

INSTITUTE OF EDUCATION AND RESEARCH
Science faculty University of the Punjab, Lahore
Course Outline



Programme	BSSed	Course Code	SE-309	Credit Hours	3
Course Title	Botany-III (Cell Biology, Genetics and Evolution)				
Course Introduction					
<p>This course is planned to provide adequate knowledge about morphology and functioning of cell, cellular organelles and mechanisms of cell division, study of genes and their inheritance patterns and concept of evolution. It is generally aimed to familiarize students with the cell structure and its functioning along with basic concepts of genetics.</p>					
Learning Outcomes					
<ul style="list-style-type: none"> On the completion of the course, the students will: On successful completion of this module students will be able to describe, apply and integrate the basic concepts of Cell Biology including Genetics and Evolution, Structure and Functions of Organisms. 					
Course Content				Assignments/Readings	
Week 1	Cell Biology Unit-1: Structures and brief description of Bio-molecules 1.1. Carbohydrates 1.2. Lipids 1.3. Proteins			Quiz/ Weaver, R.F. (2005). Molecular Biology.	
	1.4. Nucleic Acids Unit-2: Cell 2.1 Physico-Chemical Nature of Plasma Membrane and Cytoplasm			Long Question Test/ Weaver, R.F. (2005). Molecular Biology	
Week 2	Unit-3: Ultrastructure of plant cell with a brief Description and Function Of the following organelles: 3.1 Endoplasmic Reticulum 3.2 Plastids 3.3 Mitochondria 3.4 Ribosomes			Quiz/ Weaver, R.F. (2005). Molecular Biology	
	3.5 Dictyosomes 3.6 Vacuoles 3.7 Microbodies (Glyoxysomes and Peroxisomes)			Diagrams with Labelling/ Weaver, R.F. (2005). Molecular Biology	

Week 3	Unit-4: Nuclues 4.1 Nuclear Membrane, Nucleolus, Ultrastructure and Morphology of Chromosomes, Karyotype Analysis. Unit-5: Reproduction in Somatic and Embryogenic Cell, Mitosis and Meiosis, Cell Cycle.	Written assignment/ Weaver, R.F. (2005). Molecular Biology
	Unit-6: Chromosomal Aberrations 6.1 Changes in the Number of Chromosomes Aneuploidy and Euploidy 6.2 Changes in the Structure of Chromosomes, Deficiency, Duplication, Inversion and Translocation.	Diagrams with Labelling/ Weaver, R.F. (2005). Molecular Biology
Week 4	GENETICS Unit-1: Introduction 1.1 Scope and brief History of Genetics 1.2 Mendelian Inheritance	Quiz/ Strickberger, M.V. (2003). Genetics

	1.3 Laws of Segregation and Independent Assortment 1.4 Back Cross, Test Cross	Long Question Test/ Strickberger, M.V. (2003). Genetics
	1.5 Dominance and Incomplete Dominance	Written Assignment/ Strickberger, M.V. (2003). Genetics
Week 5	Unit-2: 2.1 Sex linked inheritance	Quiz/ Strickberger, M.V. (2003). Genetics
	2.2 Sex Linkage in Drosophila and Man (Color Blindness)	Written Assignment/ Strickberger, M.V. (2003). Genetics
Week 6	2.3 XO, XY, WZ Mechanisms	Written Assignment/ Strickberger, M.V. (2003). Genetics
	2.4 Sex Limited and Sex Linked Characters	Long Question Test/ Strickberger, M.V. (2003). Genetics
Week 7	2.5 Sex Determination	Long Question Test/ Strickberger, M.V. (2003). Genetics
	Unit-3: 3.1 Linkage and Crossing Over, Definition	Drawing figures with labelling/ Strickberger, M.V. (2003). Genetics
Week 8	3.2 Linkage Groups	Long Question Test/ Strickberger, M.V. (2003).

		Genetics
Week 9	3.3 Construction of Linkage Maps	Quiz/ Strickberger, M.V. (2003). Genetics
	3.4 Detection of Linkage	Long Question Test/ Strickberger, M.V. (2003). Genetics
Week 10	3.5 Recombination	Quiz/ Traverse, A. (2007). Recombination
	Unit-4: 4.1 DNA Replication	Quiz/ Agashe, S.N. and Caulton, E. (2009). DNA Replica
Week 11	4.2 Nature of Gene	MCQs/ Erdtman, G.(reprinted 2008). Nature of Gene
	4.3 Genetic Code	Long Question Test/ Strickberger, M.V. (2003). Genetic Code
Week 12	4.4 Transcription	Long Question Test/ Erdtman, G. (reprinted 2008). Transcription
	4.5 Translation	Diagrams with Labelling/ Weaver, R.F. (2005). Translation
Week 13	4.6 Regulation of Gene Expression (e.g. lac operon).	MCQs/ Traverse, A. (2007). Regulation of Gene Expression
	Unit-5: 5.1 Transmission of Genetic Material in Bacteria	Long Question Test/ Erdtman, G. (reprinted 2008). Genes Transmission
Week 14	5.2 Conjugation and Gene Recombination in Co-Transduction and Transformation.	Long Question Test/ Strickberger, M.V. (2003) Genetic Transmission
	Unit-6: 6.1 Principles of Genetic Engineering / Biotechnology	Written Assignment/ Strickberger, M.V. (2003). Biotechnology
Week 15	6.2 Basic Genetic Engineering Techniques.	Long Question Test/ Traverse, A. (2007). Genetic Engineering
	Unit-7: 7.1 A Brief Introduction of Gene Mutation	MCQs/ Traverse, A. (2007). Gene Mutation
Week 16	Unit-8: 8.1 Evolution	Written Assignment/ Traverse, A. (2007). Evolution
	Revision	

Textbooks and Reading Material

1. Bretscher, A. (2007). Molecular Cell Biology. W. H. Freeman and Company
2. Weaver, R.F. (2005). Molecular Biology. McGraw Hill, St. Louis.
3. Griffiths, J.F., Miller, J.H., Suzuki, D.T., Lewontin, R.C. and Gelbart, W.M. (2003). An Introduction to Genetic Analysis. W.H. Freeman and Company.
4. Sinha, U. and Sinha, S. (2003). Cytogenesis, Plant Breeding and Evolution. Vini Educational Books, New Delhi.
5. Strickberger, M.V. (2003). Genetics. MacMillan Press Ltd., London.
6. Karp, G. (2002). Cell and Molecular Biology. Concepts and Experiments. (4th Ed.), John Wiley and Sons. New York.
7. Gilmartin, P.M. and Bowler. C. (2002). Molecular Plant Biology. (Vol. 1 & 2). Oxford University Press. UK.
8. Carroll, S.B., Grenier, J.K. and Velnerbee, S.D. (2001). From DNA to Diversity—Molecular Genetics and the Evolution of Animal Design. Blackwell Science.
9. Hoelzel, A.R. (2001). Conservation Genetics. Kluwer Academic Publishers.
10. Lodish, H. (2001). Molecular Cell Biology. W.H. Freeman and Company.
11. Dyonsager, V. R. (2000). Cytology and Genetics. (3rd Ed.), TATA and McGraw Hill Publication Co. Ltd, New Delhi.

Teaching Learning Strategies

1. Lecture Method
2. Inquiry Method
3. Demonstration Method
4. Project Method

Assignments: Types and Number with Calendar

1. Quiz
2. Presentation
3. Written Test
4. Class discussion

**Department of Science Education
Institute of Education & Research
University of the Punjab, Lahore
Course Outline**



Programme	BS Science Education	Course Code	BSScEd-707	Credit Hours	04
Course Title	Mathematics B-III [Calculus (II)]				
Course Introduction					
<p>Mathematics B-III (Calculus-II) is a continuation of Calculus-I. In this course, students study more advanced topics of integration and learn new concepts like sequences, series, and functions of more than one variable. This course helps students understand how calculus is used to solve practical problems in science, engineering, economics, and other fields. It improves students' problem-solving skills and logical thinking. By the end of the course, students will have a stronger understanding of advanced calculus concepts and their applications.</p>					
Learning Outcomes					
<p>On the completion of the course, the students will:</p> <ol style="list-style-type: none"> 1. Use different methods of integration such as integration by parts and substitution. 2. Solve definite and improper integrals. 3. Understand sequences and series and check whether they converge or diverge. 4. Expand functions using Taylor and Maclaurin series. 5. Find partial derivatives of functions with two or more variables. 6. Solve practical problems related to area, volume, and applications of integration. 7. Show clear and logical steps while solving mathematical problems. 					
Course Content					
Week 1	Unit -1: Sequence and Series				
	1.1	Sequences, Infinite series, Convergence of sequence and series			
Week 2	1.2	The integral test, Comparison tests, Ratio test, Root test			
Week 3	1.3	Alternative series, Absolute and conditional convergence			
Week 4	1.4	Power series, Interval and radius of convergence			
Week 5	Unit-2: Functions of Several Variables				
	2.1	Functions of two variables, Graphs of functions of two variables			
Week 6	2.2	Contour diagrams, Linear functions, Functions of three variables			
	2.3	Limit and continuity of a function of two variables			
Week 7	2.4	The partial derivative, Computing partial derivatives algebraically			
Week 8	2.5	The second-order partial derivative, Local linearity and the differential			
Week 9	MID- TERM EXAM				
Week 10	PRESENTATIONS				

Week 11	2.6	Tangent planes and normal lines
	2.7	Optimization, Maxima and minima of a function of two variables
Week 12	2.8	Lagrange multipliers
	2.9	Various methods for finding area and volume surface of revolution
Week 13	QUIZZ	
	Unit-3: Multiple Integrals	
Week 14	3.1	Double integral in rectangular and polar form
	3.2	Triple integral in rectangular, Cylindrical and spherical coordinates
Week 15	3.3	Substitutions in multiple integrals
	3.4	Moments and centre of mass
Week 16	FINAL- TERM EXAM	
Textbooks and Reading Material		
<ol style="list-style-type: none"> 1. Thomas, Calculus, 11th Edition. Addison Wesley Publishing Company, 2005 2. H.Anton, I. Bevens, S. Davis, Calculus, 8th Edition, John Wiley & Sons, In.2005 3. Hughes-Hallet, Gleason, McCalum, et al, Calculus Single and Multivarible, 3rd Edition John Wiley & Sons, Inc 2002 4. Frank A. Jr, Elliott Mendelson, Calculus, Schaum's Outline Series, 4th Edition 1999 5. C.H. Edward and E.D Penney, Calculus and Analytical Geometry Prentice Hall, Inc. 1988 6. E.W.Swokoski, Calculus and Analytical Geometry PWS Publishers, Boston, 19 		
Teaching Learning Strategies		
<ul style="list-style-type: none"> • Lecture Method • Collaborative Method • Problem-Solving Approaches • Demonstration Method • Project Method • Connecting mathematics to real world context • Discussion 		
Assignments: Types and Number with Calendar		
<ul style="list-style-type: none"> • Class presentation, Quizzes. • 1st assignment before mid-term exam. • 2nd assignment after mid-term exam 		