



TULSIRAMJI GAIKWAD-PATIL
College of Engineering & Technology

Mohgaon, Wardha Road, Nagpur - 441 108

(An Autonomous Institution Affiliated to RTM Nagpur University, Nagpur)



DEPARTMENT OF MECHANICAL ENGINEERING

Structure & Curriculum

From

Academic Year 2022-2023

Vision of Institute

To emerge as a learning center of Excellence in the National Ethos in domains of Science, Technology and Management.

Mission of Institute

- M1: To strive for rearing standard and stature of the students by practicing high Standards of professional ethics, transparency and accountability.
- M2: To provide facilities and services to meet the challenges of Industry and Society.
- M3: To facilitate socially responsive research, innovation and entrepreneurship.
- M4: To ascertain holistic development of the students and staff members by inculcating knowledge and profession as work practices.

Vision of the Department

To emerge as a premier centre in the field of Mechanical Engineering Education and produce competent Engineers.

Mission of the Department

- To impart quality Technical Education through effective teaching -learning process.
- To provide a better environment to encourage innovation and entrepreneurship.
- To strengthen industry institute interaction to meet the challenges of industry and society.
- To ensure overall development of students and staff members by inculcating knowledge and professional ethics.

Program Education Objectives (PEO)

PEO-1: Demonstrate essential technical skills to identify, analyze and solve problems and design issues in mechanical engineering.

PEO-2 :Analyze the complex problems in the field of mechanical engineering by using modern tools.

PEO-3 :Apply mechanical engineering concepts for the betterment of society and environment.

PEO-4 :Develop professionals having administrative and managerial skills for mechanical engineering and allied industries.

PEO-5 :Demonstrate the attributes of mechanical engineering in lifelong learning to contribute towards societal needs.

Program Outcomes (PO)

- 1. Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- 2. Problem Analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- 3. Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- 4. Conduct investigations of complex problems:** Use research based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- 5. Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and software tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
- 6. The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
- 7. Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- 8. Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- 9. Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- 10. Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- 11. Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
- 12. Lifelong learning:** Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

Program Specific Outcomes (PSO)

PSO 1: Apply the knowledge to work professionally and ethically in Thermal, Design, production and Manufacturing areas of Mechanical engineering.

PSO 2: Analyze and design mechanical components and its processes to meet the societal needs.

PSO 3: Apply Engineering and Management principles to work professionally in the industry or as an entrepreneur.

Tulsiramji Gaikwad-Patil College of Engineering & Technology, Nagpur

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SCHEME OF INSTRUCTION & SYLLABUS

Programme: Mechanical Engineering

Scheme of Instructions: Second Year B.E. in Mechanical Engineering

Semester-IV

Sr. No.	Course Category	Course Code	Course Title	L	T	P	Contact Hrs/Wk	Course Credits	EXAMSCHEME				
									CT-1	CT-2	TA/CA	ESE	TOTAL
1	BSC	BME2401	Applied Mathematics – IV	3	1	-	4	4	15	15	10	60	100
2	PCC	BME2402	Mechanics of Fluids and Hydraulic Machines	3	1	-	4	4	15	15	10	60	100
3	PCC	BME2403	Kinematics of Machines	3	1	-	4	4	15	15	10	60	100
4	PCC	BME2404	Mechanics of Materials	3	1	-	4	4	15	15	10	60	100
5	PCC	BME2405	Manufacturing Engineering -II	3	-	-	3	3	15	15	10	60	100
6	PCC	BME2406	Lab-Mechanics of Materials	-	-	2	2	1	-	-	25	25	50
7	PCC	BME2407	Lab-Manufacturing Engineering -II	-	-	2	2	1	-	-	25	25	50
8	PCC	BME2408	lab-Mechanics of Fluids and Hydraulic Machines	-	-	2	2	1	-	-	25	25	50
9	PROJ	BME2410	Micro Project	-	-	2	2	1	-	-	25	25	50
10	MCC	BAU2404	Group Reading of Classics	2	-	-	2	Audit	-	-	-	-	-
Total				17	4	8	29	23	75	75	150	400	700

L-Lecture

CT1-ClassTest1

CT2-ClassTest2

T-Tutorial

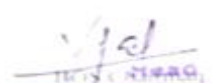
TA/CA-Teacher Assessment/Continuous Assessment

ESE-End Semester Examination (For Laboratory End Semester performance)

P-Practical

Course Category	HSMC (Hum., Soc.Sc, Mgmt.)	BSC (Basic Sc.)	ESC (Engg. Sc.)	PCC (Professional Core Courses)	PEC (Professional Elective Courses)	OEC (Open Elective courses from other discipline)	Project / Seminar /Industrial Training	MCC (Mandatory Courses)
Credits	-	4	--	18	-	-	1	Yes
Cumulative Sum	7	26	24	23	-	-	1	--

PROGRESSIVE TOTAL CREDITS :58+23=81


 HOD
 Department of Mechanical Engineering
 Tulsiramji Gaikwad-Patil College of
 Engineering & Technology, NAGPUR


 Dean Academics
 Tulsiramji Gaikwad-Patil
 College Of Engineering
 and Technology, Nagpur


 Vice Principal
 Tulsiramji Gaikwad-Patil
 College Of Engineering &
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		Tulsiramji Gaikwad-Patil College of Engineering and Technology Wardha Road, Nagpur-441 108 NAAC Accredited with A+ Grade (An Autonomous Institute Affiliated to RTM Nagpur University, Nagpur)			
Program: B.Tech In Mechanical Engineering					
Semester-IV		BME2401: Applied Mathematics IV			
Teaching Scheme				Examination Scheme	
Theory	3 Hrs/Week			CT-I	15 Marks
Tutorial	1			CT-II	15 Marks
Total Credits	4			CA	10 Marks
Duration of ESE: 3Hrs				ESE	60 Marks
Pre-Requisites: AM-I, AM-II				Total Marks	100 Marks
Course Contents					
Unit I	Numerical Methods (Differential Equations) Numerical solution of ordinary differential equation by Taylor series method, Runge-Kutta method of 4th order, Euler modified method, Milne's Predictor corrector method. Runge-Kutta method to solve simultaneous first order Differential Equation.				
Unit II	Z- Transform a. Definition, Convergence of Z-transform and Properties, Inverse Z-transform by Partial Fraction Method, Residue Method (Inversion Integral Method) and Power Partial Fraction Method, Convolution of two sequences. b. Difference Equations and application of Difference equation by Z- transform.				
Unit III	Special Function & Series Solution Series solution of Differential equation by Frobeniu's method, Bessel's Function, Legendre's Polynomials, Recurrence Relations, Rodrigue's Formula, Generating Function, Orthogonal Properties of $J_n(x)$ & $P_n(x)$				
Unit IV	Probability, Probability Distributions & Mathematical Expectation: Random variables, discrete and continuous random variable, probability density function; probability distribution function for discrete and continuous random variable joint distributions. Definition of mathematical expectation, the variance and standard deviations, moment generating function				
Unit V	Special Probability Distribution & Random Processes Geometric ,Binomial, Poisson, Normal, Exponential & Uniform distribution Random Processes- Ensemble average & time average, Auto Correlation & Cross correlation Stationary Random Processes, Power Spectrum and Ergodic Random Processes.				

Text Books	
T.1	Higher Engineering Mathematics by B.S. Grewal, 40th Edition, Khanna Publication
T.2	Advanced Engineering Mathematics by Erwin Kreyszig, 8th Edition, Wiley India

T.3	Applied Mathematics for Engineers & Physicist by L.R. Pipes and Harville.
Reference Books	
R.1	A Text Book of applied Mathematics, Volume II , by P.N. Wartikar& J.N. Wartikar, Poona Vidyarthi GrihaPrakashan
R.2	Introductory methods of Numerical Analysis, by S.S. Sastry, PHI
R.3	Mathematics for Engineers by Chandrika Prasad John wiley& son
Useful Links	
1	https://archive.nptel.ac.in/courses/111/102/111102133/
2	https://www.digimat.in/nptel/courses/video/111102133/L01.html

CourseCode	Course Outcomes	BT level	Class Sessions
BME2401.1	Apply the knowledge of Numerical techniques to solve ordinary differential equations in engineering problems.	3	9
BME2401.2	Apply the concept of Z-Transform for solving difference equation	3	10
BME2401.3	Understand solution of differential equation by using series solution	2	8
BME2401.4	Use of a probability distribution for a random variable to evaluate probabilities	2	10
BME2401.5	Apply Various distributions to solve real life problems.	3	8


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Program: B.Tech In Mechanical Engineering					
Semester-IV		BME2402: Mechanics of Fluids and Hydraulic Machines			
Teaching Scheme				Examination Scheme	
Theory	3 Hrs/Week	CT-I		15 Marks	
Tutorial	1	CT-II		15 Marks	
Total Credits	4	CA		10 Marks	
Duration of ESE: 3Hrs		ESE		60 Marks	
Pre-Requisites: Applied Physics				Total Marks	100 Marks
Course Contents					
Unit I	UNIT-I Fluid Properties: Types of fluids, Mass Density, Specific Weight, Specific Gravity, Newton’s Law of Viscosity, Dynamic Viscosity, Stoke’s Theorem, Surface Tension, Capillarity, Compressibility, Vapour pressure. Fluid Statics: - Pressure, Measurement of pressure using manometers, Hydrostatic law, Pascal’s law.				
Unit II	UNIT-II Fluid Dynamics Introduction to Navier-Stroke’s Equation, Euler equation of motion along a stream line, Bernoulli’s equation, application of Bernoulli’s equation to pitot tube, venturi meter, orifices, orifice meter.				
Unit III	UNIT-III Flow Through Pipes Flow Through Pipes:, Energy losses through pipe, Darcy-Weisbach equation, Chezy’s Equation, Minor losses in pipes, pipes in series and parallel, Siphons, Transmission of power.				
Unit IV	UNIT-IV Theory of turbo machines Turbo Machine classification, Elements of hydro-electric power plant, Impulse Turbine: - principles of operation, constructional features, Velocity Diagram and Analysis, Design parameters, Performance characteristics, Governing. Reaction or pressure Turbine:- principles of operation, Classification , Degree of reaction, comparison over Pelton Turbine, Draft tube, Cavitations in Turbine, Francis Turbine:- Types, Constructional features, Installations, Velocity Diagram and analysis, Design parameters, Performance characteristics, Governing. Propeller Turbine, Kaplan Turbine: -Constructional features, Velocity Diagram and analysis,				
Unit V	UNIT- V Hydrodynamic pumps:- Centrifugal pumps:- Principle of operation, Classification, Component of Centrifugal Pump, Various heads, Velocity triangles and their analysis, N.P.S.H., Cavitations’ in pumps, Installation and operation, Performance characteristics, Introduction to self-priming pumps Reciprocating pump : Basic principle, Classification, Main Components, Slip, Work Done, Indicator Diagram, Cavitations’, Air vessels,,				

Text Books	
T.1	1. Fluid Mechanics, Dr. R.K. Bansal, Laxmi Publication (P) Ltd. New Delhi
T.2	2. Engineering Fluid Mechanics, Kumar K.L., S. Chand & company Ltd. Eurasia
T.3	3. Hydraulic Machines (A mathematical Approach in SI Units), Prof. V.V. Ambade, Dr. G.K. Awari, Dr. D.P. Kothari, New Age International Publishers, New Delhi
T.4	4. Fluid Mechanics & Hydraulic Machines, R.K. Rajput, S. Chand & Company Ltd.
Reference Books	
R.1	1. Introduction to Fluid Mechanics, James E.A., John and Haberm W.A., Prentice Hall of India
R.2	2. Fluid Mechanics, Jain A.K., Khanna Publication
R.3	3. Engineering Fluid Mechanics, Garde R.J. and Miraj Goankar, Nem chand & Bros, Roorkee, SCITECH, Publication (India) Pvt. Ltd.
Useful Links	
1	http://www.nptelvideos.com/lecture.php?id=3999
2	http://www.nptelvideos.com/lecture.php?id=4007

CourseCode	Course Outcomes	BT level	Class Sessions
BME2402.1	Classify fluid properties, types of flow & flow measuring devices, pressure and pressure measuring devices	2	9
BME2402.2	Apply the Principle of Bernoulli's equation to the various fluid flow measuring devices and Elaborate behavior of fluid in motion condition	3	9
BME2402.3	Apply Darcy-Weisbach and Chezy's Equation to determine different losses of fluid flow through pipes.	3	9
BME2402.4	Classify different layout of hydro-electric power plant and Analyze design characteristics of hydraulic machines i.e. turbines (impulse and reaction)	2	9
BME2402.5	Elaborate the working principle & Analyze design of Centrifugal and reciprocating pump.	3	9


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Program: B.Tech In Mechanical Engineering

Semester-IV BME2403: Kinematics of Machine

Teaching Scheme

Theory

3
Hrs/Week

Tutorial

1

Total Credits

4

Duration of ESE: 3Hrs

Examination Scheme

CT-I

15
Marks

CT-II

15 Marks

CA

10 Marks

ESE

60 Marks

Pre-Requisites: Applied Physics

Total Marks

100 Marks

Course Contents

Unit I

Introduction to Kinematic of Machine

Basic concept of mechanism, link, kinematics pairs, kinematics chain, mechanism, Difference between machine and mechanism, Inversions, machine, simple & compound chain, Degrees of freedom, Estimation of degree of freedom of mechanism by Grubber's criterion and other methods. Harding's notations, Classification of four bar chain, Class-I & Class-II, Kutzbach's criteria, Various types of mechanism such as Geneva wheel, Pawl and ratchet mechanism, Exact straight line mechanism, Approx. straight line mechanism, Pantograph mechanism. Introduction to compliant mechanisms

Unit II

Kinematic Analysis

a. Kinematic analysis of simple mechanisms using vector algebra (Graphical method). Concept of Corioli's component of acceleration. Velocity analysis using Instantaneous center of Rotation method, Kennedy's theorem.
b. Kinematic analysis using analytical method and formulation of algorithm for computer program of kinematic analysis of four bar mechanism and slider crank mechanism (Can use excel spread sheets).

Unit III

Kinematic Synthesis

a. Synthesis of mechanisms, Graphical
b. Synthesis of mechanisms analytical technique.
Restricted to design of crank rocker and slider crank mechanism only.

Unit IV

Cams and followers:

a. Types of cams and followers, types of follower motion, velocity and acceleration diagrams, Construction of cam profile.
b. Introduction to cams with specified contours (No analytical treatment).

Unit V

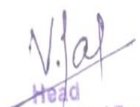
Gears, gear trains and Governor

a. Classification of gears, Types of gears, Spur gears - terminology, conjugate gear tooth action and law of gearing, involute and cycloidal profile, contact ratio, Interference and under cutting, methods of avoiding interference, minimum number of teeth,
b. Helical gears: Nomenclatures, center distance, force analysis. Spiral Gears, Worm and worm Gears, Bevel Gears; their terminologies, center distance, force analysis and efficiency, Gear Trains.
c. Introduction, Types, Governor Effort and governor power, Controlling force analysis, sensitivity, stability, isochronism's and hunting, friction, insensitiveness. Introduction to

	modern electronic governors (Without Numerical) .
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Text Books	
T.1	Theory of Machine, S. S. Rattan, Tata McGraw Hill.
T.2	Mechanism and Machine Theory, J.S. Rao&Dukki Patti, New Age International (P) Ltd, Publishers
T.3	Theory of Machines, P L Ballaney, Khanna Publications.
Reference Books	
R.1	Theory of Machines and Mechanisms, J. E. Shigley and J. J. Uicker, Oxford University Press
R.2	Theory of Machines, Sadhu Singh, Pearson publications
R.3	Advanced Mechanism Design–Analysis and Synthesis, A.G.Erdman and G.N.Sandor, Vol. I and II, Prentice – Hall
R.4	“Mechanisms and Mechanical Devices Source Book”, Neil Sclater, Nicholas P Chrironis, McGrawHill
R.5	Kinematics and Linkage Design, A. S. Hall, Jr., Prentice – Hall
R.6	Mechanism Synthesis and Analysis, A. H. Soni, McGraw Hill
Useful Links	
1	https://www.digimat.in/nptel/courses/video/112104121/L01.html
2	https://www.digimat.in/nptel/courses/video/112105268/L01.html

CourseCode	Course Outcomes	BT level	Class Sessions
BME2403.1	Demonstrate kinematic and dynamic analysis (Displacement, Velocity, acceleration, Inertia forces) of a given mechanism using analytical and graphical method.	3	9
BME2403.2	Explain the concept of compliant mechanisms.	3	9
BME2403.3	Synthesize new mechanisms for specific requirements and Perform computer aided analysis of simple mechanisms.	3	9
BME2403.4	Construct cam profiles and analyze the follower motion.	3	9
BME2403.5	Classify the Geometry of gear, its types, and analysis of forces and motions of gear teeth. Study of gear trains and governors.	3	9


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Program: B.Tech In Mechanical Engineering

Semester-IV BME2404: Mechanics of Materials

Teaching Scheme

Theory

3
Hrs/Week

Tutorial

1

Total Credits

4

Duration of ESE: 3Hrs

Examination Scheme

CT-I

15
Marks

CT-II

15 Marks

CA

10 Marks

ESE

60 Marks

Pre-Requisites: Maths-I, Math-II, Engineering Mechanics

Total Marks

100 Marks

Course Contents

Unit I

Concept of simple stresses and strains:

Introduction, Stress, Strain, Types of stresses, Stress - Strain diagram, Hooks law, Elastic constants, factor of safety, analysis of tapered rod and composite section. Relation between Young's modulus, Modulus of elasticity and Bulk modulus. Thermal stresses and strain.

Combined Stresses:- Definition of principal planes & principal stresses, analytical method of determining stresses on oblique section when member is subjected to direct stresses in one plane in mutually perpendicular two planes, when member is subjected to shear stress and direct stresses in two mutually perpendicular planes, Mohr's circle for representation of principal stresses.

Unit II

Shear force and bending moment:

Relation between load, shear force and bending moment, Shear force and bending moment diagrams for different types of beams subjected to different types of loads (Concentrated and UDL).

Stresses in beams: - Pure bending, theory of simple bending with assumptions & expressions for bending stress, derivation of bending equation, bending stresses in symmetrical sections, section modulus for various shapes of beam sections.

Shear stresses in beams: - Concept, derivation of shear stress distribution formula, shear stress distribution diagram for common symmetrical sections, maximum and average shear stress.

Unit III

Deflection of Beam

Differential equation of deflected beam, slope and deflection at a point, calculations of deflection for determinate beams by double integration and Macaulay's method, Method of superposition.

Strain energy & impact loading

Concept of Strain Energy, Definition of strain energy stored in a body when it is subjected to gradually applied load, suddenly applied loads & impact loads. Strain energy stored in bending & torsion

Unit IV

Column & Struts: Failure of long & short column, slenderness ratio, Euler's column theory, End conditions for column. Expression for crippling load for various end conditions of column. Effective length of column, limitations of Euler's formula, Rankine formula, Johnson's parabolic formula.

Unit V	Torsion of circular shafts: - Derivation of torsion equation, Torsion shear stress induced in the shaft, when it is subjected to torque. Strength and rigidity criterion for design of shaft. Torque transmitted by solid & hollow circular shaft. Equivalent twisting and bending moment in shaft when it is subjected to bending moment, torque & axial load.
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Text Books	
T.1	Strength of Material, R.K. Rajput, S.Chand Publication
T.2	Strength of Materials, Ramamurtham, Dhanapat Rai Publication
T.3	Strength of Materials, R K Bansal, Laxmi Publications
Reference Books	
R.1	Strength of Materials, S S Rattan, Tata McGraw-Hill
R.2	Mechanics of Material, Beer & Johnson, Tata Mc-Graw Hill
R.3	Elements Of Strength Of Materials ,Timoshenko S.P., Young D.H East West Press Pvt. Ltd.
Useful Links	
1	http://www.nptelvideos.com/lecture.php?id=3999
2	http://www.nptelvideos.com/lecture.php?id=4007

CourseCode	Course Outcomes	BT level	Class Sessions
BME2404.1	Apply the concept of simple stresses and strains and their relations based on linear elasticity, material behaviors due to different types of loading.	3	9
BME2404.2	Apply shear force and bending moment diagrams of a beam and analyze bending stresses, shear stresses in a beam.	3	9
BME2404.3	Illustrate the Concept of deflection of beams by applying principle Macaulay's method and estimate strain energy & impact loading in mechanical element.	4	9
BME2404.4	Analyze the torsion of circular shafts.	4	9
BME2404.5	Analyze the Strength criterion for design of Column & Struts.	4	9


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Program: B.Tech In Mechanical Engineering

Semester-IV BME 2405- Manufacturing Engineering -II

Teaching Scheme

Theory

3
Hrs/Week

Tutorial

1

Total Credits

4

Duration of ESE: 3Hrs

Examination Scheme

CT-I

15 Marks

CT-II

15 Marks

CA

10 Marks

ESE

60 Marks

Pre-Requisites: Workshop technology, Manufacturing Engineering –I,

Total Marks

100 Marks

Course Contents

Unit I

Introduction to Machining Parameters: Introduction to machining, Tool materials, nomenclature and tool geometry of single point cutting tool, tool materials properties, classification, HSS, carbide tool, coated tools, diamond coated tool. Theory of Metal Cutting: Introduction. Orthogonal and Oblique cutting. Mechanics of Metal Cutting, shear plane, Stress, Strain and cutting forces. Merchant's circle, Chip formation, cutting force calculations, Determination of Torque and power required for turning Drilling and Milling. Tool life and surface finish, Texture of surface finish in different applications and distinction between μRa , μRt , μRz types and selection criteria of cutting fluids

Unit II

Lathe: Introduction, Type, Construction of simple lathe mechanism and attachments for various operations, machine specifications, basis for selection of cutting speed. feed and depth of cut, time estimation for turning operations such as facing, step turning, taper turning, threading, knurling. Advances in Capstan & Turret Lathe.

Unit III

Shaper: Introduction, type, specification, description of machines, hydraulic drives in shapers, cutting parameters. Mechanism of shaper: Quick return mechanism, Crank & slotted link mechanism, Table feed mechanism, attachments for shaper, Jigs and fixtures: Introduction, principles of jig and fixture, Principle of location, jig bushes, drilling jigs, type of clamps, classification of fixtures

Unit IV

Milling: Introduction. Specification, types, column & knee type milling machine, fixed bed type milling machines, production milling machines, special purpose milling machines such as thread milling Machines, profile milling machine, Gear Milling/Hobbing machines. Mechanisms & Attachments for Milling. Cutting, parameters, Types of milling operations, Types of milling cutters, Tool geometry & their specifications. Programming in Master cam milling

Unit V

Super finishing process: Honing, Lapping, super finishing, polishing, buffing, metal spraying, galvanizing and electroplating. Process parameters and attainable grades of surface finish, Advances in surface roughness measurement.

Text Books	
T.1	A Text Of Book Manufacturing Technology by Chand And Co. Publication.
T.2	A Text Of Book Manufacturing Technology II by Chand And Co. Publication
Reference Books	
R.1	Elements Of Workshop Technology: Vol.I 1 REVISE Manufacturing Process by Choudhury Hajra,S.K; Choudhury Hajra,A.K;Roy,Nirj har
R.2	Elements Of Workshop Technology-II by Choudhary S.K. ;Choudhary A.K. Nirjhar Roy
R.3	Elements Of Workshop Technology: Vol.I 1 REVISE Manufacturing Process by Choudhury Hajra,S.K; Choudhury Hajra,A.K;Roy,Nirj har
Useful Links	
1	https://www.digimat.in/nptel/courses/video/112103202/L02.html
2	https://nptel.ac.in/courses/112/104/112104028/
3	https://nptel.ac.in/courses/112/103/112103202/

CourseCode	Course Outcomes	BT level	Class Sessions
BME2405.1	Distinguish various cutting tool materials and tool geometries.	2	9
BME2405.2	Understand the different processes and machine tools for cylindrical surface Machining.	2	9
BME2405.3	Differentiate various machining processes and conditions for flat surface machining using Single point cutting tool in a shaper machine	2	9
BME2405.4	Illustrate machining processes for circular surfaces using multi point cutting tool in a milling machine.	3	9
BME2405.5	Summarize surface finishing processes like as polishing and spraying	2	9


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Program: B.Tech In Mechanical Engineering

Semester-IV BME2406: Lab-Mechanics of Materials

Teaching Scheme			Examination Scheme	
Theory	2 Hrs/Week		Internal Practical Exam	25 Marks
Tutorial	Nil		External Practical Exam	25 Marks
Practical Credits	2		Total	50 Marks

Course Outcomes

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

1. **Demonstrate** Universal Testing machine.
2. **Analyze** Tension Test, Compression Test and Shear Test on Metal using UTM machine.
3. **Analyze** Impact Test, Hardness Test and Torsion Test on Metal.
4. **Calculate** the deflection and Young's modulus of the Beam.
5. **Illustrate** the stiffness of spring wire.

Experiment No.	Name of Experiment	CO Attained
1	Demonstrate Universal Testing Machine.	CO1
2	Analyze tension test on metals using universal testing machine.	CO2
3	Illustrate compression test on metals using universal testing machine.	CO2
4	Analyze shear test on metals using universal testing machine.	CO2
5	Integrate the impact resistance of mild steel using Charpy impact test.	CO3
6	Integrate the impact resistance of mild steel using I-Zod Impact test.	CO3
7	Calculate indentation hardness of Mild steel specimen, Cast iron specimen, Brass specimen and Aluminum specimen.	CO3
8	Illustrate mechanical properties of mild steel under torsion.	CO3
9	Experiment Deflection of Beam.	CO4
10	Evaluate Deflection of Springs.	CO5

Text Books

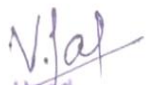
T.1	Strength of Material, R.K. Rajput, S.Chand Publication
T.2	Strength of Materials, Ramamurtham, Dhanapat Rai Publication
T.3	Strength of Materials, R K Bansal, Laxmi Publications

Reference Books

R.1	Strength of Materials, S S Rattan, Tata McGraw-Hill
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R.2	Mechanics of Material, Beer & Johnson, Tata Mc-Graw Hill
R.3	Elements Of Strength Of Materials ,Timoshenko S.P., Young D.H East West Press Pvt. Ltd.
Useful Links	
1	https://sm-nitk.vlabs.ac.in/exp/tensile-test-mild-steel/videos.html
2	https://sm-nitk.vlabs.ac.in/exp/compression-test-mild-steel/videos.html
3	https://sm-nitk.vlabs.ac.in/exp/torsion-test-mild-steel/videos.html
4	https://sm-nitk.vlabs.ac.in/exp/charpy-impact-test/videos.html
5	https://sm-nitk.vlabs.ac.in/exp/izod-impact-test/videos.html

Course Code	Course Outcomes	BT Level	Lab Session
BME2406.1	Demonstrate Universal Testing machine.	2	2
BME2406.2	Analyze Tension Test, Compression Test and Shear Test on Metal usingUTM machine.	4	2
BME2406.3	Analyze Impact Test, Hardness Test and Torsion Test on Metal.	4	2
BME2406.4	Calculate the deflection and Young's modulus of the Beam.	4	2
BME2406.5	Illustrate the stiffness of spring wire.	3	2


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Program: B.Tech In Mechanical Engineering

Semester-IV BME2407: Lab- Manufacturing Engineering-II

Teaching Scheme		Examination Scheme	
Theory	2 Hrs/Week	Internal Practical Exam	25 Marks
Tutorial	Nil	External Practical Exam	25 Marks
Practical Credits	2	Total	50 Marks

Course Outcomes

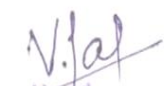
After successful completion of the course, students will be able to:

1. Identify single point cutting tools nomenclature with significance.
2. Develop a job using Lathe Machine.
3. Develop a job using Shaper Machine.
4. Develop a job using Milling Machine.
5. Summarize nomenclature of grinding wheel with significance.

Experiment No.	Name of Experiment	CO Attained
1	Identify single point cutting tool nomenclature with significance	CO1
2	Produce Thread Cutting, Taper Turning job as per given drawing in a Lathe Machine	CO2
3	Produce knurling, Drilling Job as per given drawing in a Lathe Machine	CO2
4	Produce key-slot as per given drawing in a Shaper Machine.	CO3
5	Produce V-slot as per given drawing in a Shaper Machine.	CO3
6	Produce Spur Gears (External Teeth) as per given drawing in a Milling Machine.	CO4
7	Produce Screw Gears (Hyperboloid Gears) as per given drawing in a Milling Machine.	CO4
8	Identify Multi-Point Cutting Tool nomenclature with significance	CO4
9	Identify grinding wheel nomenclature with significance	CO5
10	Identify broaching tool nomenclature with significance	CO5

Text Books	
T.1	A Text Of Book Manufacturing Technolgy by Chand And Co.Publication.
T.2	A Text Of Book Manufacturing Technolgy II by . Chand And Co.Publication
Reference Books	
R.1	Elements Of Workshop Technology: Vol.I 1 REVISE Manufacturing Process by Choudhury Hajra,S.K; Choudhury Hajra,A.K;Roy,Nirj har
R.2	Elements Of Workshop Technology-II by Choudhary S.K. ;Choudhary A.K. Nirjhar Roy
R.3	Elements Of Workshop Technology: Vol.I 1 REVISE Manufacturing Process by Choudhury Hajra,S.K; Choudhury Hajra,A.K;Roy,Nirj har
Useful Links	
1	https://www.digimat.in/nptel/courses/video/112105233/L01.html
2	https://nptel.ac.in/courses/112/103/112103250/
3	https://nptel.ac.in/courses/112/105/112105212/

Course Code	Course Outcomes	BT Level	Lab Session
BME2407.1	Identify single point cutting tools nomenclature with significance.	3	2
BME2407.2	Develop a job using Lathe Machine.	3	2
BME2407.3	Develop a job using Shaper Machine.	4	2
BME2407.4	Develop a job using Milling Machine.	4	2
BME2407.5	Summarize nomenclature of grinding wheel with significance.	4	2


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Program: B.Tech In Mechanical Engineering

Semester-IV BME2408: Lab- Mechanics of Fluids and Hydraulic Machines

Teaching Scheme		Examination Scheme	
Theory	2 Hrs/Week	Internal Practical Exam	25 Marks
Tutorial	Nil	External Practical Exam	25 Marks
Practical Credits	2	Total	50 Marks

Course Outcomes

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

1. Demonstrate the application of Bernoulli's Theorem
2. Evaluate the discharge using flow measuring device both in pipe and open channel flow
3. Estimate various losses of energy in pipe
4. Estimate performance characteristics of Impulse and Reaction turbine
5. Evaluate performance characteristics of various types of pumps.

Experiment No.	Name of Experiment	CO Attained
1	Determine the Metacentric height of given floating vessel	CO1
2	Verify Bernoulli's theorem.	CO2
3	Determine the value of co-efficient of discharge of given venture meter fitted in a pipe.	CO2
4	Determine the value of co-efficient of discharge for a given orifice meter.	CO2
5	Determine Frictional Losses in pipe	CO3
6	Performance characteristics of Pelton wheel	CO4
7	Performance characteristics of Francis turbine	CO4
8	Performance characteristic of Kaplan Turbine	CO4
9	Performance characteristics of variable centrifugal Speed Pump	CO5
10	Performance characteristics of Reciprocating Pump	CO5

Text Books

T.1	1. Fluid Mechanics, Dr. R.K. Bansal, Laxmi Publication (P) Ltd. New Delhi
T.2	2. Engineering Fluid Mechanics, Kumar K.L., S. Chand & company Ltd. Eurasia
T.3	3. Hydraulic Machines (A mathematical Approach in SI Units), Prof. V.V. Ambade, Dr. G.K. Awari, Dr. D.P. Kothari, New Age International Publishers, New Delhi
T.4	4. Fluid Mechanics & Hydraulic Machines, R.K. Rajput, S. Chand & Company Ltd.

Reference Books	
R.1	1.Introduction to Fluid Mechanics, James E.A., John and Haberm W.A., Prentice Hall of India
R.2	2. Fluid Mechanics, Jain A.K., Khanna Publication
R.3	3. Engineering Fluid Mechanics, Garde R.J. and Miraj Goankar, Nem chand & Bros,Roorkee, SCITECH, Publication (India) Pvt. Ltd.
Useful Links	
1	http://www.nptelvideos.com/lecture.php?id=3999
2	http://www.nptelvideos.com/lecture.php?id=4007

Course Code	Course Outcomes	BT Level	Lab Session
BME2408.1	Demonstrate the concept of Buoyancy and Metacentric Height	3	2
BME2408.2	Demonstrate the application of Bernoulli's Theorem	3	2
BME2408.3	Estimate various losses of energy in pipe	4	2
BME2408.4	Evaluate performance characteristics of Impulse and Reaction turbine	4	2
BME2408.5	Evaluate performance characteristics of various types of pumps.	4	2


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