DEPARTMENT OF PHYSICS
VALUE ADDED COURSE

Semester	Course Code	Course Title	Hours
III	21UPHVAC1	ULTRASONIC NON-DESTRUCTIVE TESTING	30

Course Outcome:

At the end of this course, students will be able to

CO1. Prepare of multicomponent of liquid mixtures, measurement techniques so as to study the molecular interactions

CO2. Understand the ultrasonic imaging techniques and instrumentation for applications in medical diagnosis

CO3. Understand the holography technique and its utilization.

CO4. Understand the concepts of ultrasonic interferometry and to measure the acoustical parameters of liquids.

CO5. Learn the applications of the ultrasonic instruments in industry.

UNIT I: Classification and Different Types of Techniques 6 hrs

Pulse echo – Contact testing – Through transmission – immersion – Pitch-catch or tandom – Resonance – Surface wave – Contact type techniques – Function of a flaw detector

UNIT II: Materials Characterisation 6 hrs

Classification of Materials characterization – Experimental Techniques and Theory – Specimen preparation – Velocity and attenuation measurements – density measurements – Elastic constants – Applications of elastic constants in materials – Variation of elastic moduli with porosity

UNIT III: Ultrasound in Medicine 6 hrs

Ultrasound in tissues – Transducers for Medical Imaging – Mechanically scanned probes – Arrays – Annular arrays – Linear and curvelinear array probes – Phased array probes – Instrumentation – Different types of scans – A-scan – B-scan – Time position scan

UNIT IV: Underwater Acoustics 6 hrs

Fundamentals of Underwater acoustics – Temperature measurements – Salinity, temperature and depth measurements – Flow measurements – wave and tide parameter measurements – Sound velocity – Acoustic system for depth and sea level measurements – Sonar

UNIT V: Applications of Ultrasound – General and Advanced 6 hrs

Classification of Ultrasonic Applications – Low frequency – High intensity Applications - Welding – Cleaning – Food industry – Concrete testing – Sensor for temperature and pressure measurements –Length meters – Level meters – Thickness measurements – Ultrasonic microscopy – Holography

BOOKS FOR STUDY:

1. Baldev Raj, V Rajendran, P Palanichamy, Science and Technology of Ultrasonics, Third Edition 2015, Narosa Publishing House, New Delhi

Semester	Course Code	Course Title	Hours
V	21UPHVAC1	BIOPHYSICS	30

Course Outcomes:

At the end of this course, students will be able to

CO1: Understand the organization and functioning of biomolecules.

CO2: Study the kinetics of the molecules to monitor the living organs, disease diagnosis and used as a life supporting equipment.

CO3: Learn the concepts of physiological processes in living systems governed by the principles of Physics.

CO4: Identify the biochemical and biophysical changes occurring in living system.

CO5: Understand optical principles and identify the appropriate tissue imaging.

UNIT I: BIOMOLECULES 6 hrs

Organization of molecules – Macromolecules and Intermolecular forces – Stability of macromolecules – Biological membrane – Proteins: Organization of Proteins – Primary structure – Lipids: Organization of Lipids – Nucleic acids: Organization of Lipids – Primary structure of DNA – Structure of RNA

UNIT II: PRINCIPLES OF KINETICS OF MOLECULES 6 hrs

Diffusion – Factors affecting diffusion – Biological significance of diffusion – Osmosis – Biological significance of osmosis – Filtration – Formation of urine by filtration – Dialysis – Kinds of Dialysis – Surface Tension – Factors affecting surface tension – Biological significance of surface tension.

UNIT III: PRINCIPLES OF OPTICS IN BIOLOGICAL STUDIES 6 hrs

Characteristics of Light – Microscopy: Principle – Types of Microscopes: Polarization Microscope – Ultraviolet Microscope – Fluorescent Microscope – Photometry – Beer's law - Lambert's law – Beer-Lambert's law Colorimeter.

UNIT IV: BIOPHYSICAL PHENOMENA IN BIOCHEMICAL STUDIES 6 hrs

Hydrogen Ion concentration (pH) – pH Scale – pH meter: Principle, Factors affecting measurement of pH Factors – Chromatography– Principles of Chromatography – Types of Chromatography: Thin Layer Chromatography (TLC) – Column Chromatography – GEL Permeation Chromatography.

UNIT V: BIOMECHANICS 6 hrs

Introduction – Mechanical properties of muscles – Biomechanics of the cardiovascular system – Blood pressure – Electrical activity during the heartbeat – Electrocardiography.

BOOKS FOR REFERENCE:

1. Dr. R. N. Roy, A Text Book of Biophysics, Revised Edition, New Central Book Agency (P) Ltd. (2007).

2. Rodney Cotterill, Biophysics an Introduction, John Wiley & Sons Ltd., (2002).