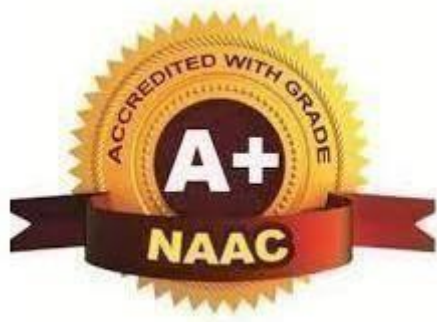# TULSIRAMJI GAIKWAD-PATIL
College of Engineering & Technology

Mohgaon, Wardha Road, Nagpur - 441 108

An Autonomous Institute

DEPARTMENT OF MECHANICAL ENGINEERING

B.Tech. Mechanical Engineering

Teaching Scheme

Considering

National Education Policy 2020

From

Academic Year 2024-25

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.

Programme 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.

Programme 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 in formed 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 the set 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 inindependentandlifelonglearninginthebroadestcontextoftechnologicalchange.

Programme Specific Outcomes(PSO)

PSO1: Apply the knowledge to work professionally and ethically in Thermal, Design, production and Manufacturing areas of Mechanical engineering.

PSO2: Analyze and design mechanical components and its processes to meet the societal needs.

PSO3: Apply Engineering and Management principles to work professionally in the industry or as an entreprene

Scheme of Instructions : Second Year B.Tech. in Mechanical Engineering(As Per NEP 2020)Semester–IV

Sr. No.	Sem	Type	BOS/ Dept	Sub Code	Subject	T/P	Contact Hrs/Wk			Credits	% Weightage			ESE Duration	Total Marks
							L	P	Hrs		CT/IA	CA	ESE		
1	IV	PCC	ME	BME32401	Mechanics of Materials	T	3	-	3	3	30	10	60	3Hrs	100
2	IV	PCC	ME	BME32402	Fluids Mechanics and Hydraulic Machines	T	3	-	3	3	30	10	60	3Hrs	100
3	IV	PCC	ME	BME32403	Engineering Thermodynamics	T	3	-	3	3	30	10	60	3Hrs	100
4	IV	OEC	ME	B$$324XX	Open Elective-II	T	2	-	2	2	15	5	30	2Hrs	50
5	IV	VEC	B & S	BSH32403	Human Value for Professional Society	T	2	-	2	2	15	5	30	2Hrs	50
6	IV	VSEC	ME	BME 32406	Basics of CNC Programming	P	-	4	4	2	-	50	50	4Hrs	100
7	IV	AEC	B & S	BSH32404	Leadership and Team Dynamics	P	-	4	4	2	-	50	50	4Hrs	100
8	IV	PCC	ME	BME32404	Mechanics of Materials Lab	P	-	2	2	1	-	25	25	2Hrs	50
9	IV	PCC	ME	BME32405	Fluids Mechanics and Hydraulic Machines Lab	P	-	2	2	1	-	25	25	2Hrs	50
10	IV	MDM	EC	BEC32306	Basic of Electronics and communication	T	2	-	2	2	15	5	30	2Hrs	50
					Total		15	12	27	21	135	195	420	27 Hrs	750

Course Category	PCC (Programme Core Courses)	PEC (Programme Elective Courses)	(MDM) Multidisciplinary Minor	OEC (Open Electivecourses from other discipline)	VSEC (Vocational and Skill Enhancement Course)	HSSM (Humanities Social Science and management)(VEC/IKS/AEC)	FP/CP/OJT/RM/ Project (Experimental Learning Courses)
Credits	11	-	2	2	2	4	-
Cumulative Sum	21	-	5	6	6	12	2

PROGRESSIVE TOTAL CREDITS:64+21=8

Programme: Mechanical Engineering

List of **Program Electives** offered By Mechanical Department (NBA Accredited)

Program Elective- I	Program Elective-II	Program Elective- III	Program Elective- IV	Program Elective- V
Semester V	Semester VI	Semester VI	Semester VII	Semester VIII
BME33504: Industrial Economics and Management	BME33605: Hydraulic and Pneumatic Systems	BME33609: Automotive maintenance and Industrial Safety	BME34704: Total Quality Management	BME34803: Material Handling System
BME33505: Computer Aided Design	BME33606: Mechanical Measurement and Metrology	BME33610: Advanced Manufacturing techniques	BME34705: Finite Element Analysis	BME34804: Computer Integrated Manufacturing
BME33506: Automotive System	BME33607: Automotive maintenance and Industrial Safety	BME33611: Advance IC Engine	BME34706: Design of Mechanical drives	BME34805: Renewable Energy System
BME33507: Smart Materials	BME33608: Control System Engineering	BME33611:Industrial Robotics	BME34706: Advanced Mechanical Vibration	BME34706: Composite and Nano Materials

Program: Mechanical Engineering

List of **Open Electives** offered Mechanical Engineering Department (NBA Accredited if applicable)

Open Elective-I	Open Elective-II	Open Elective-III
III-Semester	IV-Semester	V-Semester
BME32306: Basics of Manufacturing Technology and Processes	BME32407 : Automobile Engineering	B$$32XX::Additive Manufacturing

				June-2024	1.00	Applicable for AY-2024-2025
Chairperson (HOD)	Dean Academics	Vice-Principal	Principal	Date of Release	Version	

Second Year (Semester-IV) B.Tech. Mechanical Engineering
BME32401: Mechanics of Materials

Teaching Scheme			Examination Scheme	
Lectures	3 Hr / Week		**CT**	30
Tutorials	-		**CA**	10
Total Credits	3		**ESE**	60
			Total	100 Marks
			Duration of ESE: 03 Hrs	

Course Objectives:

1	To understand stress, strain, linear elasticity, and material behavior under various loading.
2	To learn shear force and bending moment diagrams.
3	To understand beam deflection, strain energy, and impact loading.
4	To understand the torsional behavior of a circular shaft.
5	To understand the failure of columns and struts.

	Course Contents	Hours
Unit I	**Concept of simple stresses and strains**: Introduction, stress, strain, types of stresses, stress and strain diagram for brittle & ductile material, elastic limit, Hooks law, modulus of elasticity Modulus of rigidity, factor of safety, analysis of tapered rod, analysis of composite section, thermal stress and strain. Longitudinal strain & stress, lateral stresses and strains, Poisson's ratio, volumetric stresses and strain with uni-axial, bi-axial & tri-axial loading, bulk modulus, relation between Young's modulus and modulus of rigidity, Poisson's ratio and bulk modulus.Principal stresses and strains	**(9)**
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 is bending with assumptions & expressions for bending stress, derivation of bending equation, bending stresses in symmetrical sections, section modulus for various shapes of beam sections.	**(9)**
Unit III	**Deflection of beams:-** Deflection & slope of cantilever, simply supported, overhung beams subjected to concentrated load, UDL, Relation between slope, deflection & radius curvature Macaulay's method to determine deflection of beam. **Strain energy & impact loading:** - 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.	**(9)**
Unit IV	**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.	**(9)**
Unit V	**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.	**(9)**

Text Books

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

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	https://www.youtube.com/@nptel-nociitm9240
2	http://www.digimat.in/nptel/courses/video/112101095/L17.html

	Course Outcomes	CL
BME32401.1	**Apply** the concepts of simple stresses and strains, and their relationships based on the principles of linear elasticity, to analyze material behavior under different types of loading.	3
BME32401.2	**Apply** shear force and bending moment diagrams to a beam and analyze the resulting bending and shear stresses.	3
BME32401.3	**Analyze** the deflection of beams using Macaulay's method and estimate the strain energy and impact loading in mechanical elements.	4
BME32401.4	**Analyze** the torsional behavior of a circular shaft.	4
BME32401.5	**Analyze** the Strength criterion for design of Column & Struts.	4

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Second Year (Semester-IV) B.Tech. Mechanical Engineering
BME32402: Fluids Mechanics and Hydraulic Machines

Teaching Scheme			Examination Scheme	
Lectures	3 Hr / Week		**CT**	30
Tutorials	-		**CA**	10
Total Credits	3		**ESE**	60
			Total	100 Marks
			Duration of ESE: 03 Hrs	

Course Objectives:

1	To classify fluid & their Properties under static condition and apply the equations to various hydraulic components and working principles of various measuring devices.
2	To establish the relationship between various properties & apply mathematical treatment to various problems related to fluid system & their Design.
3	To introduce various principles & design of hydraulic Machines i.e. Turbines. Centrifugal and Positive Displacement Pump.
4	To explain the working Principles of Fluid mechanics and their Practical applications in designing the fluid systems
5	To appreciate the application of Similitude in the design of Hydraulic Machines.

Course Contents		Hours
Unit I	**UNIT-I Fluid Properties:** Types of fluids, Mass Density, Specific Weight, Specific Gravity, Newton′s Law of Viscosity, Dynamic Viscosity, Surface Tension, Capillarity, Compressibility, Vapour pressure. **Fluid Statics:-** Pressure, Measurement of pressure using manometers, Hydrostatic law, Pascal′s law.	**(9)**
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.	**(9)**
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.	**(9)**
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. Reaction or pressure Turbine: - principles of operation, Classification, Degree of reaction, comparison over Pelton Turbine. Francis Turbine: - Types, Constructional features, Installations, Velocity Diagram and analysis, Design parameters, Performance characteristics. Propeller Turbine, Kaplan Turbine: -Constructional features, Velocity Diagram and analysis.	**(9)**

	UNIT- V Hydrodynamic pumps	
Unit V	Centrifugal pumps: - Principle of operation, Classification, Component of Centrifugal Pump, Various heads, Velocity triangles and their analysis, N.P.S.H., Performance characteristics, Introduction to self-priming pumps Reciprocating pump:- Basic principle, Classification, Main Components, Slip, Work Done, Indicator Diagram, Cavitations′, Air vessels.	**(9)**

Text Books	
T.1	Fluid Mechanics, Dr. R.K. Bansal, Laxmi Publication (P) Ltd. New Delhi
T.2	Engineering Fluid Mechanics, Kumar K.L.,S. Chand & company Ltd. Eurasia

Reference Books	
R.1	Introduction to Fluid Mechanics, James E.A., John and Haberm W.A., Prentice Hall of India
R.2	Fluid Mechanics, Jain A.K., Khanna Publication
R.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 Outcomes	CL
BME32402.1	**Classify** fluid properties, types of flow & flow measuring devices, pressure and pressure measuring devices.	**2**
BME32402.2	**Apply** the Principle of Bernoulli's equation to the various fluid flow measuring devices and Elaborate behavior of fluid in motion condition.	**3**
BME32402.3	**Apply** Darcy Weisbach and Chezy's Equation to determine different losses of fluid flow through pipes.	**3**
BME32402.4	**Analyze** design characteristics of hydraulic machines i.e. turbines (impulse and reaction).	**4**
BME32402.5	**Analyze** the principles of operation, classification, constructional components, performance characteristics, and design aspects of centrifugal and reciprocating pumps.	**4**

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Second Year (Semester-IV) B.Tech. Mechanical Engineering

BME32403: Engineering Thermodynamics

Teaching Scheme			Examination Scheme	
Lectures	3 Hr / Week		**CT**	30
Tutorials	-		**CA**	10
Total Credits	3		**ESE**	60
			Total	100 Marks
			Duration of ESE: 03 Hrs	

Course Objectives:

1	To describe the basic principles of classical thermodynamics and prepare them to apply them during heat and work interaction.
2	To enable the students to explain laws of thermodynamics, gas laws and apply it to various systems, note the significance of the results and to know about entropy
3	To explain the properties of pure substance, their behaviors during various thermodynamic processes
4	To explain working principle and significance of vapour power and various air standard cycles.

	Course Contents	**Hours**
Unit I	**Introduction to Thermodynamics:** Fundamental Concepts and Definitions, Modes of energy transfer, heat and work, thermodynamic definition of work, internal energy, enthalpy, temperature, zeroth law of thermodynamics and its application. Ideal Gas, Equation of state, Thermodynamic Processes, representation of these processes on P-v, T-s planes, First Law of Thermodynamics: First law applied to a system undergoing a process and a cycle.	**(9)**
Unit II	**Application of first law of thermodynamics** to non-flow processes, determination of work, heat, internal energy and enthalpy changes during the various thermodynamic processes. First law applied to flow processes, general energy equation, steady flow energy equation on unit mass and time basis, application of SFEE for devices such as boiler, turbine, heat exchangers, pumps, nozzles, etc.	**(9)**
Unit III	**Second Law of Thermodynamics:** Limitations of the first law, Thermal Energy Reservoirs, definition of a heat engine, heat pump, refrigerator, thermal efficiency and the coefficient of performance. Kelvin-Planck and Clausius statements of the second law, their equivalence, reversible heat engine, Carnot theorems. Carnot cycle, Entropy: Entropy as a property, Clausius inequality.	**(9)**
Unit IV	**Pure Substance:** Behavior of pure substance (steam) with reference to P-V, T-s and h-s diagrams, properties of steam, Sensible Heat, Latent Heat, Critical State, Triple Point, Wet Steam, Dry Steam, Superheated Steam, Dryness Fraction, saturation state, Steam tables and Mollier chart, Determination of properties of steam using steam tables and Mollier chart.	**(9)**
Unit V	**Vapour power cycle:** Introduction; vapour Carnot cycle, simple Rankine cycle, methods to improve the efficiency of simple Rankine cycle, Analysis of simple Rankine cycle. Air standard cycles, introduction to air standard cycles, Otto cycle, Diesel cycle, air standard efficiency, mean effective pressure, Analysis of air standard cycles.	**(9)**

Text Books

T.1	Cengel Y.A., Boles M.A., A Text Book of Thermodynamics, McGraw-Hill, 6th Edition
T.2	Basic and Applied Thermodynamics, 2nd Edition, Nag P. K., Tata McGraw-Hill.

Reference Books

R.1	Fundamentals of Thermodynamics, 5th Edition, Richard E. Songtag, Claus Borgnakke nd Gordon J. Van Wylen, John Wiley and Sons, Inc.

R.2	Thermodynamics, 5th Edition, K. Wark, McGraw-Hill	
R.3	Arora, C.P., Thermodynamics, 1st ed, Tata McGraw Hill Education.	

	Useful Links
1	https://nptel.ac.in/courses/112/108/112108148/
2	https://nptel.ac.in/courses/112/105/112105123/

	Course Outcomes	CL
BME32403.1	**Define** the basic concepts of thermodynamics, represent different thermodynamic processes on P-V and T-s plots and analyze them using gas laws and compute associated heat and work interactions.	2
BME32403.2	**Explain** First Law of thermodynamics and apply it to non-flow and flow processes.	2
BME32403.3	**Explain** Second Law of thermodynamics and entropy; analyze the performance of heat pump, heat engine and refrigerator.	2
BME32403.4	**Describe** the formation of steam, its characteristics and determine properties of steam using steam tables and Mollier chart.	3
BME32403.5	**Represent** various air standard cycles and vapour power cycles such as Carnot, Otto, Diesel, and Rankine cycles on P-v and T-s plots.	3

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Second Year (Semester-IV) B.Tech. Mechanical Engineering

BME 32406:Basics of CNC Programming

Teaching Scheme			Examination Scheme	
Lectures	4 Hr / Week		**CT**	-
Tutorials	-		**CA**	50 Marks
Total Credits	2		**ESE**	50 Marks
			Total	100 Marks
			Duration of ESE: 02 Hrs	

Course Objectives:

1	To Identify different metal removal processes.
2	To understand application and advantage of CNC machines and technology.
3	To learn controls of different CNC machines.

Sr.No.	List of Experiment	CO
1	Produce simple job on lathe including turning, facing, chamfering and drilling Operation.	**CO1**
2	Produce simple job on Machine including face Milling and Slotting operation.	**CO1**
3	Identify and draw various components of CNC lathe machine	**CO2**
4	Identify and draw various components of CNC milling machining centre.	**CO2**
5	Demonstration of various safety symbols for the CNC machines	**CO3**
6	Demonstration of various controls and feeds for the CNC machines	**CO3**
7	Demonstration of CNC machine referencing and manual Jog mode.	**CO4**
8	Demonstration of setting and presetting of tools on CNC machine	**CO4**
9	Demonstration of Programming input on CNC machine	**CO5**
10	Operate CNC machine and try to change different parameters and controls to observe their effects during machining	**CO5**

Text Books	
T.1	CNC Machines, HMT, Bangalore, New age International Limited
T.2	CNC Programming made easy , Binit kumar Jha, Vikas publishing house Pvt. Ltd.
Reference Books	
R.1	CAD/CAM Computer Aided Design and manufacturing, Groover, Zimmers, Pearsons
R.2	Computer Numerical Control-Turning And Machining Centres, Quesada Robert, Prentice Hill India, New Delhi

Useful Links	
1	https://nptel.acin/courses/112105211/
2	https://www.autodesk.com/solutions/cnc-machining-software

	Course Outcomes	CL
BME 32406.1	**Identify** different metal removal processes.	3
BME 32406.2	**Explain** application and advantage of CNC machines and technology.	3
BME 32406.3	**Demonstrate** the controls of different CNC machines.	2
BME 32406.4	**Explain** the construction and working principle of CNC system.	3
BME 324056.5	**Identify** different axes, machine zero, home position of CNC turning machine.	3

Second Year (SemesterIV) B.Tech. Mechanical Engineering

BME32404:Mechanics of Materials lab

Teaching Scheme			Examination Scheme	
Lectures	2 Hr / Week		**CT**	-
Tutorials	-		**CA**	25 Marks
Total Credits	1		**ESE**	25 Marks
			Total	50 Marks
			Duration of ESE: 02 Hrs	

Course Objectives:

1	To understand the mechanical behavior of materials under various loading conditions.
2	To learn material properties such as strength, stiffness and elasticity while applying theoretical concepts to practical situations.
3	To understand comprehension of stress-strain relationships and structural performance.

Sr.No.	List of Experiment	CO
1	Demonstrate Universal Testing Machine.	CO1
2	Analyze tension test on metals l 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	Calculate impact resistance of mild steel using Charphy impact test on metals.	CO3
6	Calculate impact resistance of mild steel using I-Zod Impact test on metals.	CO3
7	Analyze Hardness test on metals.	CO3
8	Illustrate Torsion test on metals.	CO3
9	Calculate the values of bending stress and Young's modulus of elasticity for the material of the beam.	CO4
10	Calculate the stiffness and modulus of rigidity of the spring wire under deflection.	CO5

Text Books	
T.1	"Strength of Materials" by S. Ramamrutham
T.2	"Materials Science and Engineering: An Introduction" by William D. Callister and David G. Rethwisch
Reference Books	
R.1	"Strength of Materials" by R. K. Bansal.
R.2	"Mechanics of Materials" by James M. Gere and Barry J. Goodno

Useful Links	
1	https://archive.nptel.ac.in/courses/113/104/113104104/
2	https://nptel.ac.in/courses/112107146

	Course Outcomes	CL
BME32404.1	**Demonstrate** Universal Testing machine.	3
BME32404.2	**Analyze** Tension Test, Compression Test and Shear Test on Metal using UTM machine.	4
BME32404.3	**Analyze** Impact Test, Hardness Test and Torsion Test on Metal.	4
BME32404.4	**calculate** the bending stress and determine the Young's Modulus of elasticity for the material of a beam under various loading conditions.	4
BME32404.5	**Analyze** the Deflection of springs under various loading conditions.	4

Second Year (SemesterIV) B.Tech. Mechanical Engineering

BME32405:Fluids Mechanics and Hydraulic Machines Lab

Teaching Scheme			Examination Scheme	
Lectures	2 Hr / Week		**CT**	-
Tutorials	-		**CA**	25 Marks
Total Credits	1		**ESE**	25 Marks
			Total	50 Marks
			Duration of ESE: 02 Hrs	

Course Objectives:

1	To understand and Apply Fundamental Fluid Mechanics Principles
2	To analyze Fluid Flow Behavior and Stability
3	To evaluate and Optimize Flow Measurement Devices
4	To understand Energy Conversion and Performance in Turbomachinery
5	To apply Experimental Data to Design and Efficiency Calculations

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

Text Books	
T.1	Fluid Mechanics, Dr. R.K. Bansal, Laxmi Publication (P) Ltd. New Delhi
T.2	Engineering Fluid Mechanics, Kumar K.L.,S. Chand & company Ltd. Eurasia
Reference Books	
R.1	Introduction to Fluid Mechanics, James E.A., John and Haberm W.A., Prentice Hall of India
R.2	Fluid Mechanics, Jain A.K., Khanna Publication

Useful Links	
1	http://www.nptelvideos.com/lecture.php?id=3999
2	http://www.nptelvideos.com/lecture.php?id=4007

	Course Outcomes	CL
BME32405.1	**Demonstrate** the concept of Buoyancy and Metacentric Heigh	3
BME32405.2	**Demonstrate** the application of Bernoulli's Theorem	3
BME32405.3	**Estimate** various losses of energy in pipe	4
BME32405.4	**Evaluate** performance characteristics of Impulse and Reaction turbine	4
BME32405.5	**Evaluate** performance characteristics of various types of pumps.	4

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Second Year (Semester-IV) B.Tech. Mechanical Engineering
BEC32306: Basic Electronics and Communication

Teaching Scheme			Examination Scheme	
Lectures	2 Hr / Week		**CT**	15
Tutorials	-		**CA**	05
Total Credits	2		**ESE**	30
			Total	50 Marks
			Duration of ESE: 03 Hrs	

Course Objectives:

1	To Understanding P-N Junction Diode Fundamentals.
2	To Understand BJT Fundamentals,BJT Voltages and Currents and BJT as an Amplifier.
3	To Understand Basic Communication Systems.

Course Contents		Hours
Unit I	Semiconductor Diodes and Applications - P-n junction diode, Characteristics and Parameters, Diode approximations, DC load line analysis, Half-wave rectifier, Two-diode Full-wave rectifier, Bridge rectifier, Capacitor filter circuit, Zener diode voltage regulators: Regulator circuit with no load, and with load.	**(9)**
Unit II	Bipolar Junction Transistors: Types of transistors, BJT operation, BJT Voltages and Currents, BJT amplification, Common Base, Common Emitter and Common Collector Characteristics.Comparison between CC,CE,CB configurations, RC and LC Oscillators.	**(9)**
Unit III	Elements of basic electronic communication system, Need of modulation, transmission modes-simplex, half duplex full duplex, synchronous and asynchronous, sources of noise (internal and external) signal to noise ratio Types of modulation AM,FM,PM.	**(9)**

Text Books

T.1	The raja b.l: "basic electronics solid state", s.chand and co.
T.2	Gayakwad ramakant a: "op-amps and linear integrated circuits", prentice hall of india

Reference Books

R.1	Bhargava n.n. kulshreshtha d.c.gupta s.c. "basic electronics and linear circuits", tata mcgraw hill
R.2	Salivahanan,s;bhaaskaran,v.s.kanchana "linear integrated circuits" tata mcgraw hill
R.3	"Basics of electronics communication"Tata mcgraw hill

	Useful Links
1	https://archive.nptel.ac.in/courses/108/108/108108122/
2	https://avcce.digimat.in/nptel/courses/video/108108111/L15.html

	Course Outcomes	CL
BEC32306.1	**Examine** the fundaments behavior of diode in rectifiers, filter circuits.	3
BEC32306.2	**Illustrate** I/O characteristics of CE, CB, CC bipolar junction transistor.	4
BEC32306.4	**Infer** the basic fundaments of communication system.	2

Second Year (Semester-IV) B.Tech. Mechanical Engineering

BSH32403: Human Values for Professional Society

Teaching Scheme			Examination Scheme	
Lectures	2 Hr / Week		**CT**	15
Tutorials	-		**CA**	05
Total Credits	2		**ESE**	30
			Total	50 Marks
			Duration of ESE: 03 Hrs	

Course Objectives:

1	To introduce students to know the difference between values and ethics and to ensure sustained happiness and prosperity, which are the core aspirations of all human beings.
2	To teach harmony in the Family and Society-Human Relationship.
3	To explain ethics in personal and professional life.

Course Contents	Hours
Unit I — **Need, Content and Process for Value Education:-** Meaning and importance of Value Education, Types of Values - Personal Values, Social Values, and Moral Values & Spiritual Values, Relevance of Human values: Integrity, Empathy.	**(9)**
Unit II — **Harmony in the Human Life:-** Define Harmony and significance of Harmony, Importance of - Harmony in the family, society and human relationship, and understand Harmony with self and Nature.	**(9)**
Unit III — **Ethics in the Professional Society:-** Nature, characteristics and scope of professional ethics; Types of Professional Ethics, Professional Values: Trusteeship, Inclusiveness, Commitment, Sustainability, Accountability, Transparency, Impartiality.	**(9)**

Text Books

T.1	R.R. Gaur, R Sangal, G.P. Bagaria (2009): A Foundation Course in Human Values and Professional Ethics, Excel Books
T.2	D.R. Kiran (2014) Professional Ethics and Human Values, McGraw Hill Education (India).

Reference Books

R.1	LaFollette, Hugh, ed. Ethics in Practice: An Anthology. Cambridge: Blackwell,1997.
R.2	Vivian L Vignoles (2017): Identity: Personal and Social, Chapter to appear in Oxford Handbook of Personality and Social Psychology (2nded.), edited by Kay Deaux and Mark Snyder.
R.3	Happiness and Well-Being, NIOS Module V (Health and well-being).

	Useful Links
1	https://onlinecourses.nptel.ac.in/noc23_hs89/preview
2	https://archive.nptel.ac.in/courses/109/104/109104068

	Course Outcomes	CL
BSH32403.1	**Define and explain** the importance of value education in life.	2
BSH32403.2	**Understand and explain** the significance of harmony in family and society.	2
BSH32403.3	**Apply** ethics in personal and professional life and benefits the organization but also contributes to broader societal well-being.	3

Second Year (Semester-IV) B.Tech. Mechanical Engineering
BSH32404: Leadership and Team Dynamics

Teaching Scheme			Examination Scheme	
Lectures	4 Hr / Week		**CT**	-
Tutorials	-		**CA**	50
Total Credits	2		**ESE**	50
			Total	100 Marks
			Duration of ESE: 02 Hrs	

Course Objectives:

1	To provide a framework for the students to understand the importance of Leadership and team effectiveness in organizations.
2	To develop an understanding of the interpersonal processes and group dynamics.
3	To provide a theoretical understanding of leadership practices in organizations.

Course Contents		Hours
Unit I	**Introduction to Leadership & Team Management:** Leadership Myths; Interactional Framework for analyzing leadership; Leadership Development: The First 90 Days as a Leader; Leader Development- The Action-Observation-Reflection Model, LMX Theory and Normative Decision Model; Situational Leadership Model; Contingency Model and Path Goal Theory; Emotional Approach Charismatic and Transformational Leadership; Leadership for Tomorrow.	**(9)**
Unit II	**Leadership Attributes: Personality Traits and Leadership:** Personality Types and Leadership; Intelligence and Leadership; Emotional Intelligence and Leadership, Power and Leadership: The art of influence in leadership: Leadership and "Doing the Right Things: Character-Based Approach to Leadership; Role of Ethics and Values in Organisational Leadership.	**(9)**
Unit III	**Leadership Behaviour:** Leadership Pipeline, Assessing Leadership Behaviors: Multi-rater Feedback Instruments: The Dark Side of; Leadership- Destructive Leadership; Managerial Incompetence and Derailment Conflict Management, Negotiation and Leadership, Leadership under a crisis situation: The Situation and the Environment: Culture and Leadership: Global Leadership.	**(9)**

Text Books

T.1	Leadership: Enhancing the lessons of experience by Hughes, R.L., Ginnett, R.C., & Curphy, G.J. (2019), 9th Edition, McGraw Hill Education, Chennai, India.
T.2	Robbins, S.P. Judge, T.A. & Vohra, N., "Organizational Behavior," 18th Ed, Pearson Education. (2019).

Reference Books

R.1	Baron R. A. and Byrne D., "Social Psychology", 10th Ed., Pearson Education, Inc. (2004)
R.2	Luthans F., "Organizational Behavior",10th Ed., McGraw-Hill Companies. (2004)

Useful Links	
1	https://onlinecourses.nptel.ac.in/noc22_mg39/preview
2	https://www.summary.com/book-summary/the-first-90-days

	Course Outcomes	CL
BSH32404.1	**Explain** how global leadership skills contribute to leadership effectiveness.	2
BSH32404.2	**Understand** the leader's role in team-based organizations.	2
BSH32404.3	**Classify** the potential contribution of outdoor training to the development of team leadership.	2