

Course Type	Course Code	Name of Course	L	T	P	Credit
ESO	NPHE101	BIOMEDICAL ENGINEERING	3	0	0	3

**Course Objective**

The Objective of the course is to teach students about various biomedical processes and the primary role of a biomedical engineer.

**Learning Outcomes**

Upon successful completion of this course, students will:

- Understand the role of a biomedical engineer in a modern health care system.
- Have knowledge about human anatomy and physiology.
- Learn various biomedical processes.
- Get acquainted with different bio-instrumental tools, used to address health-related issues in our day to day life.

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
1	<b>Introduction:</b> What is Biomedical engineering? Modern health care system; Role of a Biomedical engineer; Recent advances and prospectus in future.	05	From this unit, students will learn about the role of a biomedical engineer in a modern health care system.
2	<b>Anatomy and Physiology:</b> Introduction; Cellular organization; Tissues; Major organ systems; Homeostasis; Biomolecules; Nucleic Acids; Proteins; communication systems; Engineering balances.	12	This unit will help students to learn about human anatomy and physiology.
3	<b>Biomechanics and biomolecular Engineering:</b> Prelude; Viscoelastic properties; Mechanics of Materials, Cells, Tissues, and Organs; Cardiovascular dynamics; Biomaterials and Artificial organs; Transport processes; Drug delivery; Tissue Engineering; Antigens, Antibodies, Clinical use of Antibodies, Vaccines.	14	Here students will know about various biomedical processes, their cause, effects, and remedy.
4	<b>Bioinstrumentation and Imaging:</b> Overview of measurement systems; Types of Sensors; Instruments in medical practice and the research laboratory; Biomicro electro-mechanical systems and lab-on-a-chip devices; X-rays and Ultrasound imaging; Magnetic Resonance Imaging (MRI), Computer Tomography (CT), Surgery; Nuclear medicine; Optical bio-imaging; Image processing and analysis.	11	The students get acquainted with different bio-instrumental tools and their use to address health-related issues in our day to day life.
<b>Total</b>		42	

**Text Books:**

1. Biomedical Engineering - Bridging medicine and technology, W. M. Saltzman, Cambridge University Press, 2009.
2. Introduction to Biomedical Engineering, J. D. Enderle and J. D. Bronzino, Elsevier, 2012.

**Reference Books:**

1. Human Physiology - from cells to systems, L. Sherwood, Books/Cole, Cengage Learning.
2. Introduction to Biomedical Engineering, M. M. Domach, Prentice Hall, 2003.
3. Drug Delivery – Engineering principles for drug therapy, W. M. Saltzman, Oxford University Press, 2001.
4. Tissue Engineering – Principles for the design of replacement organs and tissues, W. M. Saltzman, Oxford University Press, 2004.
5. Introductory Biomechanics – From Cells to Organisms, C. R. Ethier, and C. A. Simmons, Cambridge University Press, 2009.
6. Biomedical Imaging: Principles and Applications, Ed: Reiner Salzer, Wiley, 2012.
7. Introduction to medical imaging, N. B. Smith, A. Webb, Cambridge University Press, 2011.