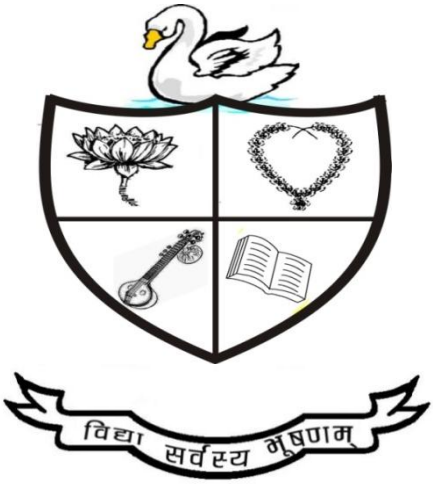
SYLLABUS FOR

THE FOUR-YEAR UNDERGRADUATE PROGRAMME (FYUGP)

As per provisions of NEP_2020 to be implemented from academic year 2022 onwards.

Semester: VII	Session: 2025 - 26
Course Type: DSC	Title: Industrial biotechnology



Department of Biotechnology

GOVT. DIGVIJAY AUTONOMOUS POST GRADUATE COLLEGE, RAJNANDGAON (C.G.)

GOVT. DIGVIJAY AUTONOMOUS P.G. COLLEGE, RAJNANDGAON (C.G.)

FYUGP (NEP 2020 Course)

Department: Biotechnology

Session: 2025 - 26	Program: FYUG
Semester: VII	Subject: **Biotechnology**
Course Type: DSC	Course Code: **.....**
Course Title: Industrial biotechnology	
Credit:	Lecture: **60**
M.M. 100 = **(ESE 80+IA 20)**	Minimum Passing Marks: **40%**

Title	**Calculus**
Course Learning Outcome:	After completing this course, the students will be able to – Understand about mutants for significant industrial production. Develop skills in physical and chemical methods for industrial products. Develop skills in the fermentation process for industrial products. Understand economics and quality control.

Theory

Units	Lectures	Lectures	Credit
I	**15**	Industrial mutants Selection of mutants producing improved levels of primary metabolites with suitable examples. Isolation of mutants that do not produce feedback inhibitors or repressors. Mutants that do not recognize the presence of inhibitors or repressors. Modification of permeability	1
II	**10**	Industrial methodologies Isolation, preservation and maintenance of industrial microorganisms . Removal and recovery of cell mass (precipitation, filtration, and centrifugation) Cell disruption - Physical and chemical methods. Purification of product liquid-liquid extraction: solvent recovery. Chromatography: Adsorption, ion-exchange, HPLC	2
III	**10**	Industrial bioneeds Fermentation processes: Microorganisms involved, inoculum	

		preparation, the medium used and product recovery. Enzyme: Protease, pectinase. Organic acid and vitamins: Citric acid, vitamin B12 and vitamin B2. Antibiotics: Penicillin, erythromycin.	
IV	**10**	Testing and quality control Testing- Sterility, pyrogen, carcinogenicity, and toxicity. Fermentation economics- Cost estimates, process design, capital cost estimates, operating cost. Concept of quality control and quality assurance. Good laboratory practices and good manufacturing practices.	

Practical Course

Credit = 01; Lecture/Lab hour = 15

1. Isolation and screening of industrially important microbes.

2.Isolation and identification of bacteria from milk and water samples.

3.Fermentative production, purification, and estimation of citric acid.

4.Fermentative production, purification, and estimation of alcohol.

5.Wine production and estimation of alcohol.

6.production of enzymes from microbial source

List of Books	**Text book-** Industrial Biotechnology- D Das Industrial Microbiology- A.H. Patel.Peppler H.J and Perlman D - Microbial Technology, Vol I and II-Elsevier Stanbury P.F., Whitaker A. and Hall S.J - Principles of Fermentation Technology-Elsevier Prescott and Dunn‟s- Industrial Microbiology-CBS 7. Ed. G. Subramaniam- Bioseparation& Bioprocessing Casida L.E - Industrial Microbiology- New Age Crueger W and Crueger A - Biotechnology: A Textbook of Industrial Microbiology-Panima Publishing Patel A.H. - Industrial Microbiology, Macmillan

Evaluation Scheme		
Exam Type	Mode of Exam	Marks
Theory	External	80
	Internal	20
Practical	External	40
	Internal	10

Evaluation Scheme for Theory (External)					
Type of Question	No. of questions	Marks	Word Limit	Choice	Total Marks
Very Short Answer	08	02	30	No	16
Short Answer	04	06	75	Yes	24
Long Answer	04	10	150	Yes	40
Evaluation Scheme for Theory (Internal)					
Based on Mid-term Exam					20
Total					**100**

Evaluation Scheme for Practical			
S. No.	**Evaluation**	**Type**	**Marks**
1	Experiment 1	External	10
2	Experiment 2	External	10
3	Experiment 3/ Instrumentation	External	05
4	Spotting	External	10
5	Viva	External	05
6	Sessional	Internal	10
Total			**50**

Approval of the Board of Studies

Date: 14/05/25

Name	Prof. S. K. Jadhav	Sabiha Naz	Dr. Shubha Diwan	Shri Sanjay Bhagwat	Ku. Varsha Meshram	Dr. Pramod Kumar Mahish
Designation	VC Nominee	Subject Expert	Subject Expert	Employment/ Industrial Member	Merit Alumni	Chairman/ HOD
Signature			joined online	joined online		

SYLLABUS FOR

THE FOUR-YEAR UNDERGRADUATE PROGRAMME (FYUGP)

As per provisions of NEP_2020 to be implemented from academic year 2022 onwards.

Semester: VI**I**	Session: **2025-26**
Course Type: **DSE I**	Title: **Agricultural Biotechnology**

Department of Biotechnology

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FYUGP (NEP 2020 Course)

Department: Biotechnology

Session: **2025-26**	Program: **B.Sc.**
Semester: VI**I**	Subject: **Biotechnology**
Course Type: : **Discipline specific Elective (DSE)**	Course Code: **.....**
Course Title: **Agricultural Biotechnology**	
Credit: **4 (3+1)**	Lecture: **60**
M.M. 100 = **(ESE 80+IA 20)**	Minimum Passing Marks: **40%**

Title	**Calculus**
Course Learning Outcome:	After completing this course, the students will be able to - (i) Develop skills related to the use of microbes for the improvement of nitrogen fixation. (ii) Develop skills related to the development of biofertilizers. (iii) Understand about pathogens related to agriculture. (iv) Develop skills related to biopesticides development.

Theory

Units	Lectures	Lectures	Credit
I	**15**	**Basic biotechnological need** 1. Symbiotic nitrogen fixation. 2. Non symbiotic nitrogen fixation. 3. Nitrate assimilation and nitrification. 4. Phytohormones.	1
II	**10**	**Production of agrobiotics** 1. Concept and types of biofertilizers. 2. Microbial inoculum. 3. Sulfur and phosphate solubilizing biofertilizers 4. Applications of biofertilizers.	2
III	**10**	**Biotechnological control of pathology** 1. Concept of plant pathology. 2. Classification of plant diseases. 3. Causative agent, symptoms, mechanism of action, and	

		control majors of plant diseases. 4. Pathogenesis mechanism related to enzymes, toxins, and nutrition.	
IV	**10**	**Biotechnological control of pests** 1. Definition and types of biopesticides 2. Advantages of biopesticides. 3. Composition and types of biomasses and their conversion and neutralization. 4. Single-cell proteins and their nutritive values.	

Practical Course

Credit = 01; Lecture/Lab hour = 15

1. Isolation of Rhizobium sp. from root nodule of leguminous plant.
2. Isolation & Study of nonsymbiotic nitrogen-fixing organisms
3. Isolation and study of PSBs.
4. Estimation of leg hemoglobin from root nodule of leguminous plant.
5. Determination of IAA Oxidase activity.
6. Cultivation and study of Spirulina algae, Mushrooms
7. Study of community by quadrate method (Frequency, Density, and Abundance of Species)

List of Books	➢ **Text** Book- Agricultural Biotechnology- A Singh ➢ Agricultural Biotechnology at a Glance- A K Thakur • Bilgrami KS and Dubey HG- Textbook of modern plant pathology, Vikas publication. • Guptal PK ad genetics and biotechnology in crop improvement- Rastogi Publication • Pathak VN Khatri, Pwathak M- Fundamentals of plant pathology- Arobotanoical publication. • Vyas S and Modi HA- Biofertisers and organic farming- AKTA Prakashan.

Evaluation Scheme		
Exam Type	Mode of Exam	Marks
Theory	External	80
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Practical	External	40
	Internal	10

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Short Answer	04	06	75	Yes	24
Long Answer	04	10	150	Yes	40
Evaluation Scheme for Theory (Internal)					
Based on Mid-term Exam					20
Total					**100**

Evaluation Scheme for Practical			
S. No.	**Evaluation**	**Type**	**Marks**
1	Experiment 1	External	10
2	Experiment 2	External	10
3	Experiment 3/ Instrumentation	External	05
4	Spotting	External	10
5	Viva	External	05
6	Sessional	Internal	10
Total			**50**

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Semester:VI**I**	Session: **2025-26**
Course Type: DSE II	Title: **Genomics**

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FYUGP (NEP 2020 Course)

Department: Biotechnology

Session: **2025-26**	Program: **B.Sc.**
Semester: VI**I**	Subject: **Biotechnology**
Course Type: Discipline Specific Elective (**DSE)**	Course Code: **.....**
Course Title: **Genomics**	
Credit: **4 (3+1)**	Lecture: **60**
M.M. 100 = **(ESE 80+IA 20)**	Minimum Passing Marks: **40%**

Title	**Calculus**
Course Learning Outcome:	After completing this course, the students will be able to - • Analyse and interpret genomic data. • Develop competency related to genomic and epigenomic alteration. • Understand about gene expression and regulation. • Develop an understanding of various RNA interphases.

Theory

Units	Lectures	Lectures	Credit
I	**15**	**Concept of genomics** 1. Genomics- Introduction, comparative genomics, Cot and Rot value, forward and reverse genetics. 2. DNA sequence analysis methods: Sanger dideoxy method and fluorescence method. 3. Gene variation and Single Nucleotide Polymorphisms (SNPs); Expressed sequenced tags (ESTs). Gene disease association.	1
II	**10**	**Epigenetics and genomic stability** 1. Epigenetic control of gene expression- DNA methylation and its role in gene expression. 2. Genome stability by DNA methylation. 3. Chromatin modifications implicated in gene silencing and activation.	2

		Epitranscriptome- resetting the epigenome.	
III	**10**	**Control and regulation of gene expression** 1. Transcriptional control of gene expression- Gene architecture, promoter architecture. 2. Regulation sequences, enhancers, and mechanism of their action. 3. Mediator complex and general transcription factors. DNA binding and activation domains, activation of latent activators, and co-activators.	
IV	**10**	**RNA regulated regulations** 1. Post-transcriptional control of gene expression- Introns and exons, mechanism of RNA splicing. 2. Polyadenylation. 3. Small RNA and RNA interference. 4. Catalytic RNA	

Practical Course
Credit = 01; Lecture/Lab hour = 15

- Isolation of DNA from plants.
- Isolation of DNA from blood.
- DNA molecular size determination.
- Preparation of slide to observe micronuclei.
- Banding pattern study of DNA through electrophoresis.
- Genetic variation study by RAPD.
- Genetic variation study by RFLP.
- Use of NCBI database for homology study.

List of Books	• **Text books-Introduction to genomics- A M Lesk** ➢ **Genome analysis and bioinformatics- T R Sharma** ➢ Latchman DS (2015), Gene control, Garland Science, New York. • Krebs, JE, Goldstein ES, Kilpatrick SJ (2014) Lewins Genes XI, Jones Bartlett Publishers.

Evaluation Scheme		
Exam Type	Mode of Exam	Marks
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Evaluation Scheme for Theory (Internal)					
Based on Mid-term Exam					20
Total					**100**

Evaluation Scheme for Practical			
S. No.	**Evaluation**	**Type**	**Marks**
1	Experiment 1	External	10
2	Experiment 2	External	10
3	Experiment 3/ Instrumentation	External	05
4	Spotting	External	10
5	Viva	External	05
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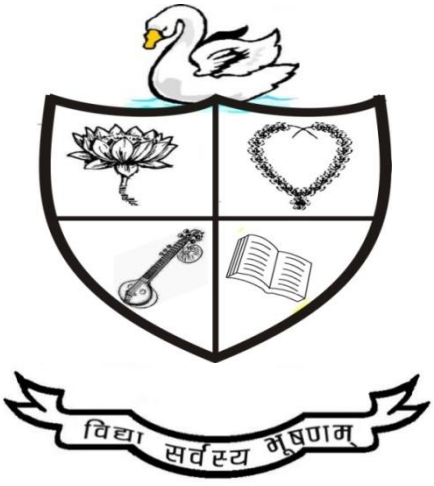
Semester: VI**I**	Session: **2025-26**
Course Type: **: DSE III**	Title: Proteomics



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FYUGP (NEP 2020 Course)

Department: Biotechnology

Session: **2025-26**	Program: **B.Sc.**
Semester: VI**I**	Subject: **Biotechnology**
Course Type: **: Discipline specific Elective (DSE)**	Course Code: **.....**
Course Title: Proteomics	
Credit: **4 (3+1)**	Lecture: **60**
M.M. 100 = **(ESE 80+IA 20)**	Minimum Passing Marks: **40%**

Title	**Calculus**
Course Learning Outcome:	After completing this course, the students will be able to - • Understanding protein structure and design of workflow. • Develop an understanding of technology related to proteomics. • Develop competency in protein sequencing and related methods. • Understand quantitative and high throughput methods related to proteomics.

Theory

Units	Lectures	Lectures	Credit
I	**15**	**Concept of proteomics** 1. Protein structure and folding basic concepts and techniques. 2. Proteome- Basics and workflow design of proteomics technology. 3. Comparative proteomics and importance of proteomics. 4. An overview of systems biology.	1
II	**10**	**Basic techniques in proteomics** 1. Tools and techniques in proteomics: Principle and application of separation of 1D and 2D polyacrylamide gel electrophoresis.Workflow. 2. Two-dimensional fluorescence difference in-gel electrophoresis (DIGE).	2

III	**10**	**Advanced techniques in proteomics** 1. Protein sequencing. 2. MS analysis and related techniques (LC-MS(MS). 3. Advanced methods in proteomics (microfluidic chips, ICAT, iTRAQ). 4. Advanced methods in proteomics (SILAC)	
IV	**10**	**Application of proteomics** 1. Database searches, relative quantification, analysis, and interpretation. 2. Quantitative proteomics. 3. Post-translational modifications and their profiling. 4. High-throughput methods for the interaction of proteins with other biomolecules.	

Practical Course

Credit = 01; Lecture/Lab hour = 15

1. Isolation of protein.
2. Purification of protein.
3. Quantification of protein.
4. Electrophoretic observation of protein.
5. Protein database mining.
6. Homology study of protein by using the database.
7. Structural elucidation of protein by using the database.
   Analysis of protein domains using the database

List of Books	• **Text Book-** Introduction to Proteomics: Tools for the New Biology, D.C. Liebler, Humana Press, 2002. • Principles of Proteomics, R.M. Twyman, Bios Scientific Pub., 2004 • Proteomics for Biological Discovery, T.D. Veenstra, J.R. Yates III, John-Wiley & Sons, Hoboken, New Jersey, USA; 2006. • Protein Biochemistry and Proteomics (The Experimenter Series), R. Hubert, Academic Press, 2006

Evaluation Scheme		
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