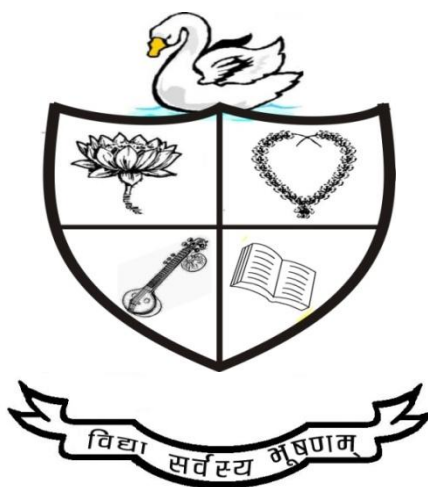


SYLLABUS FOR THE FOUR-YEAR UNDERGRADUATE PROGRAMME (FYUGP)

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

Semester: IV	Session: 2026-27
Course Type: DSC	Title: Recombinant DNA technology



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

Part A: Introduction			
Program: Bachelor in Life Sciences (Diploma/Degree/Honors)		Semester: IV Sem	Session:2026-27
1	Course Code	BTSC-04-T	
2	Course Title	Recombinant DNA technology	
3	Course Type	Core Course	
4	Pre-requisite (if any)	As per program	
6	Course Learning Outcomes (CLO)	After completing this course, the students will be able to - • Understand various tools of genetic engineering. • Develop competency in genetic exploitation for human welfare. • Understand the practical application of recombinant DNA technology. • Understand the use of information technology in the field of genome and proteome analysis.	
6	Credit Value	03 Credits (Credit = 15 Hours - learning & observation)	
7	Total Marks	Max. Marks: 100	Min Passing Marks: 40
Part B: Content of Course (Theory)			
Total No. of Teaching-learning Periods (01 Hr. per period)- 45 Periods (45 Hours)			
Unit	Topic (Course content)		No. of Period
I	Prerequisites of rDNA technology 1. Recombinant DNA technology: General concept. Steps and application. 2. Host controlled Restriction Modification System, Ligases and Polymerases, Klenow fragment, Taq, Pfu polymerase. 3. Nuclease (Endo, Exo, and restriction endonuclease). 4. Modification Enzyme (Kinase, Phosphates and terminal deoxynucleotidyltransferase), Reverse Transcriptase.		12 (12 Hrs)
II	Gene transfer 1. Vectors: Based on Plasmid, Bacteriophages, Cosmid. 2. High capacity vectors. 3. The basic concept of Gene Transfer Methods: Microinjection, Electroporation, Lipofection, and Microprojectile. 4. Selection and Screening of Recombinants: Genetic and Hybridization methods.		11 (11 Hrs)
III	Genomic validation 1. PCR: Types of PCR, Steps, Applications, Advantages and Limitations of PCR. 2. Molecular Marker-RFLP, RAPD, and Microarray. 3. Human Genome Project. 4. Gene Library: Genomic and cDNA library, Chromosome walking and jumping.		11 (11 Hrs)
IV	Application of genetic technology 1. Gene Therapy: <i>In vivo</i> and <i>Ex vivo</i>, germline and somatic gene therapy. 2. Basic idea of stem cell technology: Types of stem cell cultures and their		11 (11 Hrs)

	Significance. 3. Introduction to Genomics, DNA sequencing methods – manual & automated: Maxam & Gilbert and Sangers method. 4. Introduction to protein structure, Chemical properties of proteins, physical interactions that determine the property of proteins, short-range interactions, electrostatic forces, van der Waal interactions, hydrogen bonds, and Hydrophobic interactions.	
Keywords	Recombinant DNA, Vectors, PCR, cDNA library.	

• Part C - Learning Resource	
Text Books, Reference Books, Other Resources -	
Text Book-	
➤ P S Verma and A K Agrawal ➤ An introduction to genetic engineering- S T Tischoll	
• Molecular Biology; Watson. • Gene VIII; Benjamin Lewin. • The Cell, A molecular Approach; Geoffrey M. Cooper. • Molecular Biology of the Cell; Alberts • Modern Biotechnology, 2nd Edition, S.B. Primrose, Blackwell Publishing, 1987. • Molecular Biotechnology: Principles and Applications of Recombinant DNA, 4th Edition, B.R. Glick, J.J. Pasternak and C.L. Patten, 2010. • Molecular Cloning: A Laboratory Manual (3rd Edition) Sambrook and Russell Vol. I • Principles of Gene Manipulation 6th Edition, S.B.Primrose, R.M.Twyman and R.W. Old. Blackwell Science, 2001.	
• Online resources- https://onlinecourses.swayam2.ac.in/cec21_bt05/preview • https://archive.nptel.ac.in/courses/102/104/102104052/	

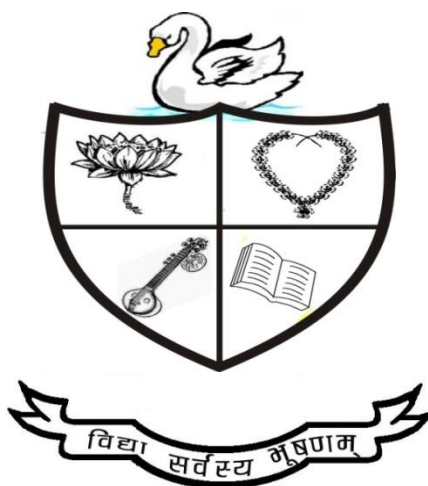
Part D: Assessment and Evaluation		
Suggested Continuous Evaluation Methods:		
Maximum Marks: 100 Marks		
Continuous Internal Assessment (CIA): 30 Marks		
End Semester Exam (ESE): 70 Marks		
Continuous Internal Assessment (CIA) (By course teacher):	Internal Test / Quiz-(2): 20 +20 Assignment / Seminar - 10 Total Marks - 30	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 30 Marks
End Semester Exam (ESE):	Two section – A & B Section A: Q1. Objective – 10 x1= 10 Mark; Q2. Short answer type- 5x4 =20 Marks Section B: Descriptive answer type qts., 1 out of 2 from each unit- 4x10=40 Marks	

Approval of the Board of Studies						
Date: 20-06-2026						
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 by Google Meet on 20-06-2026 https://meet.google.com/nzg-cntq-zbc					

SYLLABUS FOR THE FOUR-YEAR UNDERGRADUATE PROGRAMME (FYUGP)

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

Semester: IV	Session: 2026-27
Course Type: DSC Practical	Title: Recombinant DNA technology



Department of Biotechnology
**GOVT. DIGVIJAY AUTONOMOUS POST GRADUATE
COLLEGE, RAJNANDGAON (C.G.)**

FYUGP (NEP 2020 Course)

Department: Biotechnology

Four Year Undergraduate Program (2024-28)

Department of Biotechnology

Course Curriculum

Part A: Introduction		
Program: Bachelor in Life Sciences (Diploma/Degree/Honors)		Semester: IV Sem Session:2026-27
1	Course Code	BTSC-04-P
2	Course Title	Recombinant DNA technology
3	Course Type	Core Course
4	Pre-requisite (if any)	As per program
6	Course Learning Outcomes (CLO)	After completing this course, the students will be able to - - Isolate nucleic acid from biological cells. - Estimate and manipulate nucleic acid. - Amplify nucleic acid. - Analyse nucleic acid on the basis of database.
6	Credit Value	01 Credits Credit =30 Hours Laboratory or Field learning/Training
7	Total Marks	Max. Marks: 50 Min Passing Marks: 20

Part B: Content of Course		
Total No. of learning-Training/performance Periods: 30 Periods (30 Hours)		
Module	Topic (Course content)	No. of Period
Lab./Field Training/ Experiment Contents of Course	5. Isolation of chromosomal DNA from plant cells 6. Isolation of chromosomal DNA from <i>E.coli</i> 7. Qualitative and quantitative analysis of DNA using spectrophotometer 8. Plasmid DNA isolation 9. Restriction digestion of DNA. 10. Ligation of DNA. 11. Transformation of competent cells. 12. Demonstration of PCR. 13. Use of SNP databases at NCBI and other sites. 14. Use of OMIM database 15. Detection of Open Reading Frames using ORF Finder	30
Keywords	Recombinant DNA, Vectors, PCR, cDNA library.	

• Part C - Learning Resource
Text Books, Reference Books, Other Resources -
Text Book-
➤ P S Verma and A K Agrawal
➤ An introduction to genetic engineering- S T Tischoll
• Molecular Biology; Watson.

• Gene VIII; Benjamin Lewin. • The Cell, A molecular Approach; Geoffrey M. Cooper. • Molecular Biology of the Cell; Alberts • Modern Biotechnology, 2nd Edition, S.B. Primrose, Blackwell Publishing, 1987. • Molecular Biotechnology: Principles and Applications of Recombinant DNA, 4th Edition, B.R. Glick, J.J. Pasternak and C.L. Patten, 2010. • Molecular Cloning: A Laboratory Manual (3rd Edition) Sambrook and Russell Vol. I to III, 1989. • Principles of Gene Manipulation 6th Edition, S.B.Primrose, R.M.Twyman and R.W. Old. Blackwell Science, 2001.
• Online resources- https://onlinecourses.swayam2.ac.in/cec21_bt05/preview • https://archive.nptel.ac.in/courses/102/104/102104052/ •

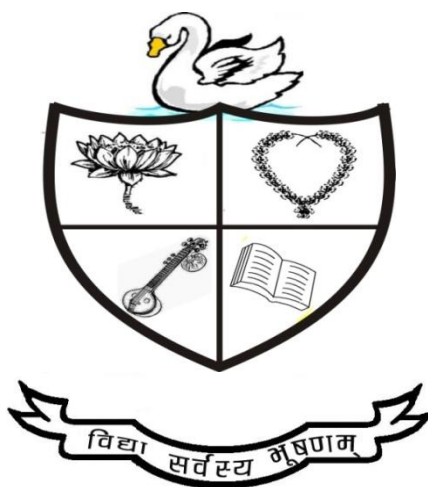
Part D: Assessment and Evaluation		
Suggested Continuous Evaluation Methods:		
Maximum Marks: 50 Marks		
Continuous Internal Assessment (CIA): 15 Marks		
End Semester Exam (ESE): 35 Marks		
Continuous Internal Assessment (CIA) (By course teacher):	Internal Test / Quiz-(2): 10 +10 Assignment / Seminar + Attendance- 05 Total Marks - 15	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 15 Marks
End Semester Exam (ESE):	Laboratory / Field Skill Performance: A. On spot Assessment - 20 Marks B. Spotting based on tools & technology (written) – 10 Marks C. Viva-voce (based on principle/technology) - 05 Marks	Managed by course teacher as per lab status

Approval of the Board of Studies						
Date: 20-06-2026						
Name	Prof. S. K. Jadhav	Sabiha Naz	Dr. Shubha Diwan	Shri Sanjay Bhagwat	Ku. Varsha Meshram	Dr. Pramod Kumar Mahish
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Signature	Joined by Google Meet on 20-06-2026 https://meet.google.com/nzg-cntq-zbc					

SYLLABUS FOR THE FOUR-YEAR UNDERGRADUATE PROGRAMME (FYUGP)

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

Semester: IV	Session: 2026-27
Course Type: DSE	Title: Bioprocess Engineering



Department of Biotechnology
**GOVT. DIGVIJAY AUTONOMOUS POST GRADUATE
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GOVT. DIGVIJAY AUTONOMOUS P.G. COLLEGE, RAJNANDGAON (C.G.)

FYUGP (NEP 2020 Course)

Department: Biotechnology

Course Curriculum

Part A: Introduction		
Program: Bachelor in Life Sciences (Degree/Honors)		Semester: IV Sem
		Session: 2026-27
1	Course Code	BTSE-02-T
2	Course Title	Bioprocess Engineering
3	Course Type	Elective course
4	Pre-requisite (if any)	As per program
5	Course Learning Outcomes (CLO)	After completing this course, the students will be able to - - Understand the prerequisite of bioprocess engineering. - Develop skills for the operation of bioreactors. - Develop skills for industrial production. - Understand the geological exploitation by the process of bioprocess engineering.
6	Credit Value	03 Credits (Credit = 15 Hours - learning & observation)
7	Total Marks	Max. Marks: 100 Min Passing Marks: 40

Part B: Content of Course (Theory)		
Total No. of Teaching-learning Periods (01 Hr. per period)- 45 Periods (45 Hours)		
Unit	Topic (Course content)	No. of Period
I	Concept of bioprocess engineering - Introduction to bioprocess engineering. - Isolation, preservation, and maintenance of industrial microorganisms. - Media for industrial fermentation. - Kinetics of microbial fermentation.	12 (12 Hrs)
II	Bioreactors - Types of fermentation processes. - Operations of bioreactors. - Measurement and control of bioprocess parameters. - Downstream processing.	11 (11 hrs)
III	Bioproducts - Production of alcohol, acids and solvents. - Production of antibiotics. - Production of amino acids. - Whole cell immobilization for industrial application.	11 (11 hrs)
IV	Microbial role and regulation - Application of microbes in mineral beneficiation. - Application of microbes for oil recovery. - Quality control, quality assurance and standard operating procedures of fermenter. - Good manufacturing practices.	11 (11 hrs)
Keywords	Fermentation, bioreactors, fermentation-based production, mineral beneficiation.	

• Part C - Learning Resource	
Text Books, Reference Books, Other Resources -	
Text book- Industrial Biotechnology- D Das	
Industrial Microbiology- A.H. Patel.	
Reference Book- - Wastewater Engineering- Treatment, Disposal & Reuse. Metall and Eddy, Inc., Tata Mcgraw Hill, N. Delhi. - Microbiology- Pelczar&Pelczar. - Environmental Biotechnology, PrathamVashishith. Dominant Publishers And Distributors, N.Delhi. - Principles of Fermentation Technology; Stanburry. - Industrial Microbiology; Casida.	
Online resources- https://archive.nptel.ac.in/courses/102/105/102105058/ http://www.ndl.gov.in/he_document/nptel/downloads_new_lecturenotes_102105058_102105058	

Part D: Assessment and Evaluation		
Suggested Continuous Evaluation Methods:		
Maximum Marks: 100 Marks		
Continuous Internal Assessment (CIA): 30 Marks		
End Semester Exam (ESE): 70 Marks		
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End Semester Exam (ESE):	Two section – A & B Section A: Q1. Objective – 10 x1= 10 Mark; Q2. Short answer type- 5x4 =20 Marks Section B: Descriptive answer type qts., 1out of 2 from each unit-4x10=40 Marks	

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SYLLABUS FOR THE FOUR-YEAR UNDERGRADUATE PROGRAMME (FYUGP)

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

Semester: IV	Session: 2026-27
Course Type: DSE Practical	Title: Bioprocess Engineering



Department of Biotechnology
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FYUGP (NEP 2020 Course)

Department: Biotechnology

Four Year Undergraduate Program (2024-28)

Department of Biotechnology

Course Curriculum

Part A: Introduction		
Program: Bachelor in Life Sciences (Diploma/Degree/Honors)		Semester: IV Sem Session:2026-27
1	Course Code	BTSE-02-P
2	Course Title	Bioprocess Engineering
3	Course Type	Elective course (Practical)
4	Pre-requisite (if any)	As per program
5	Course Learning Outcomes (CLO)	After completing this practical course, the students will be able to - - Isolate and maintain industrially significant microbes. - Develop skills for alcoholic production. - Develop skills for acid production. - Develop skills for antibiotic and enzyme production.
6	Credit Value	01 Credits Credit =30 Hours Laboratory or Field learning/Training
7	Total Marks	Max. Marks: 50 Min Passing Marks: 20
Part B: Content of Course (Theory)		
Total No. of learning-Training/performance Periods: 30 Periods (30 Hours)		
Module	Topic (Course content)	No. of Period
Lab./Field Training/ Experiment Contents of Course	- Isolation of industrially important microorganisms for microbial process. - Determination of thermal death point (TDP) and thermal death time (TDT) of microorganisms. - Comparative studies of ethanol production using different substrates. - Microbial production of citric acid using <i>Aspergillus niger</i>. - Microbial production of antibiotics (<i>Penicillin</i>) - Production and estimation of alkaline protease.	30
Keywords	Fermentation, bioreactors, fermentation-based production, mineral beneficiation.	

Part C - Learning Resource
Text Books, Reference Books, Other Resources -
Text book- Industrial Biotechnology- D Das Industrial Microbiology- A.H. Patel.
Reference Book- - Wastewater Engineering- Treatment, Disposal & Reuse. Metall and Eddy, Inc., Tata Mcgraw Hill, N. Delhi. - Microbiology- Pelczar&Pelczar. - Environmental Biotechnology, PrathamVashishith. Dominant Publishers And Distributors, N.Delhi.

- Principles of Fermentation Technology; Stanburry.
- Industrial Microbiology; Casida.

Online resources- <https://archive.nptel.ac.in/courses/102/105/102105058/>

http://www.ndl.gov.in/he_document/nptel/downloads_new_lecturenotes_102105058_102105058

Part D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

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	Assignment / Seminar + Attendance-	05	
	Total Marks -	15	
End Semester Exam (ESE):	Laboratory / Field Skill Performance:		Managed by course teacher as per lab status
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