**School of Science**
**B.Sc. (Zoology) Programme**
**Subject Code & Name: BS03MDZOO2 Biophysics**

**Teaching and Evaluation Scheme:**

| Teaching Scheme | | | | Examination Scheme | | | |
|---|---|---|---|---|---|---|---|
| Credits | | | | Component Weightage (%) | | | |
| | | | | CCE | | SEE | |
| L | T | P | Total | TH | PWE | TH | PWE |
| 3 | 0 | 1 | 4 | 35 | 15 | 35 | 15 |

| | |
|---|---|
| Programme Name | B.Sc. (Zoology) |
| Semester | III |
| Course Code | BS03MDZOO2 |
| Course Title | Biophysics |
| Course Content Type(Th./Pr.) | Theory & Practical |
| Course Credit | 4 |
| Sessions+ Lab. Per Week | 3+2 |
| Total Teaching/Lab. Hours | 45 Hours + 30 Hours |
| * 2 Laboratory = 1 Session | |
| | |

**Learning Objectives**

Students will able to study

1. Production and application of ultrasonic waves in various fields
2. Various medical tools & their principles ECG, EEG, EMG, ECT,MRI & CAT scan.
3. The physical principles behind the various techniques available for interrogating biological macromolecules.

**Prerequisites (if any)**

**Learning Outcomes**

On the Completion of this course, students will able to:

1. Student can learn about various biomedical instrumentation
2. They learn about core concept of production, detection and application of ultrasonic waves.
3. Should be able to understand spectroscopic techniques.
4. Learn about how mechanics involves in physics of vision and audition.

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| Detailed Contents | | |
|---|---|---|
| **UNIT** | **TOPIC/SUB-TOPIC** | **TEACHING HOURS** |
| I | **Ultrasonic waves:**<br>Introduction to Ultrasonic waves, properties and production of ultrasonic waves: Magnetostriction method and Piezo-electric method, Detection of Ultrasonic waves, Applications of ultrasonic waves.<br>**Biomedical Instrumentation-** (Brief introduction):<br>Flow of electricity, Flow of electricity in solids, electrolytes, gases and vacuum, Electricity and human body, ECG, EEG, EMG, ECT, Pace makers and defibrillation, Magnetism and electricity, MRI scanning, CAT scan. | **15** |
| II | **Spectroscopic Methods** (principle and applications):<br>Laws of light absorption: Beer-Lamberts law, UV and Visible spectroscopy: Working and application of UV and visible spectroscopic techniques.<br>Principle and application of NMR, IR spectroscopy, Raman spectroscopy, X-ray crystallography. | **15** |
| III | **Bio Physics and Fluid flow:**<br>Steady Laminar flow, Poisulle's formula, energetics of fluid flow, turbulence and hemodynamics.<br>**Physics of audition:** Transverse and longitudinal waves, Physiological characteristics of sound, human ear, phase sensitivity and determination of direction, Doppler effect and related numerical.<br>**Physics of Vision:** Wave nature of light, geometrical optics, refractive power, retina and photoreceptors, resolving power of eye, polarization and vision. | **15** |

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| Text Book(s) | |
|---|---|
| **Unit : I** | i. Engineering Physics by G. Vijayakumari, Vikas Publishing house<br>ii. Text book of Biochemistry and Biophysics, Sheela Tiwari, CBS Publishers.<br>iii. Electric and Electronic measurements and Instrumentation. (19th Ed. 2016) A.K. Sawhney, Dhanpat Rai & Co. |
| **Unit: II** | i. Wilson, K., and Walker, J. Principles and Techniques of Biochemistry and Molecular Biology. Cambridge University Press, 2010.<br>ii. Bio Physics and Molecular biology Tools and Techniques, 4th Edition, by Praveen Kumar, Path finder Publication |
| **Unit: III** | i. Biophysics by Chatwal, Himalaya Publication |

| **Practicals** |
|---|
| 1. To verify Stefan's fourth power law.<br>2. To determine resolving power of compound microscope.<br>3. To verify Malus law.<br>4. Determine the wavelength of monochromatic light by Newton's ring.<br>5. To determine wavelength of light using plane diffraction grating. (Normal Incidence method)<br>6. To determine Cardinal points of lens system.<br>7. To determine specific rotation of sugar solution using Laurent's half shade polarimeter. |
| **Reference Books** |
| 1. Elementary Biophysics by Srivastava, Narosa Publication<br>2. Fundamentals of Molecular Spectroscopy by Colin Banell, Mc Graw Hill Publication<br>3. Biomolecule NMR Spectroscopy by N.S.Evans (OUP Oxford)<br>4. Modern Optical Spectroscopy with exercises and Examples from Bio Physics and Biochemistry by William. Parson, Springer Publication. |
| **Web Resources** |
| https://archive.nptel.ac.in/courses/104/104/104104085<br>https://nptel.ac.in/courses/104104085 |
| **Required Software(s) (if any)** |

**L::** Lecture, **T::** Tutorial , **P::**Practical
**CCE::** Continuous and Comprehensive Evaluation
(CCE Theory includes Mid Semester Examination, Assignment, MCQ quizzes, Seminar, Reflective notes, class participation, case analysis and presentation, slip tests (announced/ surprised), attendance etc. or any combination of these)
**PWE::** Practical Work Examination
(PWE includes Laboratory practical work, project work, viva simulation exercise work etc.)
**SEE::** Semester End Evaluation

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