



University of Kerala

Discipline	BOTANY				
Course Code	UK3DSCBOT205				
Course Title	BIOPHYSICS AND BIOSTATISTICS				
Type of Course	DSC				
Semester	III				
Academic Level	200 - 299				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	04	03 Hours	-	02 Hours	05 Hours
Pre-requisites	No Pre-requisites				
Course Summary	Students will be able to understand the concept of bioenergetic, biophysical properties, tools, and techniques in biophysics. Students will be able to carry out data collection and statistical representation of data. Develops skills to interpret scientific data using basic statistical methods.				

Detailed Syllabus:

Module	Unit	Content	Hrs
I	Bioenergetics & Biophysical properties		05
	1	Concepts of free energy, Thermodynamic principles in Biology. Entropy, Oxidation-reduction, redox potential.	
	2	Energy requirements in cell metabolism, role and structure of mitochondria, high energy phosphate bond, electron transfer phenomenon, and biological transfer.	
II	Tools and Techniques in Biophysics I		10
	3	Principles and applications of light and electron microscopy - Scanning and Transmission electron microscopy.	
	4	Principles and applications of Spectrophotometer (UV-visible)	
	5	Chromatography: Principle and types -Adsorption and partition chromatography. Thin layer chromatography, column chromatography, gas chromatography, HPLC.	
III	Tools and Techniques in Biophysics -II		07
	6	Electrophoresis: Horizontal and vertical gel electrophoresis, PAGE and AGE.	
	7	Centrifugation- Basic principles of centrifugation, RCF (relative centrifugal force), sedimentation coefficient, Ultracentrifugation, Density gradient, and Differential centrifugation.	
	8	pH meter- Principles and applications, Buffers-their functions in biological systems.	
IV	Biostatistics - Data Collection and Handling		08

	9	Nature and types of data - Typical examples, Collection, classification, and tabulation of data.	
	10	Diagrammatic and graphic representation. Line diagram, Bar diagram, Pie diagram, Histogram, Frequency curve, frequency polygon, Ogives.	
	11	Statistical terms and symbols. Measures of central tendencies for discrete data (mean, median, mode).	
	12	Measures of dispersion (range, mean deviation, variance, standard deviation, standard error)	
V	Statistical treatment of data		15
	13	Samples and sampling techniques – simple random sampling, systematic sampling, and stratified sampling., Errors.	
	14	Significance tests (chi-square test & t test). Correlation and regression analysis	

Practicals		
	<ol style="list-style-type: none"> 1. Separation of plant pigments by paper chromatography/TLC. 2. Preparation of buffer 3. Measurement of pH 4. Construct the absorption spectrum of any sample. 5. Familiarise students to equipment like Centrifuge 6. Spectrophotometer, pH meter, Electrophoresis. 7. Workout problems on frequency distribution 8. Represent data using bar diagram and histogram 9. Measures of central tendencies (Mean, Median, Mode) 10. Workout problems on measures of dispersion (range, mean, deviation, variance, standard deviation, standard error) 11. Workout problems on chi-square test. 	30

Suggested Reading

1. Banerjee, P.K. (2006). Introduction to Biostatistics. S. Chand and Company Ltd., Ram Nagar, New Delhi
2. Balaji, K., Raghavaiah, A.V.S. & Jayaveera, K.N. Biostatistics. I.K. International Pub. House.
3. Essential Biophysics, Narayanan, New Age Publ
4. Williams, B. L. and Wilson, K. (1983). A Biologist's Guide to Principles Techniques of Practical Biochemistry

References

1. Methods in Molecular Biophysics, Igor N S, N Zaccai & J Zaccai, (2007), Cambridge
2. Principle of Biochemistry, D Voet, J Voet and CW Pratt, 3rd Ed,
3. Advanced Methods in Protein Microsequencing, Witmann Handbook of Molecular Biophysics (Methods & Application), 2009, HG Bohr, Wiley

Weblink

1. <https://www.britannica.com/science/chromatography/Elution-chromatography>

Course Outcomes

No.	Upon completion of the course, the graduate will be able to	Cognitive Level	PSO addressed
CO-1	Students will be able to identify the major aspects in bioenergetics and thermodynamics of living system	R, U	PSO-3
CO-2	Students learn the fundamentals of instruments and techniques used in Biology	R, U	PSO-5
CO-3	Students will be able to conduct experiments using analytical instruments	Ap, E	PSO-7,8,9
CO-4	Students apply the statistical methods for data analysis and will be able to validate experimental hypothesis	An, AP, E	PSO-8

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Biophysics and Biostatistics

Credits: 3:0:1 (Lecture:Tutorial:Practical)

CO No.	CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/Tutorial (T)	Practical (P)
CO-1	1	3	R, U	F, C	L,T	
CO-2	2	5	R, U	F, C	L,T	P
CO-3	3	8, 9	Ap, E	P		p
CO-4	4	8	An, AP, E	P	L,T	

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓	✓		✓
CO 4	✓	✓		✓