Semester

Bio Physics			
Course Code	21PHY651	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	2:2:0:1	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03 Hours

Course objectives:
Course Objectives:

1. To understand the essentials of cells and Biomolecular structures.
2. To understand the importance of sun light to sustain the life.
3. To recognize the role of Biophysics in human life cycle.

Teaching-Learning Process (General Instructions)
These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes.

1. **Apart from conventional lecture methods various types of innovative teaching techniques through videos, animation films may be adopted so that the delivered lesson can progress the students in theoretical, applied and practical skills in physics.**
2. **State the necessity of physics in engineering studies and offer real life examples.**
3. **Seminars and Quizzes may be arranged for students in respective subjects to develop skills.**
4. **Encourage the students for group learning to improve their creativity and analytical skills.**
5. **While teaching show how every concept can be applied to the real world. This helps the students to expand understanding level.**
6. **Support and guide the students for self-study.**
7. **Ask some higher order thinking questions in the class, which promotes critical thinking.**
8. **8. Inspire the students towards the studies by giving new ideas and examples.**

Module-1 .

Biomolecular Structures: **08 hours**

Brief Introduction about cell, Characteristics of cell, Structural organization of proteins, Dynamics of protein folding, Protein Engineering,

Nucleic Acids; DNA, RNA, Principle of base pairing/base stacking, Watson-Crick model for DNA, Replication of DNA and RNA.

Lipids and Membranes; Structure of Simple Lipids, Compound Lipids and Steroids. Membranes and membrane structures.

Pedagogy	Chalk and talk, Power point presentation, Videos **Self-study Component:** The size of the cell, basic unit of cell and characteristics of Cell.

Module-2

Thermodynamics and Bioenergetics; **08 hours**

Laws of thermodynamics, Differential Scanning Calorimetry, Free energy, Irreversible Thermodynamics, Chemical potential, The Isolated state, Fick's law of diffusion, Open System, and Biological Oscillations. Photo -Bioenergetics, The Chloroplast, Photo synthesis, Photosynthetic reactions, Photo system1, and 2, Chemo Bioenergetics, Mitochondrial Structure, Electron transport process, Electron transport Chain (Respiratory Chain) Complex1,2,3,4-Oxidative Phosphorylation- Mechanism of Oxidative Phosphorylation.

Pedagogy	Chalk and talk, Power point presentation, Videos **Self study Component: Laws of Thermodynamics. Differential Scanning Calorimetry.**

Module-3

Biomechanics: **08 hours** Introduction, Striated Muscles, Contractile proteins, Mechanical properties of muscles, contraction mechanism, role of Ca^{2+} ions, Biomechanics of the cardiovascular system, Blood pressure, Electrical activity during the heartbeat, Electrocardiography.	
PedagogyDirectly	Chalk and talk, Power point presentation, Videos **Self study Component: Introduction and Striated muscles**
Module-4	
Radiation Biophysics: **08 hours** Types of radiations. Interaction between radiation and matter, Directly ionizing radiation, dose and Dose rate, dosimetry. Description and interpretation of radiation action, Dose effects graphs and target theory, direct and indirect radiation action, radioactive isotopes, biological effects of radiation, radiation protection and therapy.	
Pedagogy	Chalk and talk, Power point presentation, Videos **Self study Component: Types of radiations.**
Module-5	
Neurobiophysics: **08 hours** Introduction, The Nervous System, Physics of membrane Potentials . Membrane potential due to diffusion, Voltage Clamp, Sensory mechanisms- The visual receptor, Electrical activity and visual generator potentials, Optical defects of eye, Neural aspects of vision, visual communications, bioluminescence, Physical aspect of hearing, The ear, Elementary acoustics, theories of hearing, Signal transduction in the Cell.	
Pedagogy	Chalk and talk, Power point presentation, Videos **Practical Topics:** **Self-study Component:** Nervous system, and Physics of membranes

Course Outcomes

After the completion of the course student should be able to :

1. Elucidate the Bio molecular structures.
2. Describe the Photo Bioenergetics.
3. Apprehend on properties of muscles and Cardiovascular systems.
4. Analyse various biological effects of radiations.
5. Describe the Nervous system, Neural aspects of vision and Physical aspect of hearing.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50)in the semester-end examination(SEE).

Continuous Internal Evaluation:

Three Unit Tests each of **20 Marks (duration 01 hour**)

1. First test at the end of 5th week of the semester
2. Second test at the end of the 10th week of the semester
3. Third test at the end of the 15th week of the semester

Two assignments each of **10 Marks**

4. First assignment at the end of 4th week of the semester
5. Second assignment at the end of 9th week of the semester

Group discussion/Seminar/quiz any one of three suitably planned to attain the COs and POs for **20 Marks** (**duration 01 hours**)

6. At the end of the 13th week of the semester

The sum of three tests, two assignments, and quiz/seminar/group discussion will be out of 100 marks and will be **scaled down to 50 marks**

(To have less stressed CIE, the portion of the syllabus should not be common /repeated for any of the methods of the CIE. Each method of CIE should have a different syllabus portion of the course).

CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (**duration 03 hours)**

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.

The students have to answer 5 full questions, selecting one full question from each module. Marks scored out of 100 shall be reduced proportionally to 50 marks

Suggested Learning Resources:

Text books:

Reference books:

1. Bio Physics, W, Hoppe, W. Lohmann, Markl, Springer, Verling, Berlin.
2. Essentials of Bio Physics P. Narayanan New Age International (P) Ltd New Delhi (2000)
3. Bio Physics V.Pattabhin and N. Gautham, Narosa Publishing House ,New Delhi..
4. Bio physical Chemistry, Upadhyay and Upadhyanath, Himalaya Publishing House (2008)

Web links and Video Lectures (e-Resources):

1. https://youtu.be/SSNC2nFxnuA.
2. https://youtu.be/0GNNW553IVY.
3. https://youtu.be/NX0VQ8Uj4PY
4. https://youtu.be/L_az3Zvb_tc

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

http://nptel.ac.in

https://swayam.gov.in