

Bachelor of Science (Honors) Biological Science

Syllabus - Third Semester

CELL BIOLOGY AND GENETICS LAB

Course Code: BLS2306

Credit Units : 01

Course Contents:

Module I

Cell fractionation and separation of cell organelles by ultra centrifugation

Module II

Isolation of chloroplast from spinach

Module III

Isolation of mitochondria

Module IV

1. Study of gene interaction.
2. Study of bacterial conjugation.
3. Study of bacterial transduction.
4. Study of physical and chemical mutagens on growth of E. coli.

Examination Scheme:

IA			EE			
Class Test (Practical Based)	Mid Term Viva	Attendance	Major Experiment	Minor Experiment/Spotting	Practical Record	Viva
15	10	05	35	15	10	10

PROJECT (WITH PRESENTATION AND EVALUATION)

Course Code: BLS2332

Credit Units: 04

Objectives:

The aim of the project is to provide the students with an opportunity to further their intellectual and personal development in the chosen field by undertaking a significant practical unit of activity. The project can be defined as a scholarly inquiry into a problem or issues, involving a systematic approach to gathering and analysis of information / data, leading to production of a structured report.

Chapter Scheme and distribution of marks:

Chapter 1: Introduction – 10 marks

Chapter 2: Conceptual Framework/ National/International Scenario – 25 marks

Chapter 3: Presentation, Analysis & Findings -- 25 marks

Chapter 4: Conclusion & Recommendations -- 10 marks

Chapter 5: Bibliography -- 05 marks

Project Report	Power Point Presentation & Viva
75 marks	25 marks

Components of a Project Report

The outcome of Project Work is the Project Report. A project report should have the following components:

1) Cover Page: This should contain the title of the project proposal, to whom it is submitted, for which degree, the name of the author, name of the supervisor, year of submission of the project work, name of the University.

2) Acknowledgement: Various organizations and individuals who might have provided assistance /co-operation during the process of carrying out the study.

3) Table of Content: Page-wise listing of the main contents in the report, i.e., different Chapters and its main Sections along with their page numbers.

4) Body of the Report: The body of the report should have these four logical divisions

a) **Introduction:** This will cover the background, rationale/ need / justification, brief review of literature, objectives, methodology (the area of the study, sample, type of study, tools for data collection, and method of analysis), Limitations of the Study, and Chapter Planning.

b) **Conceptual Framework / National and International Scenario:** (relating to the topic of the Project).

c) **Presentation of Data, Analysis and Findings:** (using the tools and techniques mentioned in the methodology).

d) **Conclusion and Recommendations:** In this section, the concluding observations based on the main findings and suggestions are to be provided.

5) Bibliography or References: This section will include the list of books and articles which have been used in the project work, and in writing a project report.

6) Annexures: Questionnaires (if any), relevant reports, etc.

(The main text of the Project should normally be in the range of 5000 words. However, there may be annexure in addition to the main text)

The Steps of a Project Report

Step I : Selection of the topic for the project by taking following points into consideration:

- Suitability of the topic.
- Relevance of the topic
- Time available at the disposal.
- Feasibility of data collection within the given time limit.
- Challenges involved in the data collection (time & cost involved in the data collection, possibility of getting responses, etc.)

Step II : Finalisation of the Topic and preparation of Project Proposal in consultation with the Supervisor.

Step III : Collection of information and data relating to the topic and analysis of the same.

Step IV : Writing the report dividing it into suitable chapters, viz.,

Chapter 1:Introduction,

Chapter 2: Conceptual Framework / National & International Scenario,

Chapter 3: Analysis & Findings

Chapter 4: Conclusion and Recommendations.

Step V : The following documents are to be attached with the Final Project Report.

1) Approval letter from the supervisor (Annexure-IA)

2) Student's declaration (Annexure-IB)

3) Certificate from the Competent Authority of the Organisation / Institution, if the student undertakes the Project Work in any Organisation / Institution.

Guidelines for Evaluation:

- Each of the students has to undertake a Project individually under the supervision of a teacher and to submit the same following the guidelines stated below.
- Language of Project Report and Viva-Voce Examination may be English. The Project Report must be typed and hard bound.
- Failure to submit the Project Report or failure to appear at the Viva-voce Examination will be treated as "Absent" in the Examination. He /she has to submit the Project Report and appear at the Viva-Voce Examination in the subsequent years (within the time period as per University Rules).
- No marks will be allotted on the Project Report unless a candidate appears at the Viva-Voce Examination. Similarly, no marks will be allotted on Viva-Voce Examination unless a candidate submits his/her Project Report.
- Evaluation of the Project Work to be done jointly by one internal expert and one external expert with equal weightage, i.e., average marks of the internal and external experts will be allotted to the candidate.

Syllabus - Fourth Semester

BIOSTATS & BIOINFORMATICS

Course Code: BLS2404

Credit Units: 03

Course Objective:

Course objective is to provide the knowledge that should be useful to understand different concepts of molecular properties of basic life molecules like proteins nucleic acids and their relative structure and function across the genus or kingdom

Module I:

Introduction to Molecular modeling, data bases for proteins and DNA – PDB and MMDB, structure file formats, visualizing structural information, advance structure modeling, Internal and external co-ordinate system, cartesian and cylindrical polar co-ordinate system, Potential energy calculations using semiempirical potential energy function,

Module II:

Software and Programmes for sequence comparison and analysis, Phylogenetics analysis software, Molecular Structure drawing tool,

Module III:

Molecular modeling/Docking, Molecular mechanics and dynamics, Knowledge base structure prediction, Molecular Design, structure similarity searching; Secondary structure prediction in proteins, prediction of buried residues in proteins

Module IV

Application of molecular modeling & computational biology/Bioinformatics in Agriculture, Human health, Environment, Biotechnology, Molecular Biology, Neurobiology, Drug Designing, Veterinary Science.

Module V: Introduction to the following Statistical terms

Parameter, Statistic, Null hypothesis, Alternative hypothesis, Critical region, Type 1 Error, Type 11 Error, Level of significance, P-value and its applications.

Test of Significance for Small samples: One sample t-test, Paired t-test, Degrees of freedom for t-test, F test for equality of Population variances, Degrees of freedom for F-test.

Test of Significance for Large samples: Normal test for sample mean and population mean, Normal test for two sample means.

Chi-square Test: Test of goodness of fit, Test of Independence of attributes, Degrees of freedom for Chisquare test, Coefficient of contingency, Yates' correction for continuity.

Analysis of Variance: One way and Two way (only Examples)

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:

- Bioinformatics: Sequence and Genome Analysis, D.W. Mount, Cold Spring Harbor Laboratory Press.

References:

- Algorithms on Strings, Trees, and Sequences: Computer Science and Computational Biology, D. Gusfield, Cambridge University Press.
- Biocomputing hypertext coursebook at <http://www.techfak.unibielefeld.de/bcd/Curric/welcome.html/>
- Bioinformatics: A Practical Guide to the Analysis of Genes and Proteins, A.D. Baxevanis and B.F.F. Ouellette, Wiley-interscience.
- Computational Modeling of Genetic and Biochemical Networks, J.M. Bower and H. Bolouri, MIT Press
- Computational Molecular Biology: An Algorithmic Approach, P.A. Pevzner, MIT Press
- Computer Methods for Macromolecular Sequence Analysis, R.F. Doolittle, J.N. Abelson, M.I. Simon, Academic press
- Essentials of Genomics and Bioinformatics, C.W. Sensen, John Wiley and Sons Inc.
- Introduction to Bioinformatics, T. Attwood and D. Parry-Smith, Prentice Hall
- Introduction to Computational Biology: Maps, Sequences and Genomes, M. Waterman, Chapman and Hall
- Sequence Analysis in Molecular Biology: Treasure Trove or Trivial Pursuit, G. V. Heijne and G.V. Heijne, Academic Press
- Introduction to Biostatistics, Ronald N. Forthfer and Eun Sun Lee, Publisher: Elsevier.
- Statistical Methodology, S.P. Gupta, Publisher: S. Chand & Co.
- Fundamentals of Statistics, S.C. Gupta. Publisher: S.Chand& Co.
- Biostatistics: A manual of Statistical Methodology for use in Health, Nutrition and Anthropology, K. Visweswara Rao. Publisher: Jaypee Brothers Biostatistics: A foundation for analysis in the Health Sciences, W.W. Daniel, Publisher: John Wiley and Sons
- Fundamentals of Mathematical Statistics, S.C. Gupta and V.K. Kapoor, Publisher: S.Chand& Co.
- Statistical Analysis, Kaushal, T.L. Publisher: Kalyani Publishers
- Statistical Methods, Potri, D. Kalyani Publishers.
- Mathematical Statistics, H.C. Saxena, and V.K. Kapoor: S. Chand & Company
- Biostatistics, P.N. Arora and P.K. Malhan, Publisher: Himalaya Publishing House.

MICROBIOLOGY LAB

Course Code: BLS2407

Credit Units: 01

Course Contents:

- Laboratory safety and instrument handling, General rules and regulations, Aseptic techniques, preparation of culture media for cultivation of specific microorganisms.
Observation of permanent slides (*E.coli*, *Yeast*, *Sarcina*, *Streptococcus*, *Acid fast staining*)
- Isolation and enumeration of microorganisms from air, water and rhizosphere (actinomycetes, bacteria and fungi), serial dilution and viable plate counting methods, Use of differential, selective and enriched media.
- Staining techniques: Simple staining, differential Gram staining, endospore staining, lactophenol cotton blue staining for fungi
- Growth curve measurement of bacterial population by turbidometry
- Biochemical tests – Triple Sugar Iron test (TSI) , Indole test. Methyl red test. Vogesproskauer test, Citrate utilization test (IMViC), starch hydrolysis, casein hydrolysis, catalase test
- Water microbiology- presumptive, confirmed and complete test for water potability.

Examination Scheme:

IA			EE			
Class Test (Practical Based)	Mid Term Viva	Attendance	Major Experiment	Minor Experiment/Spotting	Practical Record	Viva
15	10	05	35	15	10	10

Text & References:

- Microbiology: A laboratory Manual, Seventh Edition, by: Cappuccino and Sherman
- Microbes in Action, Fourth Edition:by Harry W. Seeley, Cornell University; Paul J. Vandemark, late of Cornell University; John J. Lee,

Syllabus - Fifth Semester

IMMUNOLOGY

Course Code: BLS2503

Credit Units: 03

Course Objective:

Role of antibody engineering in biomedical applications and the importance of immuno genetics in disease processes, tissue transplantation and immune regulation are some of the areas of attributes of this course which can help the students to understand the biotechnology related to human kind.

Course Contents:

Module I

Historical perspective of immune system and immunity; Innate and specific immunity, Humoral immunity, Cell-mediated immunity

Module II

Antibody structure in relation to function and antigen-binding; Types of antibodies and their structures: isotypes, allotypes, idiotypes; Genetic basis of antibody diversity

Module III

The organs and cells of the immune system; Histocompatibility: structure of MHC class I, II & III antigens & their mode of antigen presentation, MHC restriction; Antigens & antigenicity;

Module IV

Measurement of antigen – antibody interaction: agglutination, immunodiffusion, immuno-electrophoresis, ELISA, RIE, production of monoclonal antibodies.

Module V

Complement system; Autoimmunity; Hypersensitivity

Module VI:

Hybridoma Technology; Introduction to transplantation immunology, Introduction to Cancer immunology, Vaccines (attenuated and recombinant);

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:

Text:

- Kuby Immunology, R.A. Goldsby, T.J. Kindt, and B.A. Osborne, Freeman

References:

- Immunology, Roitt, Mosby – Yearbook Inc.
- Basic Immunology, A.K. Abbas and A.H. Lichtman, Saunders W.B. Company
- Fundamentals of Immunology, W. Paul, Lippincott Williams and Wilkins

- Immunology, W.L. Anderson, Fence Creek Publishing (Blackwell).
- Immunology: A Short Course, E. Benjamin, R. Coico and G. Sunshine, Wiley-Leiss Inc.

BIO-ANALYTICAL AND BIOPHYSICAL TECHNIQUES

Course Code: BLS2504

Credit Units: 02

Course Objective:

The students will be exposed to basic concepts related with techniques and instrumentation widely used in Biotechnology.

Course Contents:

Module I: Buffers & Sample preparation

Preparation of solutions, concept of pH and buffer, types of buffers and their preparation, pH meter. Cell Disruption techniques, ultra filtration, dialysis and reverse osmosis.

Module II: Centrifugation

Principle of centrifugation, rotors, different types of centrifuges, ultra centrifugation.

Module III: Microscopy

Principles of microscopy, types of microscopy Bright field, Dark field, phase contrast and fluorescence microscopy. Electron microscopy: Transmission and scanning electron microscopy.

Module IV: Radioisotope techniques

Study of radioisotopes in biological samples, proportional and GM counter, scintillation counters, autoradiography.

Module V: Electrophoresis & Chromatography

SDS-PAGE, isoelectric focusing, two-dimensional electrophoresis; Paper, TLC, gel filtration, ion-exchange chromatography, affinity chromatography, HPLC and GLC

Module VI: Spectroscopy

UV and visible spectroscopy, Infrared and Atomic absorption spectroscopy, fluorescence spectroscopy.

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:

Text:

- Principles of Physical Biochemistry, K.E. Van Holde, Prentice Hall.
- Essentials of Biophysics, P. Narayanan, New Age International Publishers

References:

- Advanced Instrumentation, Data Interpretation, and Control of Biotechnological Processes, J.F. Van Impe, Kluwer Academic
- Crystal Structure Analysis, J.P. Glusker and K.N. Trueblood, Oxford University Press
- Crystallography made Crystal Clear, G. Rhodes, Academic Press
- Modern Spectroscopy, J.M. Hollas, John Wiley and Son Ltd.
- NMR Spectroscopy: Basic Principles, Concepts and Applications in Chemistry, H. Gunther, John Wiley and Sons Ltd.

MOLECULAR BIOLOGY LAB

Course Code: BLS2506

Credit Units: 01

Course Contents:

1. Isolation of genomic DNA.
2. Isolation of plasmid DNA.
3. Isolation of eukaryotic total RNA.
4. Study of in vitro transcription.
5. In vitro study of translation

Examination Scheme:

IA			EE			
Class Test (Practical Based)	Mid Term Viva	Attendance	Major Experiment	Minor Experiment/Spotting	Practical Record	Viva
15	10	05	35	15	10	10

IMMUNOLOGY LAB

Course Code: BLS2507

Credit Units: 01

Module I

Blood film preparation and identification of cells.

Module II

Isolation of serum, Purification of IgG through affinity chromatography

Module III

Lymphoid organs and their microscopic organization.

Module IV

WIDAL Test

Module V

Radial Immuno Diffusion Test;Ouchterlony Double diffusion Test

Module VI: ELISA

Dot, Sandwich

Examination Scheme:

IA			EE			
Class Test (Practical Based)	Mid Term Viva	Attendance	Major Experiment	Minor Experiment/Spotting	Practical Record	Viva
15	10	05	35	15	10	10

BIOCHEMISTRY AND BIOANALYTICAL LAB

Course Code: BLS2508

Credit Units: 01

Module I: Solutions and buffers

Preparation of molar, normal and % (w/v) solutions. preparation of buffers of different pH and molar strength.

Module II: Carbohydrates

Extraction and estimation of carbohydrates from given plant/animal materials: determination of total sugars by Anthrone method Separation of sugars by thin layer chromatography

Module III: Proteins

Extraction of total proteins; Estimation of proteins by Lowery/ Bradford Method; Electrophoretic (SDS-PAGE) separation of isolated proteins

Module IV: Lipids

Extraction of total lipids; estimation of phospholipids/glycolipids; thin layer chromatographic separation of lipids

Module IV: Nucleic Acid

Extraction and estimation of DNA and RNA by UV-spectrophotometer

Examination Scheme:

IA			EE			
Class Test (Practical Based)	Mid Term Viva	Attendance	Major Experiment	Minor Experiment/Spotting	Practical Record	Viva
15	10	05	35	15	10	10

Text & References:

- Practical book of Biochemistry by Plummer
- Practical book of Biochemistry by S.K. Sawhney and Randhir Singh

SUMMER INTERSHIP PROJECT (EVALUATION)

Course Code: BLS2535

Credit Units: 04

Objectives:

The aim of the project is to provide the students with an opportunity to further their intellectual and personal development in the chosen field by undertaking a significant practical unit of activity. The project can be defined as a scholarly inquiry into a problem or issues, involving a systematic approach to gathering and analysis of information / data, leading to production of a structured report.

Chapter Scheme and distribution of marks:

Chapter 1: Introduction – 10 marks

Chapter 2: Conceptual Framework/ National/International Scenario – 25 marks

Chapter 3: Presentation, Analysis & Findings -- 25 marks

Chapter 4: Conclusion & Recommendations -- 10 marks

Chapter 5: Bibliography -- 05 marks

Project Report	Power Point Presentation & Viva
75 marks	25 marks

Components of a Project Report

The outcome of Project Work is the Project Report. A project report should have the following components:

1) Cover Page: This should contain the title of the project proposal, to whom it is submitted, for which degree, the name of the author, name of the supervisor, year of submission of the project work, name of the University.

2) Acknowledgement: Various organizations and individuals who might have provided assistance /co-operation during the process of carrying out the study.

3) Table of Content: Page-wise listing of the main contents in the report, i.e., different Chapters and its main Sections along with their page numbers.

4) Body of the Report: The body of the report should have these four logical divisions

a) **Introduction:** This will cover the background, rationale/ need / justification, brief review of literature, objectives, methodology (the area of the study, sample, type of study, tools for data collection, and method of analysis), Limitations of the Study, and Chapter Planning.

b) **Conceptual Framework / National and International Scenario:** (relating to the topic of the Project).

c) **Presentation of Data, Analysis and Findings:** (using the tools and techniques mentioned in the methodology).

d) **Conclusion and Recommendations:** In this section, the concluding observations based on the main findings and suggestions are to be provided.

5) Bibliography or References: This section will include the list of books and articles which have been used in the project work, and in writing a project report.

6) Annexures: Questionnaires (if any), relevant reports, etc.

(The main text of the Project should normally be in the range of 5000 words. However, there may be annexure in addition to the main text)

The Steps of a Project Report

Step I : Selection of the topic for the project by taking following points into consideration:

- Suitability of the topic.
- Relevance of the topic
- Time available at the disposal.
- Feasibility of data collection within the given time limit.
- Challenges involved in the data collection (time & cost involved in the data collection, possibility of getting responses, etc.)

Step II : Finalisation of the Topic and preparation of Project Proposal in consultation with the Supervisor.

Step III : Collection of information and data relating to the topic and analysis of the same.

Step IV : Writing the report dividing it into suitable chapters, viz.,

Chapter 1:Introduction,

Chapter 2: Conceptual Framework / National & International Scenario,

Chapter 3: Analysis & Findings

Chapter 4: Conclusion and Recommendations.

Step V : The following documents are to be attached with the Final Project Report.

1) Approval letter from the supervisor (Annexure-IA)

2) Student's declaration (Annexure-IB)

3) Certificate from the Competent Authority of the Organisation / Institution, if the student undertakes the Project Work in any Organisation / Institution.

Guidelines for evaluation:

- Each of the students has to undertake a Project individually under the supervision of a teacher and to submit the same following the guidelines stated below.
- Language of Project Report and Viva-Voce Examination may be English. The Project Report must be typed and hard bound.
- Failure to submit the Project Report or failure to appear at the Viva-voce Examination will be treated as "Absent" in the Examination. He /she has to submit the Project Report and appear at the Viva-Voce Examination in the subsequent years (within the time period as per University Rules).
- No marks will be allotted on the Project Report unless a candidate appears at the Viva-Voce Examination. Similarly, no marks will be allotted on Viva-Voce Examination unless a candidate submits his/her Project Report.
- Evaluation of the Project Work to be done jointly by one internal expert and one external expert with equal weightage, i.e., average marks of the internal and external experts will be allotted to the candidate.

Syllabus - Sixth Semester

RECOMBINANT DNA TECHNOLOGY

Course Code: BLS2601

Credit Units: 03

Course Objective:

A complete understanding of molecular techniques can be obtained through the course. The successful application of biotechnology largely depends on these advanced molecular techniques.

Course Contents:

Module I

Restriction endonuclease, methyltransferase, ligase, polymerase, kinase, phosphatase, nuclease, transferase, reverse transcriptase.

Module II

Cloning vectors: Plasmids, bacteriophages (Lambda and M13), phagemids, cosmids, artificial chromosomes (YAC, BAC). expression vectors (Bacteria and yeast); Basic cloning strategy and screening clones; Gene libraries

Module III

Blotting techniques and hybridization: Southern, Northern and Western blotting techniques. Radioactive and non-radioactive probes.

Module IV

Principles of PCR, types of PCRs and its applications

Module V

DNA sequencing (Maxam Gilbert, Sanger's and automated), protein engineering.

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:

Text:

- Principles of Gene Manipulation: An Introduction to Genetic Engineering, R.W. Old and S. B Primrose, Blackwell Science Inc.
- Recombinant DNA, J.D. Watson et al, W.H. Freeman and Company.

References:

- Molecular Biotechnology: Principles and Applications of Recombinant DNA, B.R. Grick and J.J. Pasternak, ASM Press.
- Molecular and Cellular Cells Methods in Biology and Medicine, P.B Kaufman, W. Wu, D. Kim and C.J. Cseke, CRC Press.

- Milestones in Biotechnology: Classic Papers on Genetic Engineering, J.A. Bavies and W.S. Reznikoff, Butterworth Heinemann.
- Gene Expression Technology, D.V. Goeddel in Methods in Methods in Enzymology, Academic Press Inc.
- DNA Cloning: A Practical Approach, D.M. Glover and B.D. Hames, IRL Press.
- Molecular Cloning: A Laboratory Manual, J. Sambrook, E.F. Fritsch and T. Maniatis, Cold Spring Harbor Laboratory Press.

IPR, BIOSAFETY AND BIOETHICS

COURSE CODE: BLS2603

Credit Units: 02

Course Objective:

The objectives of the course are to explain the biosafety and bioethics. Students will study and assess biosafety, and bioethics related to genetically engineered plant, animal and microbial products.

Course Contents:

Module I: Biotechnology and Intellectual Property Rights

Biotechnology and the Law- Objective, Evolution, Basic Structure of Gene Techniques, Applications, Commercial Potential of Biotech Inventions, Rationale for Intellectual Property Protection. Patenting Biotechnology Inventions-Objective, Concept of Novelty, Concept of inventive step, Microorganisms, Moral Issues in Patenting Biotechnological inventions. Plant Varieties Protection-Objectives, Justification, International Position, Plant Varieties Protection in India Protection of Geographical Indications Objectives, Justification, International Position, Multilateral Treaties, National Level, Indian Position.

Protection of Traditional Knowledge- Objective, Concept of Traditional Knowledge, Holders, Issues concerning, Bio-Propecting and Bio-Piracy, Alternative ways, Protectability, need for a Sui-Generis regime, Traditional Knowledge on the International Arena, at WTO, at National level, Traditional Knowledge Digital Library.

Module II: Biosafety

Definition and requirement; biosafety in relation to human health, environment, transgenic research and applications, biosafety laws, guidelines and conventions, biosafety regulation: principles and practices in microbial and biomedical labs, guidelines for research involving DNA molecule ; Regulation bodies at National and International level

Module III: Bioethics

Defination of bioethics, importance of bioethics, Bioethics in plant, animal and microbial genetic engineering, Ethical issues in healthcare, Biopiracy and ethical conflicts Legal and socioeco' nomic impact of the products and techniques in Biotechnology,

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:

Text:

- *Coyles information highway handbook; A Practical File on the New Information Order*, American Library Association, 2000.
- *American Indian Cultural & Research Journal (UCLA)*

References:

- Refer to Periodicals, Industry directories, Articles and report in journals on the regulatory issues,
- "Biotechnology" series by Rehm& Reed.

RECOMBINANT DNA TECHNOLOGY LAB

Course Code: BLS2605

Credit Units: 01

Course Objective:

The laboratory experiments in Recombinant DNA Technology would certainly help to comprehend the theoretical aspects of the subject.

Course Contents:

Module I

Study of cloning

Module II

Study of PCR

Module III

Study of Southern hybridization

Module IV

Study of RAPD

Examination Scheme:

IA			EE			
Class Test (Practical Based)	Mid Term Viva	Attendance	Major Experiment	Minor Experiment/Spotting	Practical Record	Viva
15	10	05	35	15	10	10

APPLIED BIOLOGY LAB

Course Code: BLS2606

Credit Units:01

Course Contents:

Module I

Conventional filtration and membrane based filtration

Module II

Protein precipitation and recovery

Module III

Aqueous two-phase separation

Module IV

Ion exchange chromatography

Module V

Gel Permeation chromatography

Module VI

Electrophoresis

Examination Scheme:

IA			EE			
Class Test (Practical Based)	Mid Term Viva	Attendance	Major Experiment	Minor Experiment/Spotting	Practical Record	Viva
15	10	05	35	15	10	10

Text & References:

Text:

- Practical Biochemistry, Sawhney and Singh

References:

- Practical Biochemistry, Principles & Techniques, Keith Wilson and John Walker
- Chromatographic and Membrane Processes in Biotechnology, C.A. Costa and J.S. Cabral, Kluwer Academic Publisher
- Protein Purification, M.R. Lodisch, R.C. Wilson, C.C. Painton and S.E. Builder, American Chemical Society