

(Recommended by Board of Studies of Biotechnology, D. K. D. C. (Autonomous), in its meetings held on 16.05.2026 and approved by the academic Council meeting held on ----- and effective from the session 2026-2027)

PREAMBLE:

As recommended by Board of Studies and approved by the Academic Council of Dergaon Kamal Dowerah College (Autonomous), the Department of Biotechnology works to implement the relevant components of New Education Policy (NEP), 2020 for Four Years Under Graduate Programmes (FYUGP) under Choice Based Credit System (CBCS). The following facts are taken into consideration when designing the basic structure of the FYUGP programme:

- a) Flexibility to switch between disciplines of study,
- b) Opportunity for learners to select the courses of their interest across all disciplines,
- c) Flexible entry and exit options with UG certificates, UG diplomas, or Bachelor degrees depending on the number of credits earned,
- d) Flexibility for students to switch between institutions so they can engage in multi-and/or interdisciplinary learning,
- e) Flexibility to switch to alternative modes of learning,
- f) Knowledge required for self-employment initiatives and entrepreneurship mindset,
- g) Ability for complex critical thinking and real-life problem solving,
- h) Capability to understand global issues, multicultural competence and digital literacy,
- i) Capable on research skills, communication skills, community-based engagement environment awareness, responsibility and accountability.

INTRODUCTION:

The Four Years Under Graduate Programme (FYUGP) syllabus of Zoology in light of NEP-2020, consists of Major (MJ) disciplines, Minor (MN) disciplines, Multi-Disciplinary Generic Elective Courses (GEC), Ability Enhancement Courses (AEC), Value Added Courses (VAC), Skill Enhancement Courses (SEC), Research Methodology (RM), Dissertation (D) (Collection of Data, Analysis and Preparation of Report) and Major Electives (MJE).

The FYUGP degree programme offers certificates, diplomas and degrees as follows:

UGC Certificate: Certificate course consists of two Major disciplines, two Minor disciplines, two GEC, two AEC, two VAC and two SEC.

UG Diploma: Diploma course consists of eight Major disciplines, four Minor disciplines, three GEC, two AEC, three VAC, three SEC.

3-year UG Degree: 3-year UG degree course consists of fifteen Major disciplines, six Minor disciplines, three GEC, two AEC, three VAC, three SEC, Community engagement (NCC/NSS/Adult Education/Student mentoring/NGO/Govt. Institutions, etc.) and Internship.

4-year Honours Degree: 4-year honours degree course consists of twenty Major disciplines, eight Minor disciplines, three GEC, two AEC, three VAC, three SEC, Community engagement (CE) (NCC/NSS/Adult Education/Student mentoring/NGO/Govt. Institutions, etc.), Internship (I), Research Methodology (RM), Dissertation/ two MJE.

AIM:

The FYUGP Programme in Biotechnology is designed to teach students how to think critically, logically, and analytically, which enables them to get a deeper understanding of the subject. A FYUGP degree in

Zoology will expose students to build a robust foundation in animal biology and to foster scientific temper through hands-on lab work, field studies and research.

The Programme covers broad range of topics on biotechnology. It also covers hands-on sessions in Lab using various equipments, which enables students to correlate and compare with recent developments in various branches of Biological science in a variety of organizations worldwide.

The programme aims to increase student's skill in Zoology as well as other cross-disciplinary subjects like Botany, Chemistry. Also aims students' flexibility to move from one discipline to another, to move one institution to another, to switch alternative modes of learning.

Programme Educational Objectives:

(PEO): PEO1:

Fundamental Knowledge and Skills:

Graduates will be well-versed in **Biotechnological** science concepts and techniques, enabling them to solve challenging problems and pursue advanced study in Zoology or related fields.

PEO2:

Analytical and Critical Thinking

Graduates will acquire the analytical and critical thinking abilities needed to formulate, evaluate and resolve real-world issues using logical reasoning.

PEO3:

Application of Biotechnology

Graduates will be efficient in using scientific tools and **Biotechnology** concepts to solve problems in a variety of sectors, including science, technology and Biotechnology.

PEO4:

Communication and Collaboration

Graduates will be able to effectively convey **Biotechnological** concepts, both orally and in writing, as well as collaborate in multidisciplinary teams to solve challenging problems.

PEO5:

Ethical and Professional Responsibilities

Graduates will exhibit dedication to moral behaviour and professional obligations, which include comprehending how **Biotechnology** solutions affect society and maintaining a high standard of professional development.

PEO6:

Lifelong Learning and Adaptability

Graduates will pursue lifelong learning in order to keep up with new developments and trends in Biotechnology and to adjust to the changing needs of both academia and the workforce.

PEO7:**Research and Innovation:**

Graduates will be equipped with the capacity to carry out autonomous research, enhancing their understanding of biotechnology and stimulating their imagination in addressing abstract and practical issues.

PROGRAMME OUTCOMES ARE GRADUATE ATTRIBUTES STATED AS FOLLOWS:**PO1: Disciplinary Knowledge**

Being able to demonstrate comprehensive knowledge and coherent understanding of both the theoretical and applied components of biotechnology as well as chosen interdisciplinary areas of study in a broad multidisciplinary context; ability to connect relevant disciplines, as well as recent innovations, with the learning disciplines of choice.

PO2: Communication Skills

Capability to express various biotechnological ideas clearly through computational methods, graphical methods, examples and their geometrical representations; ability to use biotechnology effectively as a precise language of communication in other fields; ability to pay close attention, read texts and research papers critically and communicate complicated information clearly and concisely to a variety of organisations and audiences.

PO3: Moral and Ethical Awareness/Reasoning

Ability to recognise ethical issues that are pertinent to one's work and pledge not to engage in unethical behaviours such as plagiarism, copyright and infringement of intellectual property rights; ability to appreciate recent developments in various fields and one's research with honesty and integrity in all aspects.

PO4: Multicultural Competence

Ability to correlate and compare recent developments in various branches of biology, ability to collaborate research in various fields of biotechnology with other researchers from a variety of communities and organisations; ability to effectively participate in a multicultural group or society and interact politely with diverse groups and the acquisition of knowledge of the values and beliefs of multiple cultures, and a global viewpoint to honour diversity.

PO5: Information/Digital Literacy

Ability to access and utilize Information and Communications Technology (ICT) tools.

PO6: Reflective Thinking

An understanding of how a researcher or an investigator influences and shapes the information one creates; ability to formulate appropriate questions pertaining to the ideas in various branches of biotechnology in order to propose new solutions using the domain knowledge of biotechnology; ability to interpret the findings and use them to solve a variety of problems found in numerous fields of biotechnology and real-life.

PO7: Cooperation/Team Work

Ability to collaborate with diverse teams in an effective and respectful manner; capacity to cooperate with people from varied backgrounds in the interests of a common goal.

PO8: Research Related Skills

The ability to formulate appropriate questions, problems, and hypotheses by analysing and interpreting the ideas from various branches of biotechnology; ability to demonstrate the results, theories, techniques and proofs using the concepts of various fields of zoology; ability to develop methodology and design research proposals.

PO9: Problem Solving

Ability to work independently and do in-depth study to find ways that biotechnology is used in various industries, pharmaceutical laboratories, and in daily life to improve job possibilities in a wide range of fields and academic study; ability to use innovative, imaginative, lateral thinking, interpersonal skills, and emotional intelligence; ability to tackle various challenges in both familiar and unfamiliar circumstances, then apply what they've learned to actual scenarios.

PO10: Critical Thinking

Capability to analyse and synthesise theoretical and applied problems, as well as acquire knowledge and skills through logical reasoning, analytical thinking and evaluations; ability to find gaps and logical faults in arguments; inculcate a healthy attitude to be a lifelong learner.

FYUGP-ZOOLOGY**SEMESTER I****Title of the Course :Biochemistry I-Minor****Course Code :BTNG1MN01****Nature of the Course : Minor-I****Total Credits 04****Distribution of Marks : 100 [60 End (Theory: 45, Lab: 15) + 40 IA****Learning Outcomes:**

- 1) .Explain how the structure of biomolecules like proteins, carbohydrates, lipids and nucleic acids determine their function
- 2) Describe major metabolic pathways
- 3) Explain enzyme structure and kinetics

UNIT	CONTENT	L	T	P	Total
1	Unit 1: Foundation of Biochemistry 1.1 Stabilizing interactions (Van der Waals, electrostatic, hydrogen bonding, hydrophobic interaction, etc.). Structure of atoms, molecules and chemical bonds 1.2 Significance of water in biochemistry; acid-base concept, buffers, pH and pK. 1.3 Energy rich compounds- sources and utilization Indian Knowledge system: Early study of Biochemistry in India	16	1		17
2	Unit 2: Biomolecules 2.1 Composition, structure and function of biomolecules (carbohydrates, lipids, proteins, nucleic acids and vitamins) and their metabolism	9	1	-	10
3	Unit 3: Enzymology 3.1 Introduction to enzymes: General characteristics, IUB enzyme classification, biological roles; 3.2 Definitions of IU, Allosteric enzymes, Isoenzymes, Ribozymes, 3.3 Cofactors and coenzymes 3.4 Mechanism of Enzyme Action, Enzyme Regulation, Enzyme Inhibition	11	1	-	12
4	Unit 4: Vitamins 4.1 Vitamins: classification, their coenzyme forms and functions	5	1	-	6
5	Lab Course a) Numerical problems based on the preparation of standard solutions of different molarity, normality, strength and percentage b) Effect of pH and temperature and substrate concentration on the rate of enzymatic reaction c) Estimation of proteins by Lowry and Bradford assays/ total carbohydrates by Anthrone method	--	-	15	15

	d) Estimation of DNA by diphenylamine method/ Quantification of RNA by Orcinol method				
	TOTAL	41	4	15	60

MODES OF IN-SEMESTER ASSESSMENT:

(40 Marks)

• One Internal Examination -

20 Marks

• Others (any one) -

10 Marks

o Seminar presentation on any of the relevant topics

o Assignment

o Group Discussion

o Quiz

o Viva-Voce

• Attendance

10 Marks

SUGGESTED READINGS

- Lehninger principles of Biochemistry
- Textbook of Biochemistry by D M Vasudevan
- Biochemistry by U Satyanarayana
- Animal Physiology & Biochemistry by Dr. R.A. Agarwal, Dr. Anil K. Srivastava & Dr. Kaushal Kumar
- A Textbook of Plant Physiology, Biochemistry and Biotechnology by Dr. S.K. Verma & Mohit Verma

Title of the Course :Cell Biology and Microbiology I-Minor**Course Code :BTNG2MN02****Nature of the Course : Minor-2****Total Credits 04****Distribution of Marks : 100 [60 End (Theory: 45, Lab: 15) + 40 IA****Learning Outcomes:**

1. Study of structure of prokaryotic and eukaryotic cell
2. Explain roles of cell organelles
3. Study mitosis and meiosis and its significance

UNIT	CONTENT	L	T	P	Total
1	Unit 1 1.1 Membrane structure and function (Structure of model membrane, lipid bilayer, osmosis, ion channels, active transport, membrane pumps). 1.2 Structural organization and function of intracellular organelles.	11	1	10	16
2	Unit 2 2.1 Cell division and cell cycle (Mitosis and meiosis, their regulation, steps in cell cycle).	10	1	-	11
3	Unit 3 3.1 Structure of bacteria; nutrition, growth medium. 3.2 Methods of sterilization and isolation.	10	1	-	11
4	Unit 4 4.1 Metabolic diversity among microorganisms. 4.2 Host parasite interactions.	10	1	-	11
5	Lab Course 1. Study of polytene chromosome in Drosophila/ Chironomus larvae/ Study of Barr body in epithelial buccal cell. 2. Study of mitosis in onion root tips/ tadpole tail. 3. Study of meiosis in flower bud/ grasshopper testes 4. Different types of media preparation/ sterilisation techniques 5. Gram staining technique of Bacteria.	--	-	15	15
	TOTAL	41	4	15	60

MODES OF IN-SEMESTER ASSESSMENT:**(40 Marks)**

• One Internal Examination -

20 Marks

• Others (any one) -

10 Marks

o Seminar presentation on any of the relevant topics

o Assignment

o Group Discussion

o Quiz

o Viva-Voce

• Attendance

10 Marks

SUGGESTED READINGS

- Cell Biology by C B Powar
- The Cell: A molecular Approach by Cooper and Hausman
- Cell and Molecular Biology By Robertes and Robertes
- Microbiology by P.D. Sharma
- Cell Biology by P.S. Verma & V.K. Agarwal
- Cell and Molecular Biology by S C Rastogi