GALGOTIAS UNIVERSITY

Department of Mechanical Engineering

Vision, Mission, PEOs , POs& PSOs B.Tech Mechanical Engineering:

Vision

To be known as a premier department in mechanical engineering, interdisciplinary research, innovation and application of knowledge for the benefit of society.

Mission

MD1: Create an effective foundation in the field of production, design, thermal, industrial and automation engineering by imparting quality education.

MD2: Conduct interdisciplinary research leading to the delivery of innovative technologies through Problem and Research Based Learning.

MD3: Provide relevant industrial experience that instills the problem solving approach; integrate the product design to manufacturing life cycle management.

MD4: Prepare students for careers in academia and various industrial organization related to mechanical and allied engineering.

Program Educational Objectives

PEO1: Graduates of Mechanical Engineering shall be engineering professionals and innovators in core engineering, service industries or pursue higher studies.

PEO2: Graduates of Mechanical Engineering shall be competent in latest technologies by exploiting automation and smart manufacturing tools to address various industry 4.0 problems.

PEO3: Graduates of Mechanical Engineering shall leverage their imbibed skill through continuous working on recent technologies to transform betterment of the society.

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Program Specific Objectives

PSO1: Students are trained to perform tasks related to conversion of mechanical system to automatic system, integrating mechanical system to IoT and cloud based technologies.

PSO2: Students are practiced to use augmented reality / virtual reality along with different CAE tools for rapid prototyping and additive manufacturing.

Program Outcomes

1. Engineering Knowledge : Apply the knowledge of Mathematics, Science, and Engineering fundamentals, and an engineering specialization to solution of complex engineering problems.
2. Problem analysis : Identify, formulate, 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 of solutions for complex engineering problems and design of system components or processes that meet the specified needs with appropriate considerations of public health and safety, and cultural, societal, and environmental considerations.
4. Conduct investigations of complex problems : Use research based methods including design of experiments, analysis and interpretation of data and synthesis of information leading to logical conclusions.
5. Modern tool usage : Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling complex engineering activities with an understanding of limitations.
6. The engineer and society :Apply reasoning within the contextual knowledge to access 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 the societal and environmental contexts, and demonstrate the knowledge of, and the need for sustainable developments.
8. Ethics :Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.

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9. Individual and team work :Function effectively as an individual independently 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 give and receive clear instructions.
11. Project management and finance :Demonstrate knowledge and understanding of engineering management principles and apply those to one's own work as a member and leader of a team to manage projects in multidisciplinary environments.
12. Life-long Learning :Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

B. Tech Mechanical engineering curricula is in tune with national and global priorities by training students in skill-based programs, e.g., AutoCAD and Solidworks for solid modeling and preparation of assembly of machine parts, Ansys skills in FEA and CFD analysis to validate designs and its performances, layered manufacturing for developing prototypes, Hands-on training on Industry model CNC machines, AI for applications in Mechanical engineering. Apart from domain-specific skills, the department ensures the handholding of its students in life skills like communication, human values, ethics by encouraging students to take two-semester projects which caters to need of local villagers and sensitizes our students to national policies like Unnat Bharat Abhiyan. The key objective of B Tech curricula is transforming young graduate into a responsible, ethical, well-skilled graduate engineer ready to serve the society.

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Name of The Course	Mechanics of Materials			
Course Code	BTME2008			
Prerequisite	BTME2001-Engineering Mechanics			
Co-requisite				
Anti-requisite				
	L	T	P	C
	3	0	0	3

Course Objectives

1. 1. To develop the relationship between the loads applied to a non-rigid body, the internal stresses and deformations induced in the body.
2. To study the general state of stresses and strains in a given loaded member and the magnitude and direction of the principal stresses
3. To understand the different approaches to calculate slope and deflection for various types of beams.
4. To analyze the columns with different edge conditions by using different theories.

Course Outcomes

CO1	Understand the basics of simple stress and strain
CO2	Draw Mohr's circle and solve problems involving biaxial state of stress.
CO3	Apply theory of simple bending for analysing problems.
CO4	Calculate deflection of various beams of different shapes.
CO5	Calculate torsion in shafts and buckling load of column.
CO6	Able to model the system and find out deflection

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
30	20	50	100

Course Content:

Unit I: Stresses and Strains	**8 Hours**
Definition/derivation of normal stress, shear stress, and normal strain and shear strain – Stress-strain diagram- Elastic constants – Poisson's ratio – relationship between elastic constants and Poisson's ratio – Generalized Hook's law – Strain energy – Deformation of simple and compound bars – thermal stresses.	
Unit II: Bi-axial Stress system	**8 Hours**
Biaxial state of stress – Stress at a point – stresses on inclined planes – Principal stresses and Principal strains and Mohr's circle of stress, Theories of failure	

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Thin cylinders and shells – deformation of thin cylinders and shells; Thick Cylinders, Shrink fits, Compounding. Fundamentals of theory of elasticity.
Unit III: Simple Bending **8 Hours**
Types of beams: Cantilever, Simply supported, Overhanging: Shear Force and Bending Moment Diagrams. Theory of simple bending – bending stress and shear stress in beams.
Unit IV: Deflection of Beams **8 Hours**
Deflection of beams by Double integration method – Macaulay's method – Area moment theorems for computation of slopes and deflections in beams – Conjugate beam method.
Unit V: Torsion and columns **8 Hours**
Introduction to Torsion – derivation of shear strain – Torsion formula – stresses and deformations in circular and hollow shafts – Stepped shafts – shafts fixed at the both ends Theory of columns – Long column and short column - Euler's formula – Rankine's formula - Secant formula - beam column.
Unit VI: modeling of system **5 Hours**
Introduction to STAADPRO, Simple SFD and BMD application Practice, Modeling of the system and find out deflection at various points

Suggested Reading

1. S. S. Rattan (2011) Strength of material Tata McGraw Hill Education. ISBN: 978-0-071-07256-4.
2. S.P. Timoshenko and D.H. Young (2011), Strength of Materials, 5th edition, East West Press Ltd, ISBN: 978-8-176-71019-0.
3. R.K. Bansal (2010), Strength of Materials, 5th Edition, Laxmi Publications, ISBN: 978-8-131-80814-6.

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