KU3DSCPHY213: Biophysics

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
III	DSC	200	KU3DSCPHY213	4	75

Learning Approach (Hours/ Week)		Marks Distribution			Duration of ESE (Hours)
Lecture+ Tutorial	Practical	CE	ESE	Total	
3	2	35	65	100	2

Course Description:

This course provides an overview of fundamental principles and practical applications of various biophysical methods used in biochemical and biological analyses. Students will learn about the principles of photometry, calorimetry, and various spectroscopic techniques such as absorption spectroscopy and UV-visible spectrometry. Furthermore, students will explore biomechanics. Finally, the course introduces neuro biophysics.

Course Prerequisite: Higher secondary level Science

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Comprehend and apply Biophysical analytical methods them in practical scenarios for quantitative analysis of biological samples.	U, A
2	Students will gain a comprehensive understanding of diffusion and osmosis, including the causes, kinetics, and types of diffusion, as well as the mechanisms and significance of osmosis in plant and human cells.	U

3	Understand Molecular Interactions in Biological Systems	U
4	Analyse Biomechanics of Biological Movements	An
5	Understand Neuro biophysics and Sensory Mechanisms	U

Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)

Mapping of Course Outcomes to PSOs

	PSO 1	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**	**PSO 6**	**PSO 7**
CO 1	3	3	3	3	3	2	2
CO 2	3	3	2	3	3	1	1
CO 3	3	3	2	3	3	2	1
CO 4	3	2	2	3	3	1	0
CO 5	3	2	2	3	3	1	2

Correlation level 0-None, 1-Slight, 2-Medium, 3-High

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	**UNIT**	**DESCRIPTION**	**HOURS**
1	**Biochemical analytical methods**		**12**
	1	Photometry, calorimetry, spectroscopies- absorption spectroscopy, spectrophotometer, ultraviolet and visible spectrometry.	3
	2	Biophysical principle: diffusion-causes of diffusion, kinetics of diffusion, types of diffusion,	3
	3	Osmosis-what is Osmosis, semipermeable membrane, mechanism of semi permeable membrane,	3
	4	Osmosis and plant cell, Osmosis and human cell	3

		Book 1: chapter 5, chapter 9	
2	**Intra and intermolecular interactions in biological system**		**13**
	1	Intra and intermolecular interaction, chemical bond, chemical behaviour of atoms, energy within atom,	4
	2	Chemical bonding and atomic orbital theory, bond length , bond energy, bond angle, bond order, chemical bonds	3
	3	Electrovalency, covalent bond, application of covalent bond, nonpolar covalent bond, polar covalent bond	3
	4	Types of Hydrogen bond, significance of Hydrogen bonding	3
		Book 2: Chapter 5	
3	**Biomechanics**		**10**
	1	Muscles-types, properties, functions, structure, molecular components of muscle.	3
	2	basic force of laws, centre of mass	2
	3	biomechanical analysis of movement of snakes	2
	4	life in fluids, swimming of fishes, aerodynamic basis of flights.	3
		Book 2: Chapter 13	
4	**Neuro Biophysics**		**10**
	1	Nervous system	3
	2	Biophysics of membrane potential, transmission of nerve impulse, Sensory mechanism	2
	3	The eye-basic structure of human eye, Biophysical aspect of vision, biophysical changes during vision.	3
	4	Ear as a hearing organ- parts of ear, Biophysical aspects of hearing.	2
		Book 2: Chapter 14	
5	**Practical Module**		**30**
	*Directions: **At least 5** experiments from the following + 2 Activities (can be selected from the list or can be designed by the course faculty.)*		
	1. Searle's Vibration magnetometer- moment and m_1/m_2 2. Zener diode voltage regulator (V_z given) 3. Melde's string - Frequency of a tuning fork.		

	4. Potentiometer- Calibration of ammeter 5. Full wave Rectifier- study of ripple factor with and without filter 6. Spectrometer dispersive power of a prism 7. Newton's Ring (Radius of Curvature) given- Wavelength of Sodium light 8. Voltage multiplier 9. Simulations	

Essential Readings:

1. A text book of Biophysics by R N Roy, 2001.
2. Introduction to Biophysics by Dr Pranab Kumar Banerjee, 2nd revised Edn., 2014.

Suggested Readings:

1. "Principles of Biochemistry" by Albert L. Lehninger, David L. Nelson, and Michael M. Cox
2. Biomechanics: Mechanical Properties of Living Tissues" by Y.C. Fung
3. Principles of Neural Science" by Eric R. Kandel, James H. Schwartz, Thomas M. Jessell, Steven A. Siegelbaum, and A.J. Hudspeth

Assessment Rubrics:

Evaluation Type			**Marks**	**Evaluation Type**			**Marks**	**Total**
Lecture			**75**	**Practical**			**25**	**100**
a)	**ESE**		**50**	a)	**ESE**		**15**	
b)	**CCA**		**25**	b)	**CCA**		**10**	
	i	*Test Paper	10		i	Punctuality	3	
	ii	**Assignment/ Book-Article review	10		ii	Skill	4	
	iii	Seminar/ Viva-Voce	5		iii	Record	3	

*Best out of two test papers

** or any other activities like quiz, open book exam, group activity.