**ANSWER THE MANDATORY QUESTIONS: -**

**Physics (Total credits-18)**

Name of the module – Engineering mechaics

Credit Points – 4

Content of the module: I've learned about fundamental concepts in physics, including forces and systems. I understand how objects at rest interact with forces in space, including the concept of moment. I've studied the conditions necessary for rigid bodies to be balanced, and I've learned how to calculate the moments of surfaces and solids. Additionally, I've gained knowledge about static friction.

Name of the module – Theory of Machines

Credit Points – 4

Content of the module: I've acquired a solid understanding of particle kinematics, including the fundamental concepts of force, mass, and acceleration. I've explored the relationship between force, work, and energy, and I've studied the motion of rigid bodies. I've also applied my knowledge to solve practical problems related to rigid body kinematics.

Name of the module – Dynamics of Machines

Credit points – 3

Content of the module: I've acquired a strong foundation in the principles of simple mechanisms. I've conducted kinematic analyses of these mechanisms to understand their motion characteristics. Additionally, I've designed cam profiles for various follower motions and have become proficient in the kinematic terminology and calculations associated with spur gears and different gear trains. I've also explored the concept of friction drives in the context of machine kinematics.

Name of the module – Fluid Mechanics

Credit Points – 3

Content of the module: ⁠I've acquired expertise in fluid mechanics, including the properties of fluids and the principles of fluid statics. I can calculate flow rates and energy losses in pipe flows. I have a strong understanding of boundary layer theory and the significance of dimensional analysis in fluid mechanics. I've also studied the operating principles and performance metrics of fluid pumps and hydraulic turbines.

Name of the module – thermodynamics and Thermal Engineering-I

Credit points – 4

Content of the module: ⁠I've acquired a solid foundation in thermodynamics, including the fundamental principles and the zeroth law. I understand the concept of the first law of thermodynamics and its implications. Additionally, I've studied the second law of thermodynamics and its relationship to entropy. I have knowledge of the thermodynamic properties of pure substances and their phase transitions. Furthermore, I've explored gas power cycles and the characteristics of gas mixtures.

**Material Science (Total Credits – 25)**

Name of the module – Finite Element Methods

Credit points – 5

Content of the module: I've learned about the finite element method, which is a way to solve complex problems by breaking them down into smaller, simpler parts. I've focused on solving problems in one and two dimensions, specifically related to heat conduction. I've also studied more advanced elements that can handle more complicated shapes and situations.

Name of the module - ⁠Heat Transfer

Credit points – 5

Content of the module: ⁠I've learned about different ways heat can move, including conduction, convection (natural and forced), and radiation. I understand how to calculate heat transfer between objects, both when they're glowing hot (black-body and grey-body radiation) and when they're changing states (like ice melting). I've also studied how heat can cause substances to move (diffusion and convective mass transfer).

Name of the module – ⁠Design of Machine Elements

Credit points – 5

Content of the module: I've acquired knowledge about designing machine components that experience both simple and varying loads. I've studied the design processes for shafts and couplings, as well as bolted and welded joints. Additionally, I've learned how to design helical, leaf, and torsional springs for both constant and variable loads. I've also gained experience in selecting appropriate sliding and rolling contact bearings.

Name of the module – ⁠Final year project on Composite Materials

Credit points – 5

Content of the module: ⁠Al6082-SiO2-Graphene hybrid composite has been successfully fabricated by the stir casting method.

The hardness, tensile, compressive properties, and microstructure analysis of hybrid composites were evaluated.

The results of the investigation can be summarized as follows:

 • Hybrid Composite exhibit improved mechanical properties when graphene content is increased while SiO2 ratio remains constant. Thus, a specimen with 7% graphene and 3% SiO2 showed 26% higher Ultimate Tensile Strength and Yield Strength than specimens with other compositions.

 • Significant increases in compressive strength are obtained by incorporating 3% SiO2 and 3% graphene exhibited the highest Compressive strength and overall improvement over the first composite.

 • Significant increases in hardness are obtained by incorporating 3% SiO2 and 7% graphene exhibited the higher hardness (13.7% increased) over the other composites.

Name of the module - Strength Of Materials

Credit points – 5

Content of the module: I have developed a comprehensive understanding of the fundamental principles of strength of materials during my B.Tech. I can analyze the stress and strain distributions within various structural components, including beams, columns, and shafts. I am proficient in applying theories of failure to predict the load-carrying capacity of materials and structures. Additionally, I can design structural elements to withstand specific loads and environmental conditions. My knowledge of material properties, such as elasticity, plasticity, and fatigue, allows me to make informed decisions in engineering design.

**Engineering Mathematics (Total Credits – 20)**

Name of the module – NUMERICAL METHODS AND STATISTICAL TECHNIQUES.

Credit Points – 5

Content of the module:

I have successfully delved into the realm of numerical methods, mastering techniques for solving algebraic and transcendental equations. I've also explored the intricacies of interpolation, enabling accurate data approximation. Furthermore, I've gained proficiency in numerical integration and the solution of ordinary differential equations, essential tools for various engineering and scientific applications. My understanding of probability and statistical distributions, along with sampling theory and hypothesis testing, equips me to analyze and interpret data effectively.

Name of the module – INTEGRAL TRANSFORMS AND APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS.

Credit Points – 5

Content of the module:

I've delved into the realm of Fourier analysis, mastering the art of representing periodic functions as infinite sums of sines and cosines. I've explored the conditions for Fourier expansion, the nuances of discontinuous functions, and the techniques of interval shifting and exploiting function symmetries. I've ventured into the world of Fourier transforms, understanding their integral representation, properties, and inverse transformations. My journey has also led me to the realm of Laplace transforms, where I've learned to solve differential and integro-differential equations with elegance. Finally, I've applied these powerful tools to tackle higher-order partial differential equations, particularly the wave, heat, and Laplace equations, using the method of separation of variables.

Name of the module – Engineering Mathematics-I

Credit Points – 5

Content of the module:

I have developed a strong understanding of vector and eigenvalue concepts, enabling me to analyze the stability of linear systems in engineering applications. I can effectively apply differentiation and integration techniques to determine the areas of 2D and 3D surfaces, aiding in the solution of engineering problems. Additionally, I have acquired proficiency in complex analysis, specifically analytic functions, allowing me to predict the behavior of various engineering systems.

Name of the module - Engineering mathematics-II

Credit Points – 5

Content of the module:

I have mastered the concepts of partial derivatives and multiple integrals, enabling me to calculate areas, volumes, and optimize functions of multiple variables in engineering contexts. I can accurately classify sequences and series as convergent or divergent, a crucial skill for analyzing linear systems. I am proficient in formulating real-world engineering problems into mathematical models using ordinary differential equations and employing suitable techniques to derive solutions.