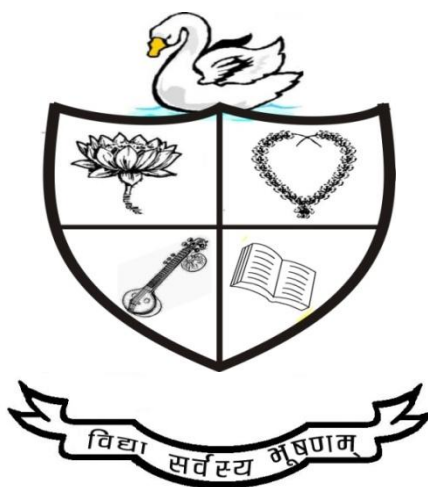


SYLLABUS FOR THE FOUR-YEAR UNDERGRADUATE PROGRAMME (FYUGP)

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

Semester: III	Session: 2026-27
Course Type: DSC	Title : Genetics and Biophysics



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: III Sem	Session: 2026-27
1	Course Code	BTSC-03-T	
2	Course Title	Genetics and Biophysics	
3	Course Type	Core 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 classical genetics of inheritance • Understand variation in genes and its impact. • Understand the use of basic physical tools for the measurement of biological processes.	
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	Chromosome and gene 1. Techniques to study chromosomes: Karyotyping, banding, chromosome labeling, comparative genome hybridization. 2. Change in chromosome number & structure: Ploidy and rearrangement (Deletion, Duplication, Inversion & Translocation). 3. Concept of gene: Fine structure of gene, split gene, pseudogenes, non-coding genes, overlapping genes & multigene family. 4. Mutation: Classification, mechanism, repair, role in evolution.	12 (12 Hrs)
II	Classical genetics 1. Mendelian genetics- basic principles and interaction of genes. 2. Linkage, Crossing Over. 3. Sex-linked inheritance and pedigree. 4. Cytoplasmic inheritance.	11 (11 Hrs)
III	Instrumentation I 1. Simple microscopy, phase contrast microscopy, fluorescence, and electron microscopy (TEM and SEM). 2. pH meter, absorption, and emission spectroscopy 3. Principle and law of absorption fluorimetry, colorimetry, spectrophotometry (visible, UV, infra-red), 4. Centrifugation principle and its types.	11 (11 Hrs)
IV	Instrumentation II 1. Introduction to electrophoresis. Starch-gel, agarose-gel electrophoresis,	11 (11 Hrs)

	immuno-electrophoresis. 2. Introduction to the principle of chromatography. Paper chromatography, thin layer chromatography, column chromatography: silica and gel filtration, affinity and ion exchange chromatography, gas chromatography, HPLC. 3. Introduction to Biosensors and their applications. 4. Radioisotopes in Biology. Autoradiography, DNA fingerprinting.	
Keywords	Gene, Genetic alteration, Spectrophotometry, Electrophoresis.	

• Part C - Learning Resource	
Text Books, Reference Books, Other Resources -	
Text Book-	➤ Genetics- PS Verma; Genetics- BD Singh; Genetics- Veer Bala Rastogi
•	Gardner, E.J., Simmons, M.J., Snustad, D.P. (2006). Principles of Genetics. VIII Edition John Wiley & Sons.
•	Snustad, D.P., Simmons, M.J. (2009). Principles of Genetics. V Edition. John Wiley and
•	Klug, W.S., Cummings, M.R., Spencer, C.A. (2009). Concepts of Genetics. IX Edition. Benjamin Cummings.
•	Cell and Molecular Biology: Concepts and Experiments. 6th Edition. John Wiley& Sons.
•	De Robertis, E.D.P. and De Robertis, E.M.F. 2006. Cell and Molecular Biology. 8th edition. Lippincott Williams and Wilkins, Philadelphia.
•	Cooper, G.M. and Hausman, R.E. 2009. The Cell: A Molecular Approach. 5th edition. ASM Press & Sunderland, Washington, D.C.; Sinauer Associates, MA.
Online resources- https://archive.nptel.ac.in/courses/102/104/102104052/ https://onlinecourses.swayam2.ac.in/cec21_bt05/preview	

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., 1out 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: III	Session: 2026-27
Course Type: DSC Practical	Title : Genetics and Biophysics



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

FYUGP (NEP 2020 Course)**Department: Biotechnology****Part A: Introduction**

Program: Bachelor in Life Sciences (Diploma/Degree/Honors)		Semester: III Sem	Session: 2026-27
1	Course Code	BTSC-03-P	
2	Course Title	Genetics and Biophysics	
3	Course Type	Core Course	
4	Pre-requisite (if any)	As per program	
5	Course Learning Outcomes (CLO)	After completing this course, the students will be able to - • Perform cellular replication. • To conduct genetic inheritance and interpretation. • Nucleic acid estimation. • Perform biological extraction, identification and measurement.	
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	1. Permanent and temporary mount of mitosis and meiosis. 2. Karyotyping with the help of photographs. 3. Problems regarding Genetics and Mendelian deviations in dihybrid crosses. 4. Pedigree charts of some common characteristics like blood group, color blindness, and PTC tasting. 5. Temporary mount of Giant chromosome. 6. Photometric (colorimetric/spectrophotometric) estimation of nucleic acid. 7. Cellular fractionation by centrifugation. 8. Maintenance and operation of laminar airflow. 9. Extraction by using the Soxhlet method. 10. To identify lipids in a given sample by TLC. 11. To verify the validity of Beer's law and determine the molar extinction coefficient of NADH. 12. Operation of electrophoresis for protein.	30
Keywords	Gene, Genetic alteration, Spectrophotometry, Electrophoresis.	

- **Part C - Learning Resource**

Text Books, Reference Books, Other Resources -

Text Book-

- Genetics- PS Verma
- Genetics- BD Singh
- Genetics- Veer Bala Rastogi

- Gardner, E.J., Simmons, M.J., Snustad, D.P. (2006). Principles of Genetics. VIII Edition

John Wiley & Sons. • Snustad, D.P., Simmons, M.J. (2009). Principles of Genetics. V Edition. John Wiley and Sons Inc. • Klug, W.S., Cummings, M.R., Spencer, C.A. (2009). Concepts of Genetics. IX Edition. Benjamin Cummings. • Cell and Molecular Biology: Concepts and Experiments. 6th Edition. John Wiley & Sons. Inc. • De Robertis, E.D.P. and De Robertis, E.M.F. 2006. Cell and Molecular Biology. 8th edition. Lippincott Williams and Wilkins, Philadelphia. • Cooper, G.M. and Hausman, R.E. 2009. The Cell: A Molecular Approach. 5th edition. ASM Press & Sunderland, Washington, D.C.; Sinauer Associates, MA.
Online resources- https://archive.nptel.ac.in/courses/102/104/102104052/ https://onlinecourses.swayam2.ac.in/cec21_bt05/preview

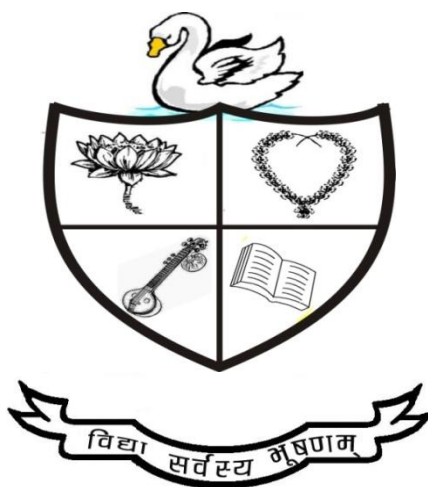
Part D: Assessment and Evaluation		
Suggested Continuous Evaluation Methods: Maximum Marks: 50 Marks Continuous Internal Assessment (CIA): 15 Marks End Semester Exam (ESE): 35 Marks		
Continuous Internal Assessment (CIA) (By course teacher):	Internal Test / Quiz-(2): 10 +10 Assignment / Seminar + Attendance- 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
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: III	Session: 2026-27
Course Type: DSE	Title : Environmental 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

Part A: Introduction		
Program: Bachelor in Life Sciences (Diploma/Degree/Honors)		Semester: III Sem Session: 2026-27
1	Course Code	BTSE-01-T
2	Course Title	Environmental Biotechnology
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 wastewater management. • Understand the significance and scope of biodegradation. • Develop skills for bioremediation. • Develop skills for the management of xenobiotics.
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	Environmental treatments 1. Domestic (municipal) and industrial wastewater treatments: primary, secondary and tertiary. 2. Important microorganisms in wastewater treatment, principles of their growth and plasmid-borne metabolic activities. 3. Aerobic biological treatments: activated sludge process rotating biological contactors. 4. Anaerobic biological treatments: airlift membrane bioreactors packed bed (column reactor.)	12 (12 Hrs)
II	Environmental degradation 1. Biodegradation: definition and concept, ready biodegradation, ultimate biodegradation and inherent biodegradation. 2. Aerobic and anaerobic degradation pathways in microbes. 3. Biodegradation of hydrocarbon with suitable example. 4. Concept of municipal solid waste management.	11 (11 hrs)
III	Environmental remediation 1. Introduction, definition and concept, methods of bioremediation (in situ and ex-situ methods) 2. Bioremediation of soil (saline soil and alkaline soil) 3. Phytoremediation: concept and types. 4. Applications of bioremediation.	11 (11 hrs)
IV	Environmental contamination 1. Xenobiotics and recalcitrancy.	11 (11 hrs)

	2. Xenobiotics degradation: pesticide degradation, herbicide degradation 3. Metabolism of xenobiotics. 4. Cytochrome p450 system, phase I, phase II, metabolic reactions.	
Keywords	Wastewater management, biodegradation, bioremediation, xenobiotics.	

• Part C - Learning Resource	
Text Books, Reference Books, Other Resources -	
Text Book- • Murugesan A. G. and Rajakumari C-Environmental Science and Biotechnology: Theory & Techniques, MJP • Asthana D.K. and Asthana M.,-Environment: Problems and Solutions- S. Chand • Chatterji A.K., Introduction to Environmental Biotechnology, Prentice Hall of India Pvt. Ltd	
Reference Book- • Jogdand S.N.- Environmental Biotechnology- Himalaya Publishing House • Kalaichelvan P.T., I Arul Pandi- Bioprocess Technology, MJP Publishers • Rajendran, Gunashekar- Microbial Bioremediation-MJP • Hammer & Hammer-Water & Wastewater Technology-PHI • Metcalf & Eddy-Waste water Engineering-TMH • Indushekar Thakur- Environmental Biotechnology-I K International	
Online resources- https://onlinecourses.nptel.ac.in/noc21_bt41/preview http://acl.digimat.in/nptel/courses/video/102105088/102105088.html	

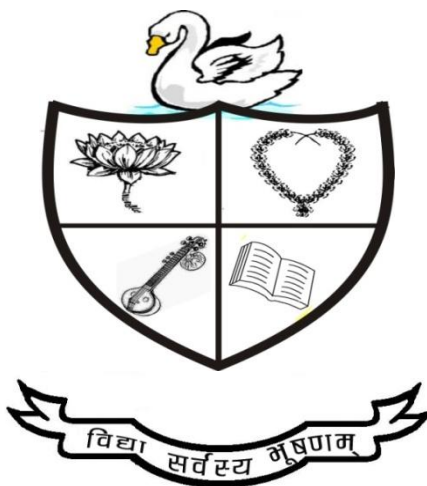
Part D: Assessment and Evaluation		
Suggested Continuous Evaluation Methods:		
Maximum Marks: 100 Marks		
Continuous Internal Assessment (CIA): 30 Marks		
End Semester Exam (ESE): 70 Marks		
Continuous Internal Assessment (CIA) (By course teacher):	Internal Test / Quiz-(2): 20 +20 Assignment / Seminar - 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: III	Session: 2026-27
Course Type: DSE Practical	Title : Environmental Biotechnology



Department of Biotechnology
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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: III Sem Session: 2026-27
1	Course Code	BTSE-01-P
2	Course Title	Environmental Biotechnology
3	Course Type	Elective course (Practical)
4	Pre-requisite (if any)	As per program
5	Course Learning Outcomes (CLO)	After completing this course, the students will be able to - • Understand and analyze physical and chemical parameters of the water bodies. • Estimate biological pollutants from the water bodies. • Determine physical and nutritional conditions of the soil. • Estimate various inorganic and organic contents from pollutants.
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	1. Determination of DO, and BOD, from polluted water sample. 2. Determination of COD from a polluted water sample. 3. Bacterial examination of water by MPN test. 4. Coliform test. 5. Determination of soil pH and total organic carbon. 6. NPK determination from soil. 7. Determination of alkalinity and hardness of water. 8. Estimation of total nitrogen in Kjeldahl's method.	30
Keywords	Wastewater management, biodegradation, bioremediation, xenobiotics.	

• Part C - Learning Resource
Text Books, Reference Books, Other Resources -
Text Book- • Murugesan A. G. and Rajakumari C-Environmental Science and Biotechnology: Theory & Techniques, MJP • Asthana D.K. and Asthana M.,-Environment: Problems and Solutions- S. Chand • Chatterji A.K., Introduction to Environmental Biotechnology, Prentice Hall of India Pvt. Ltd
Reference Book- • Jogdand S.N.- Environmental Biotechnology- Himalaya Publishing House • Kalaichelvan P.T., I Arul Pandi- Bioprocess Technology, MJP Publishers • Rajendran, Gunashekar- Microbial Bioremediation-MJP • Hammer & Hammer-Water & Wastewater Technology-PHI • Metcaf & Eddy-Waste water Engineering-TMH

Indushekhar Thakur- Environmental Biotechnology-I K Internation
Online resources- https://onlinecourses.nptel.ac.in/noc21_bt41/preview http://acl.digimat.in/nptel/courses/video/102105088/102105088.html

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