

1	Introduction: Introduction to nanotechnology and overview of nanoscale materials, effect of length scale on properties, introduction to bionanotechnology, challenges and opportunities associated with biology on the nanoscale, biological and medical applications of bionanomaterials.	6
2	Nanomaterials: Introduction to nanomaterials, Unique functional properties of natural and synthetic biomolecular-sized (nanometer-scale) constructs such as quantum dots, carbon nanotubes, nanostructured surfaces, liposomes, Environmental behavior of nanoparticles, biological activity of nanomaterials.	10
3	Biosensors: Introduction to biosensors, the biological component, the sensor surface, Immobilization of the sensor molecule, Applications of molecular recognition elements in nanosensing of different analytes, Application of various transducing elements as part of nanobiosensors	6
4	Biophotonics and Bioimaging: Overview of imaging biological systems, from the cellular level through to whole-body medical imaging, Fluorescence spectroscopy Miniaturized devices in nanobiotechnology - types and applications, MEMS, Lab on a chip concept	12
5	Nanotoxicology: Principles of toxicology; toxicology models, experimental toxicology studies; activation and detoxification mechanisms. Applications, Risks and Precautions: In vivo diagnosis, in vitro diagnosis, therapy, cosmetics; Environmental and Risk Prevention; Risks and Ethical considerations.	8
	Total	42

Books:

S.No	Name of Book/Author/Publisher
1	Nanobiotechnology: Concepts, Applications and Perspectives, Christof M.Niemeyer (Editor), Chad A. Mirkin (Editor), Wiley VCH.
2	Nanobiotechnology - II more concepts and applications, Chad A Mirkin and Christof M. Niemeyer (Eds), Wiley VCH.
3	Nanotechnology in Biology and Medicine: Methods, Devices, and Applications.
4	D.S. Goodsell, Bionanotechnology: Lessons from Nature, Wiley Press
5	G. Ozin, A. Arsenault, Nanochemistry. A Chemical Approach to Nanomaterials, RSC, London

MEDICAL PHYSICS**Details of course :-**

Course Title	Course Structure			Pre-Requisite
	L	T	P	
Medical physics (BT414)	03	01	00	Nil

Course Objective:

To impart knowledge on application of physics is in explaining various physiological phenomena and its significance in biological systems. Also, this course imparts detailed aspects of biochemistry and its applications.

Course Outcome (CO):

- 1 Describe the functions of various cellular constituents like action potential and its measurements, functioning of skeletal muscles
- 2 Summarize the physics of the lungs and breathing by blood and lungs interactions, measuring the volumes, pressure of lungs and alveoli
- 3 List the major components of the cardiovascular system with oxygen and carbon di-oxide exchange in the Capillary System and applying Bernoulli's Principle to Cardiovascular system
- 4 Gain introduction to Bio molecules with their structure and properties of mono, di oligo and polysaccharides also Classifying lipids and learning their physical and chemical properties of fats and oils, phospholipids, fatty acids, prostaglandin
- 5 Discuss on structure and properties of amino acids, proteins, nucleic acids, vitamins and minerals

S.No.	Content	Contact Hours
1	Functions of various cellular constituents: Action potential and its measurements – Hodgkin–Huxley model, Functioning of skeletal muscles, Blood and lymph circulation,	6
2	Physics of the Lungs and Breathing: The airways- Blood and Lung interaction, Measurement of Lung Volumes, Pressure, Physics of the Alveoli, Breathing mechanism, Airway resistance	8
3	Physics of the Cardiovascular system and Cardiovascular instrumentation: Major Components of the Cardiovascular System, Oxygen and Carbon di-oxide exchange in the Capillary System, Bernoulli's Principle applied to Cardiovascular system, Laminar and Turbulent Blood Flow	8
4	Bio – Chemistry (I): Bio molecules – Carbohydrate - Structure and properties of mono, di oligo and polysaccharides, Classification of lipids - physical and chemical properties of fats and oils, phospholipids, fatty acids, prostaglandin	10
5	Bio – Chemistry (II): Structure and properties of amino acids, proteins, nucleic acids, vitamins and minerals	10
Total		42