Course Title	**OMDIK604A** **IKS: Concepts & Applications in Engineering**			
Semester	III			
Prerequisites	Basic Engineering Sciences			
Teaching Scheme (hours per week)	**Lecture**	**Tutorial**	**Practical**	
	3	-	-	
Credit	3			
Evaluation Scheme	**ISE 1**	**MSE**	**ISE 2**	**ESE**
	10 Marks	20 Marks	10 Marks	60 Marks

Course Outcomes (COs): -Upon successful completion of this course, the student will able to:		**BL**
CO1	Apply basic concepts of the Indian Knowledge System to explain its structure, evolution, and key features.	3
CO2	Apply principles of Indian mathematics, astronomy, and linguistics to understand traditional knowledge practices.	4
CO3	Analyze Indian engineering, technological practices, architecture, and scientific methods.	5
CO4	Evaluate the relevance of Indian knowledge frameworks and computational approaches for modern applications.	5

Course Content

Unit No.	**Contents**	**Hrs.**
Unit 1	**Introduction to Indian Knowledge System**: Meaning, importance, and relevance of IKS; organization and historical background; key features; overview of Vedic life and values.	06
Unit 2	**Vedic Literature and Knowledge Streams**: Introduction to Vedas; four Vedas and their classifications; core messages; Vedāṅgas; basic concepts of Śikṣā, Vyākaraṇa, Nirukta, Chandas, Kalpa, and Jyotiṣa.	06
Unit 3	**Indian Mathematics and Astronomy**: Indian number systems; Bhūta-Saṃkhyā and Kaṭapayādi systems; traditional measurements; Piṅgala's binary system; contributions of Indian mathematicians; basics of algebra, geometry, trigonometry, combinatorics, magic squares; Indian astronomy, Pañcāṅga, and instruments.	06
Unit 4	**Engineering, Technology, and Scientific Practices**: Indian scientific heritage; metallurgy (Wootz steel, lost-wax casting); mining and extraction; irrigation and water management; dyes, perfumes, surgery, shipbuilding; indigenous technologies and 64 Kalās.	06
Unit 5	**Town Planning, Architecture, and Knowledge Frameworks**: Town planning (Arthaśāstra); Vāstu-śāstra fundamentals; temple architecture and iconography; Indian knowledge classification; prameya, dravya, pramāṇa; reasoning methods, fallacies, and siddhānta.	06
Unit 6	**Linguistics and Computational Aspects**: Indian linguistics and Aṣṭādhyāyī; phonetics and word formation; sentence structure; mnemonics; rule-based and recursive operations; computational Sanskrit and NLP applications.	06

Dr. M.L. Hargude HOD Mech.	Dr. K. K Pandyaji Dean Academics	Dr. S. S. Mohite Director	Prof. R. A. Kanai Executive Director

Textbooks

1. Mahadevan, B., Bhat Vinayak Rajat, and Nagendra Pavana R. N. (2022), Introduction to Indian Knowledge System: Concepts and Applications, PHI Learning Private Ltd., Delhi.
2. Kak, S. C. (1987), On Astronomy in Ancient India, Indian Journal of History of Science, 22(3), pp. 205–221.
3. Subbarayappa, B. V. and Sarma, K. V. (1985), Indian Astronomy: A Source Book, Nehru Centre, Mumbai.

Reference Books

1. Pride of India: A Glimpse into India's Scientific Heritage, Samskrita Bharati, New Delhi.
2. Sampad and Vijay (2011), The Wonder that is Sanskrit, Sri Aurobindo Society, Puducherry.
3. Bag, A. K. (1979), Mathematics in Ancient and Medieval India, Chaukhamba Orientalia, New Delhi.
4. Datta, B. and Singh, A. N. (1962), History of Hindu Mathematics: Parts I and II, Asia Publishing House, Mumbai.

M. Tech Mechanical Design Engineering

Curriculum w.e.f. A. Y. 2025-26

Constitution of India

Course Code and Course Title	**OMDIK604B Constitution of India**			
Semester	III			
Prerequisites	Professional Ethics			
Teaching Scheme (hours per week)	**Lecture**	**Tutorial**	**Practical**	
	3	-	-	
Credit	3			
Evaluation Scheme	**ISE 1**	**MSE**	**ISE 2**	**ESE**
	10 Marks	20 Marks	10 Marks	60 Marks

Course Outcomes (COs): -Upon successful completion of this course, the student will able to:		**BL**
CO1	Apply constitutional principles to explain the structure, features, and objectives of the Indian Constitution.	3
CO2	Analyze Fundamental Rights, Directive Principles, and Fundamental Duties in the context of citizens and the State.	4
CO3	Examine the structure and functions of Union and State governments and the judiciary.	4
CO4	Evaluate Union–State relations, constitutional bodies, and amendment procedures for effective governance.	5

Course Content

Unit No.	**Contents**	**Hrs.**
Unit 1	**Constitution of India – Background and Features**: Meaning and definition of the Constitution; historical background; salient features; Preamble; Union and its territory.	06
Unit 2	**Citizenship and Fundamental Rights**: Meaning of citizenship; types and termination; definition of State; Fundamental Rights—nature and classification; Right to Equality; Right to Freedom; Right against Exploitation.	06
Unit 3	**Religious, Cultural Rights and Governance Principles**: Right to Freedom of Religion; Cultural and Educational Rights; Right to Constitutional Remedies; protection in respect of conviction for offences; Directive Principles of State Policy—classification; Fundamental Duties.	06
Unit 4	**Union Government and Judiciary**: Union Executive—President, Vice President, Prime Minister, Council of Ministers, Attorney General and functions; Parliament—composition, Rajya Sabha and Lok Sabha, qualifications and disqualifications, functions; Supreme Court—jurisdiction and special leave appeal.	06
Unit 5	**State Government and Judiciary**: State Executive—Governor, Chief Minister, Council of Ministers, Advocate General; Union Territories; State Legislature—composition, qualifications and disqualifications, functions; High Court—jurisdiction and writ jurisdiction.	06
Unit 6	**Federal Relations and Constitutional Provisions**: Union–State relations—legislative, administrative, and financial; Inter-State Council; Finance Commission; Emergency provisions; freedom of trade, commerce, and intercourse; Comptroller and Auditor General; Public Services and Public Service Commissions; Administrative Tribunals; Official language; elections; special provisions for certain classes; amendment of the Constitution.	06

Dr. M.L. Hargude HOD Mech.	Dr. K. K Pandyaji Dean Academics	Dr. S. S. Mohite Director	Prof. R. A. Kanai Executive Director

Textbooks

1. M. P. Jain, Indian Constitutional Law, LexisNexis.
2. D. D. Basu, Introduction to the Constitution of India, LexisNexis.
3. P. M. Bakshi, The Constitution of India, Universal Law Publishing
4. Granville Austin, Indian Constitution: Cornerstone of a Nation, Oxford University Press.

Reference Books

1. B. R. Ambedkar, The Constitution of India, Government of India Publication.
2. V. N. Shukla, Constitution of India, Eastern Book Company.
3. Subhash C. Kashyap, Our Constitution: An Introduction to India's Constitution and Constitutional Law, National Book Trust.

Ancient Indian Management

Course Code and Course Title	OMDIK604C Ancient Indian Management			
Semester	III			
Prerequisites	Research Methodology			
Teaching Scheme (hours per week)	Lecture	Tutorial	Practical	
	3	-	-	
Credit	3			
Evaluation Scheme	ISE 1	MSE	ISE 2	ESE
	10 Marks	20 Marks	10 Marks	60 Marks

Course Outcomes (COs): -Upon successful completion of this course, the student will able to:		BL
CO1	Apply basic management concepts to explain principles of ancient Indian management thought.	3
CO2	Analyze management values and ethical practices from Jain, Vedantic literature, Mahabharata, and Ramayana.	4
CO3	Examine leadership, motivation, and decision-making lessons from the Bhagavad Gita for modern organizations.	4
CO4	Evaluate ancient Indian economic ideas and their relevance to contemporary management practices.	5

Course Content

Unit No.	Contents	Hrs.
Unit 1	**Introduction to Management**: Meaning and definition of management; nature and functions of management; management as a science or art; relevance of management in organizations.	06
Unit 2	**Ancient Indian Management Thought**: Overview of management concepts in ancient India; values, ethics, and governance practices in ancient Indian society.	07
Unit 3	**Management Perspectives from Jain and Vedantic Literature**: Introduction to Jain and Vedantic literature; code of conduct in Jain and Vedantic traditions; four pillars of human labour; management lessons from the Mahabharata.	07
Unit 4	**Management Lessons from Bhagavad Gita**: Introduction to the Bhagavad Gita; leadership, duty (karma), decision-making, motivation, and ethical management principles.	06
Unit 5	**Management Lessons from Ramayana**: Introduction to the Ramayana; leadership qualities, teamwork, governance, ethics, and strategic management lessons.	05
Unit 6	**Ancient Indian Economic Thought**: Economic ideas of Kautilya; principles of administration and governance; economic views of Mahavira and their relevance to modern management.	05

Textbooks - 1. Indian Management by Subhash Sharma. New Age International (P) Limited Publishers, New Delhi ISBN: 978-93-89802-41-2
2. Management Concepts - In Ancient Indian Psycho-Philosophic Thought &Thier Significance for Present Day Organisations by Ipshita Bansal, Popular Book Depo
3. In Indian Logic: Modern Management Philosophies as derived from Ancient Indian Philosophies, by Aparna Singh.

Dr. M.L. Hargude HOD Mech.	Dr. K. K Pandyaji Dean Academics	Dr. S. S. Mohite Director	Prof. R. A. Kanai Executive Director

M. Tech Mechanical Design Engineering

Curriculum w.e.f. A. Y. 2025-26

Research Paper Publication Ethics & Writing

Course Code and Course Title	**OMDVS605 Research Paper Publication Ethics & Writing**			
Semester	III			
Prerequisites	Research Methodology			
Teaching Scheme (hours per week)	**Lecture**	**Tutorial**	**Practical**	
	-	-	4	
Credit	2			
Evaluation Scheme	**ISE 1**	**MSE**	**ISE 2**	**ESE**
	25 Marks	-	25 Marks	50 Marks

Course Outcomes (COs): -Upon successful completion of this course, the student will able to:		**BL**
CO1	Apply appropriate literature review and academic writing techniques to draft a research paper	3
CO2	Analyze ethical issues such as plagiarism, authorship, and data integrity in research publications	4
CO3	Evaluate journals and conferences based on quality, indexing, and publication ethics	5
CO4	Create a complete and ethically compliant research paper ready for submission	6

Course Content

Unit No.	**Contents**	**Hrs.**
Unit 1	**Research Publications and Literature Survey:** Types of research papers; reputed journals and conferences in Design Engineering; literature search using Google Scholar, Scopus, Web of Science, IEEE, Springer; identification of research gaps and formulation of research problems	08
Unit 2	**Research Paper Structure and Academic Writing:** Structure of a research paper including title, abstract, keywords, introduction, methodology, results, discussion and conclusion; academic and technical writing style; effective use of figures, tables and equations	08
Unit 3	**Referencing Tools and Research Ethics:** Citation and referencing styles (IEEE, APA, Elsevier); use of reference management tools such as Mendeley and Zotero; plagiarism, self-plagiarism, data fabrication, falsification and authorship ethics	08
Unit 4	**Publication Ethics and Legal Aspects:** Plagiarism checking and similarity report interpretation; copyright issues; open access and subscription journals; Creative Commons licenses; conflict of interest and acknowledgment practices	08
Unit 5	**Journal Selection and Peer Review Process:** Identification of predatory journals and conferences; journal selection based on indexing and impact factor; manuscript formatting and online submission; peer-review process and responding to reviewers' comments	08
Unit 6	**Manuscript Preparation and Presentation:** Preparation of a complete research paper draft based on M.Tech work; ethical compliance; presentation of research paper; final submission as per journal guidelines	08

Textbooks/Reference Books

1. Day, R. A. and Gastel, B., How to Write and Publish a Scientific Paper, Cambridge University Press.
2. Cargill, M. and O'Connor, P., Writing Scientific Research Articles: Strategy and Steps, Wiley-Blackwell.

Dr. M.L. Hargude HOD Mech.	Dr. K. K Pandyaji Dean Academics	Dr. S. S. Mohite Director	Prof. R. A. Kanai Executive Director

M. Tech Mechanical Design Engineering

Curriculum w.e.f. A. Y. 2025-26

Dissertation Phase –I

Course Code and Course Title	**OMDDI606 Dissertation Phase –I**			
Semester	III			
Prerequisites	Research Methodology, Research Papers			
Teaching Scheme (hours per week)	**Lecture**	**Tutorial**	**Practical**	
	-	-	-	
Credit	6			
Evaluation Scheme	**ISE 1**	**MSE**	**ISE 2**	**ESE**
	25 Marks	-	25 Marks	50 Marks

Course Outcomes (COs): -Upon successful completion of this course, the student will able to:		**BL**
CO1	Identify a relevant industrial or research problem	3
CO2	Analyse literature to identify research gaps	4
CO3	Define clear objectives and scope for the identified problem	4
CO4	Interpret and formulate a well-defined problem statement	5

Course Content

The dissertation involves research work carried out by the student, or a detailed and critical review of recent developments, or a design-based project related to Design Engineering. The dissertation is completed in two stages: **Dissertation–I** and **Dissertation–II**.

1. **Dissertation–I** Focuses on preliminary work. The student must define the problem, carry out a literature review, plan the method of implementation, and prepare the layout and design of the proposed system. By the end of Dissertation–I, the work should be completed up to the design stage.
2. The student must show continuous progress through regular reports and at least two presentations during the semester. All activities and progress must be properly documented. Progress will be monitored by a senior expert or the course coordinator of Design Engineering.
3. The student must validate the work by submitting or publishing it in a recognized conference and/or a peer-reviewed journal.
4. The Dissertation–I report must be submitted in the prescribed format and should be approved and certified by the guide and the course coordinator of Design Engineering.
5. Evaluation during the End Semester Examination (ESE) will be carried out by two examiners: the guide and the course coordinator of Design Engineering. Assessment will be based on literature review, work carried out, quality of content, presentation skills, documentation, and the final report.

References

Research papers from Reputed national and international journals and conferences.

Dr. M.L. Hargude HOD Mech.	Dr. K. K Pandyaji Dean Academics	Dr. S. S. Mohite Director	Prof. R. A. Kanai Executive Director

Yoga for stress management

Course Code and Course Title	OMDCC607 Yoga for stress management			
Semester	III			
Prerequisites	Awareness of Health			
Teaching Scheme (hours per week)	Lecture	Tutorial	Practical	
	-	-	2	
Credit	0			
Evaluation Scheme	ISE 1	MSE	ISE 2	ESE
	-	-	-	-

Course Outcomes (COs): -Upon successful completion of this course, the student will able to:		BL
CO1	Apply health concepts to improve overall well-being.	3
CO2	Analyze stress and use yoga for stress management.	4
CO3	Practice yogic techniques for physical and mental health.	3
CO4	Evaluate the role of yoga and diet in healthy living.	5

Course Content

Unit No.	Contents	Hrs.
Unit 1	**Introduction to Health**: Meaning and definition of health; dimensions of health—physical, mental, social, and spiritual well-being.	04
Unit 2	**Stress and Stress Management through Yoga**: Concept of stress according to yoga; causes and effects of stress; role of yoga in stress management.	04
Unit 3	**Introduction to Yoga and Health**: Meaning and definition of yoga; fundamental concepts of yoga; relationship between yoga and overall health.	04
Unit 4	**Yogic Practices and Asanas**: Yogic Sukshma Vyayam; Patanjali's Ashtanga Yoga Sutra; types and benefits of asanas (minimum five in each category); practice and benefits of Suryanamaskar.	04
Unit 5	**Pranayama and Meditation**: Types and benefits of pranayama (minimum five); meaning and importance of dhyan (meditation).	04
Unit 6	**Yogic Diet and Practical Sessions**: Importance of yogic diet; food and nutrition; practice sessions—Sukshma Vyayam, asanas, pranayama, and dhyan.	04

Textbooks

1. K. N. Udupa, Stress and its Management by Yoga, Motilal Banaridas Publishers.
2. Acharya Yetendra, Yoga and Stress Management, Finger Print Publications.

Reference Books

1. B. K. S. Iyengar, Light on Yoga, Harper Collins Publisher, New Delhi, 2005.
2. Swami Vivekanand, Patanjali Yog Sutra, Geeta Press, Gorakhpur.

Dr. M.L. Hargude HOD Mech.	Dr. K. K Pandyaji Dean Academics	Dr. S. S. Mohite Director	Prof. R. A. Kanai Executive Director

M. Tech Mechanical Design Engineering

Curriculum w.e.f. A. Y. 2025-26

Dissertation Phase –II

Course Code and Course Title	OMDDI651 Dissertation Phase –II			
Semester	IV			
Prerequisites	Dissertation Phase –I, Research Papers			
Teaching Scheme (hours per week)	Lecture	Tutorial	Practical	
	-	-	-	
Credit	20			
Evaluation Scheme	ISE 1	MSE	ISE 2	ESE
	50	-	50	100

Course Outcomes (COs): -Upon successful completion of this course, the student will able to:		BL
CO1	Illustrate an industrial or in-house project by applying basic engineering concepts.	3
CO2	Identify and analyze industrial or in-house problems.	4
CO3	Apply knowledge from different courses to solve practical engineering problems.	3
CO4	Prepare and present a clear, well-organized project report.	5

Course Content

Detailed description:

1. In Dissertation – II, the student shall consolidate and complete the remaining part of the dissertation which will consist of selection of research methodology, installations, implementations, testing, results, measuring performance, discussions using data tables considered for the improvement with existing / known algorithms / systems, comparative analysis, characterization and validation of results and conclusions.
2. The candidate has to exhibit the continuous progress through regular reporting and presentations (at least TWO during semester) and proper documentation of the frequency of the activities. The continuous assessment of the progress needs to be documented unambiguously. Progress will be monitored by an evaluation committee consisting of guide and senior expert or the course coordinator of Design Engineering.
3. The candidate shall submit the report of dissertation – II in standard format for satisfactory completion of the work, duly approved and certified by the concerned guide, the course coordinator of Design Engineering and Principal.
4. The candidate will be assessed during ESE by two examiners, one of whom will be the course coordinator of Design Engineering and other is necessarily an external examiner. The assessment will be broadly based on literature study, work undergone, results and conclusion, contribution, content delivery, presentation skills, documentation and report.

References -

Research papers from Reputed national and international journals and conferences.

Dr. M.L. Hargude HOD Mech.	Dr. K. K Pandyaji Dean Academics	Dr. S. S. Mohite Director	Prof. R. A. Kanai Executive Director