Eklavya University Damoh MP

B.Sc. II Year

Biotechnology

Session 2022 onwards

NEP- 2020

School of Basic & Applied Science

EKLAVYA UNIVERSITY
ज्ञान प्राप्तये लक्ष्य संधानम्

School of Basic and Applied Sciences

Class	B.Sc. (Biotechnology)
Semester/Year	II Year
Subject & Subject Code	Biotechnology & EUS2-BTEC1T
Paper	Basic Molecular Biology (Paper-I)
Max. Marks	70 (ETE) + 30 (I) = 100

Credit			Total Credits
L	T	P	4
3	1	0	

Course Objectives:

Biophysicists use the methods of physical science to study the structure and functions of macromolecules and solve problems at the intersection of biological and physical sciences.The main objective of the course is to offer detailed and comprehensive knowledge about the synthesis and degradation pathways of amino acids and nucleotides and their importance in the proper functioning of the cells. This course also interrelates the metabolism of these molecules with respect to health diseases in addition to providing overview of inhibitors of metabolism for treating the diseases of metabolic disorders.

Course Outcome:

At the end of the course, learners will be able to:

1. Student will be able to explain role of different protein/enzyme involved in cell signalling.
2. The will be able to understand mechanism of genetic damage caused by mutation and role of various repair system in neglecting the effect of these mutation.
3. Student will be able to explain mechanism of DNA replication, transcriptionj, translation and other related processes.

Student Learning Outcomes (SLO):

Students will develop :

1. Demonstrate a core knowledge base in the theory and practice of modern Biochemistry and Biophysics.
2. Students will function successfully in the laboratory and use safe laboratory practices.
3. Students will critically evaluate data and design experiments to test hypotheses relevant to the practice of Biochemistry and Biophysics.
4. Students will read and evaluate primary literature in the discipline.
5. Students will effectively communicate scientific data and ideas, using various formats appropriate for different target audiences.
6. Students will use databases, computational tools and other online resources effectively.
7. Students will demostrate awareness of ethical issues in the practice of science.

Unit	Syllabus	Periods
UNIT - I	**Genome Organization** : Anatomy of Gene, gene structure of prokaryotes and eukaryotes. Flow of genetic information. **Cell Signalling** : Hormones and their receptors, second messengers, signalling through G protein coupled receptors **Cancer:** Oncogenes, Tumor suppressor genes, Cancer and the cell cycle; Apoptosis, Necrosis.	15

02/06/23 02/06/23 02/06/23

	जीनोम संगठन :– जीन की एनाटॉमी – प्राकैरियोट्स और यूकैरियोट्स की जीन संरचना। आनुवांशिकी सूचना का प्रवाह। **सेल सिग्नल** :– हार्मोन और उनके रिसेप्टर्स, द्वितीय संदेशवाहक, जी प्रोटीन युग्मित रिसेप्टर्स के माध्यम से सिग्नलिंग। **कैंसर** :– आन्कोजीन, टयूर सप्रेसर जीन, कैंसर और कोशिका चक्र, एपोप्ओसिस, नेक्रोसिस।	
UNIT - II	**Replication:** Prokaryotic and Eukaryotic replication: models for replication, Unit of replication, replication initiation, elongation and termination, replication inhibitors. **DNA repair:** Direct reversal, Excision repair - nucleotide and base excision, Mismatch repair Trans lesion DNA synthesis, recombination repair, SOS Response. **DNA recombination:** Models for recombination, Enzymes and protiens involved in recombination, Site-specific recombination.	15
	प्रतिकृतिः– प्रोकैरियोटिक और यूकैरियोटिक प्रतिकृति प्रतिकृति के मॉडल, प्रतिकृति की इकाई, प्रतिकृति आरंभ, लम्बावृत्ति और समाप्ति, प्रतिकृति अवरोधक। **डीएनए रिपेयर** :– डायरेक्ट रिवर्सल, एक्सिशन रिपेयर–न्यूक्लियोटाइड और बेस एक्सिशन, मिसमैच रिपेयर, ट्रांस लिजन, डीएनए संश्लेषण, रीकॉम्बिनेशन रिपेयर, एसओएस रिस्पॉन्स। **डीएनए** :– पुनर्संयोजन के मॉडल, पुनर्संयोजन में सम्मिलित एन्जाइम एवं प्रोटीन, स्थल–प्रविशिष्ट पुनर्संयोजन।	
UNIT - III	**Transcription**: Prokaryotic and Eukaryotic transcription: RNA polymerases, General and specific transcription factors, Promoters, insulator, repressor, enhancer. Structure and function of RNA.	15
	प्रतिलेखनः– प्रोकैरियोटिक और यूकैरियोटिक प्रतिलेखनः आरएनए पोलीमरेज, सामान्य और विशिष्ट प्रतिलेखन कारक, प्रमोटर, एन्सुलेटर, रिप्रेसर, इन्हेंसर। आरएनए की संरचना एवं कार्य।	
UNIT - IV	**Translation** : Prokaryotic and eukaryotic translation: Translation machinery, initiation, elongation and termination factors, translational inhibitors. Regulation of translation. Genetic Code.	15
	ट्रांसलेशन :– प्रोकैरियोटिक और यूकैरियोटिक ट्रांसलेशन : ट्रांसलेशन मशीनरी, आरंभन, लम्बावृत्ति और समाप्ति, कारक, ट्रांसलेशन अवरोधक। ट्रांसलेशन का विनियमन, जेनेटिक कोड।	
UNIT - V	**Control of gene expression in Prokaryotes** : DNA binding proteins, posttranscriptional control of gene expression. Gene regulation in Bacteria, Gene silencing, Overview of ribozyme technology. Control of gene expression in Eukaryotes: enhancers, chromatin remodeling. Mutation: Types and causes, mutant types - lethal, conditional, biochemical, loss of function, gain of function.	15
	जीन अभिव्यक्ति का प्राकैरियोट्स में नियंत्रणः– डीएनए बंधनकारी प्रोटीन, जीन अभिव्यक्ति का पोस्ट ट्रांसक्रिप्शलन नियंत्रण, जीवाणु में जीन विनियमन, जीन साइलेंसिंग, राइबोजाइम प्रौद्योगिकी का अवलोकन।	

REFERENCE BOOKS –

1. Molecular Biotechnology, "Channarayappa.
2. Lewin's Gene XII -J.E. Kerb's Jones and Barlett.
3. Cell Biology - G. Karp, Wiley, 2013, 7th Edition.
4. Molecular Biology, P.K. Gupta.
5. Biotechnology - B.D. Singh.

Suggested Web Links:

1.https://www.mphindigranthacademy.org.

02/06/23 02/06/23 02/06/23

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School of Basic and Applied Sciences

Class				**B.Sc. (Biotechnology)**
Semester/Year				**II Year**
Subject & Subject Code				**Biotechnology & ~~EUS2~~-BTEC1P**
Paper				**Lab Work on - Basic Molecular Biology**
Max. Marks				
Credit			**Total Credits**	
L	**T**	**P**	**2**	
0	0	2		

Course Outcome:

At the end of the course, learners will be able to:

1 Student will be able to explain role of different protien/enzymes involved in cell signalling.

2. They will be able to understandi mechanism of genetic damage caused by mutation and role of various repair system in neglecting the effect of these mulation.

3. Student will be able to explain mechanism of DNA replication, transcription, translation and other related processes.

Unit	Syllabus	Periods
	1. Isolation of genomic DNA . 2. Isolation of Plasmid DNA. 3. Visualization of DNA using EtBr. 4. Electrophoresis of DNA - linear, circular and super coiled plasmid. 5. Isolation of DNA from Tissue/Blood/Microorganism. 6. Plasmid restriction map. 7. Effect of UV on microbial/plant cell.	

REFERENCE BOOKS –

1. Laboratory manual of Biotechnology by P.N. Swamy, Rastogi publication, Merrut.
2. Gene, Genomics and Genetic Engineering- By Irfan Khan and Athiya Khanum, Ukaaz Publication.
3. Introductory Practical Biochemistry- By Sawheny and Singh, Narosa Publication.
4. Biochemistry A lab manual-By Farrell and Taylor, Cenage Learning.

02/06/23 02/06/23 02/06/23

Assessment and Evaluation			
Suggested Continous Evaluation Methods:			
Internal Assessment	**Marks**	**External Assesssment**	**Marks**
Class Interaction/Quiz	10	Viva Voce on Practical	10
Attendance	10	Practical Record File	10
Assignment (Charts/Model Seminar/Rural Service/ Technology Dissemination/ Report of Excursion/Lab Visits/ Survey/ Industrial Visit)	20	Table Work/Experiments	40
Total	40		60

02/06/23

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School of Basic and Applied Sciences

Class			B.Sc. (Biotechnology)
Semester/Year			II Year
Subject & Subject Code			Biotechnology &EUS2-BTEC2T
Paper			Recombinant DNA Technology (Paper-II)
Max. Marks			70 (ETE) + 30 (I) = 100
Credit			Total Credits
L	T	P	4
3	1	0	

Course Objectives:

The course is aimed at introducing the students to the field of Bioinformatics and enable them understand the concepts of statistics in biology.To impart practical exposure upon Bioinformatics tools and data bases.

Course Outcome:

At the end of the course, learners will be able to:

1 The objectives of this course are to teach students with various approaches to conduct genetic engineering and their applications in biological research as well as in biotechnology industries.

2. Genetic engineering is a technology that has been developed based on our funcamental understanding of the principles of molecular biology and this is reflected in the contents of this courses.

3. Given the impact of genetic engineering in modern society, the student should be endowed with stront theoretical knowledge of this technology.

4. In conjunction with the practicals in molecular biology and genetic engineering, the students should be able to take up biological research as well as placement in the relevant biotech industry.

Student Learning Outcomes (SLO):

Students will develop :

1. know the theory behind fundamental bioinformatics analysis methods.
2. be familiar with widely used bioinformatics databases.
3. know basic concepts of probability and statistics.
4. be able to describe statistical methods and probability distributions relevant for molecular biology data.
5. know the applications and limitations of different bioinformatics and statistical methods.
6. be able to perform and interpret bioinformatics and statistical analyses with real molecular biology data.

Unit	Syllabus	Periods
UNIT - I	**The basic principles of gene cloning and DNA analysis: –** Introduction, History the advent and importance of gene cloning and the polymerase chain reaction, Purification of DNA from Living Cells, Manipulation of Purified DNA, Introduction of DNA into living cells, Plasmids.	15
	जीन क्लोनिंग और डीएनए विश्लेषण के मूल सिद्धांत :– परिचय, इतिहास, जीन क्लोनिंग का आगमन और महत्व और पोलीमरेज चेन रिएक्शन, जीवित कोशिकाओं से डीएनए का शुद्धिकरण, शुद्ध डीएनए का हेरफेर, जीवित कोशिकाओं में डीएनए का परिचय, प्लास्मिड।	

02/06/23 02/06/23 02/06/23

UNIT - II	**Vectors for Cloning:-** Cloning Verctors: PBR 322, Bacteriophage, Cosmid, Phagemid, Shuttle vectors. Cloning vectors for E.Coli, λ and other high capacity vectors,. SV40. Cloning Vectors for Eukaryotes, Genomics & cDNA Libraries	15
	क्लोनिंग के लिए वैक्टरः– क्लोनिंगवैक्टरः पीबीआर 322, बैक्टीरियोफेज, कॉस्मिड, ई. कोलाई, शटलवैक्टर और अन्य उच्च क्षमता वाले वैक्टर, SV40-यूकैरियोट्स के लिए क्लोनिंग वेक्टर, जीनामिक्स और सी–डीएनए लाइब्रेरी।	
UNIT - III	**Enzymology of genetic manipulation:-** Enzymes useful in molecular cloning: Restriction endonuclease, DNA ligases, polynucleotide kinase, klenow enzyme, DNA Polymerase-I, reverse trancriptase, alkaline phospatase, terminal nucleotidyltransferase.	15
	आनुवांशिक हेरफेर की एंजाइमोलॉजीः– आणविक क्लोनिंग में उपयोगी एंजाइमः प्रतिबंध एंडोन्यूक्लिज, डीएनए लाईगेज, पॉलीन्यूक्लियोटाइड काइनेज, क्लेनो एंजाइम, डीएनए पोलीमरेज, रिवर्स ट्रांसक्रिप्टेस, क्षारीय फास्फाटेज, टर्मिनल न्यूक्लियोटिडाइलट्रांसफेरेज।	
UNIT - IV	**Gene editing: –** Gene Recombination and Gene transfer: Bacterial Conjugation, Transformation, Transduction. Gene transfer techniques: Approaches, gene silencing, Mutagenesis: random, site directed, Knock-in, Knock-out.	15
	जीन संपादनः– जीन पुनर्संयोजन और जीन सीनांतरणः जीवाणु संयुग्मन, ट्रांसफॉर्मेशन, ट्रांसफॉर्मेशन, ट्रांसडक्शन, जीन स्थानांनतरण तकनीकः दृष्टिकोण, जीनसाइलेसिंग, उत्परिवर्तनः यादृच्छिक, साइटनिर्देशित, नॉक–इन, नॉक–आउट।	
UNIT - V	**Application and Techniques of Gene Cloning -:** Polymerase Chain Reaction and qPCR, Labeling nucleic acids and blotting techniques (Southern, Northern, Western, Zooblot), DNA Sequencing, DNA Fingerprinting, Application of recombinant DNA technologies- Agriculture, Medicine, health. ELISA Technique.	15
	जीन क्लोनिंग के अनुप्रयोग और तकनीकः– पोलीमरेज चेन रिएक्शन और, न्यूक्लि एसिड और ब्लॉटिंग तकनीक को लेबल करना (दक्षिणी, उत्तरी, पश्चिमी, जोब्लोट), डीएनए अनुक्रमण, डीएनए फिंगरप्रिंटिंग, पुनःसंयोजक डीएनए प्रौद्यागिकियों के अनुप्रयोग– कृषि, चिकित्सा, स्वास्थ्य। एलाईजा तकनीक।	

REFERENCE BOOKS –

1.Text book of Biotechnology - By H.K. Das (Wiley Publications).
2.Text book of Molecular Biology - By K.S. Sastry, G. Padmanabhan & C. Subramanyam, Publicaton: Macmillan Indian.
3.Gene- By B. Lewin- Oxford University. Press
4. Molecular Biology - By D. Freifelder, Publication: Narosa .
5. Gene, Cenomics and Genetic Engineering - By Irfan Ali Khan and Atiya Khanum (Ukaaz Publication)

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02/06/23

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School of Basic and Applied Sciences

Class	B.Sc. (Biotechnology)
Semester/Year	II Year
Subject & Subject Code	Biotechnology & ~~EUS2~~-BTEC2P
Paper	Lab work for Recombinant DNA Technology
Max. Marks	

Credit			Total Credits
L	T	P	2
0	0	2	

Course Outcome:

At the end of the course, learners will be able to:

1 The objectives of this course are to teach students with various approaches to conduct genetic engineering and their applications in biological research as well as in biotechnology industries.

2. Genetic engineering is a technology that has been developed based on our funcamental understanding of the principles of molecular biology and this is reflected in the contents of this courses.

3. Given the impact of genetic engineering in modern society, the student should be endowed with stront theoretical knowledge of this technology.

4. In conjunction with the practicals in molecular biology and genetic engineering, the students should be able to take up biological research as well as placement in the relevant biotech industry.

Unit	Syllabus	Periods
	1. Isolation of DNA from bacterial/plant/animal cells. 2. Demonstration of Polymerase Chain Reaction. 3. Bacterial Transformation (Selection of transformants with blue white selection) 4. Demonstration of southern blotting. 5. Demonstration of Restriction degistrion of DNA. 6. Demonstration of conjugation. 7. Demonstration of Transduction.	

REFERENCE BOOKS –

1. Molecular Biology Biotechnology- By H.D. Kumar, Vikas Publication.
2. Gene, Genomics and Genetic Engineering- By Irfan Khan and Athiya Khanum, Ukaaz Publication.
3. Introductory Practical Biochemistry- By Sawheny and Singh, Narosa Publication.
4. Biochemistry A lab manual-By Farrell and Taylor, Cenage Learning.

02/06/23

02/06/23 02/06/23