# EKLAVYA UNIVERSITY, DAMOH (M.P.)

## Scheme of Examination B.Sc II Year

***/For batch admitted in Academic Session 2020-21/***

*Subject wise distribution of marks and corresponding credits*

| S. No. | Subject Name | Subject Code | Paper Name | Maximum Marks Allotted | | | | | | | | | | | Total Marks | Contact Periods Per week | | | Total Credits |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Theory Slot | | | | | | | | | Practical Slot | | | | | | |
| | | | | Final Yearly | | | | Half Yearly | | | | Quiz/ Assignment/ Attendence | End Sem | Lab Work/ Sessional | | L | T | P | |
| | | | | P1 | P2 | P3 | P4 | P1 | P2 | P3 | P4 | | | | | | | | |
| 1 | Common | BPIND20Y201 | Summer Project/Industrial Training | | | | | | | | | | | | 150 | 0 | 0 | 0 | 11 |
| | | BSECA20Y201 | Skill Enhancement Course (SEC-1) | 60 | | | | 30 | | | | 10 | | | 100 | 2 | 0 | 0 | 2 |
| | | BSECB20Y202 | Skill Enhancement Course (SEC-2) | 60 | | | | 30 | | | | 10 | | | 100 | 4 | 0 | 0 | 4 |
| | | BYOGA20Y201 | Yoga- 2 (University Core) | – | – | – | | – | – | – | | – | 60 | 40 | 100 | 2 | 0 | 0 | 2 |
| 2 | Microbiology | BMBIO20Y201 | Microbial Physiology and Metabolism (Paper-I ) (Core Course - 4A) | 30 | | | | 15 | | | | 5 | | | 50 | 3 | 1 | 0 | 4 |
| | | BMBIO20Y202 | Microbial Genetics and Molecular Biology (Paper-II ) (Core Course - 4B) | | 30 | | | | 15 | | | | | | 50 | 3 | 1 | 0 | 4 |
| | | BMBIO20Y203 | Paper- I and Paper- II, Practical (Practical 4A & 4B, Core Course 4C) | | | | | | | | | | 30 | 20 | 50 | 0 | 0 | 2 | 2 |
| | | BMBIO20Y204 | Biophysics and Biochemistry (Paper-III) (Core Course - 4D for Honors) | | | 30 | | | | 15 | | 5 | | | 50 | 3 | 1 | 0 | 4 |
| | | BMBIO20Y205 | Paper- III, Practical (Practical 4D for Honours, core Course 4E) | | | | | | | | | | 30 | 20 | 50 | 0 | 0 | 1 | 1 |
| 3 | Common | BASPR20Y201 | Assingment Presentation for 3 Core Courses | | | | | | | | | | | 50 | 50 | 0 | 3 | 0 | 3 |

**Induction programme of three weeks (MC): Physical activity, Creative Arts, Universal Human Values, Literary, Proficiencey Modules, Lectures by Eminent People, Visits to local Areas, Familiarization to Dept./Branch & Innovations.**

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Estd. by Madhya Pradesh Niji Vishwavidyalaya (Sthapna Avam Sanchalan) Adhiyadesh, 2020

# School of Basic And Applied Sciences

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|---|---|---|---|---|
| **Class** | | | | **B.Sc. Microbiology** |
| **Semester / Year** | | | | **II Year** |
| **Subject & Subject code** | | | | **Microbiology- BMBIO20Y201** |
| **Paper** | | | | **MICROBIAL PHYSIOLOGY & METABOLISM (Paper-I )** |
| **Max. Marks** | | | | **30 (ETE) + 20 (IA)** |
| **Credit** | | | **Total Credits** | |
| **L** | **T** | **P** | **4** | |
| 3 | 1 | 0 | | |

## Course Objectives:

This module gives us detailed knowledge about the growth and metabolism of bacteria. A major goal of Microbial Physiology and Metabolism is to assist scientists in rapidly communicating their research results to other scientists through an open, free-access platform, free from some of the restrictions.

## Course Outcome:

On successful completion of the course, the student shall be able to:

1. Describe the nutritional requirements of microbes and the effect of environmental factors on the growth of microorganisms.
2. Classify the various transport mechanisms in microbes.
3. Define the metabolic pathways in microbes.
4. Distinguish between various fermentation mechanisms in microbes.
5. Discuss about anoxygenic and oxygenic photosynthesis in bacteria and cyanobacteria.

## Student Learning Outcomes (SLO):

On successful completion of the course, the student shall be able to:

1. Demonstrate the Winogradsky column.
2. Describe the procedure of sterilization.
3. Describe the process of preparation of basic culture media.
4. Demonstrate the basic concept of cultivation of microorganisms
5. Analyse the growth curve of bacteria
6. Describe the effect of environmental factor
7. Learn about the microbial taxonomy, the basics of microbes, microbial growth, microbial diversity its importance and application in day to day life and beneficial versus harmful microorganisms.

| Unit | Syllabus | Periods |
|---|---|---|

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|---|---|---|
| **UNIT - I** | **MICROBIAL GROWTH :**<br>Definition of growth, Mathematical nature and expression of growth, Generation time. Growth curve in Bacteria, Measurement of Growth (Cell number, cell mass and cell constituent), Effect of environment on the microbial growth. (temperature, pH and Oxygen), Continuous culture synchronous culture and Batch culture. | 15 |
| **UNIT - II** | **MEMBRANE TRANSPORT PROCESS :**<br>Different models of cell membrane, Biochemical properties of cell membrane, function of cell membrane, Types of cellular transport (diffusion, gaseous exchange, osmosis, plasmolysis, active & passive transport, group translocation). | 15 |
| **UNIT - III** | **BACTERIAL PHOTOSYNTHESIS AND FUELING REACTIONS :**<br>Classification of photosynthetic bacteria (Oxygenic & an oxygenic photosynthetic bacteria). Photosynthetic structure. Photosynthetic pigments. Photosynthetic electron transport system. Mechanism of photosynthesis (Cyclic & Non cyclic). | 15 |
| **UNIT - IV** | **METABOLIC PATHWAYS :**<br>Respiratory Pathways (Glycolysis, Entner Daudoroff pathway, Pentose phosphate pathway, krebs cycle). Calvin cycle, substrate level & oxidative phosphorylation, Fermentation process & products. | 15 |
| **UNIT - V** | **MICROBIAL ASSIMILATION AND BIOENERGETICS :**<br>Assimilation of Ammonia, Nitrogen and sulphate Methanogens and methylotrophs, Principles of Bioenergetics G. endergonic and exergonic reaction. Oxidation reduction reaction. Redoxpotential. | 15 |

**Text Books–**


1 Doelle, H.W. 1975, Bacterial metabolism 2nd edition Academic press.

2 Moat, A.G. and Foster, J.W. 1988. Microbial physiology, 2nd edition, Springer verlag.


**Reference Books–**


1 White, D. 2000 Physiology and Biochemistry of Prokaryotes. 2nd edition. Oxford university press New York.

2 Calwell D.R. 1995 Microbial physiology and metabolism. Wm. Brown publishers, England.

3 Madigan, M.T. Martinko J.M. Stahl, D.A. and Clark, D.P. 2012. Brock Biology of Microorganisms 13th edition, Benjamin Cummings, San Francisco.

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| **Class** | **B.Sc. Microbiology** |
| **Semester / Year** | **II Year** |
| **Subject & Subject code** | **Microbiology- BMBIO20Y202** |
| **Paper** | **MICROBIAL GENETICS AND MOLECULAR BIOLOGY (Paper-I** |
| **Max. Marks** | **30 (ETE) + 20 (IA)** |

| **Credit** | | | **Total Credits** |
|---|---|---|---|
| **L** | **T** | **P** | **4** |
| 3 | 1 | 0 | |

## Course Objectives:

Explain the processes behind mutations and other genetic changes. identify and distinguish genetic regulato mechanisms at different levels. solve theoretical and practical problems in genetic analysis particularly conc genetic mapping and strain construction.Molecular biology deals with nucleic acids and proteins and how tl molecules interact within the cell to promote proper growth, division, and development. It is a large and eve discipline. This course will emphasize the molecular mechanisms of DNA replication, repair, protein synth

## Course Outcome:

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

1. Know the terms and terminologies related to molecular biology and microbial
2. Understand the properties, structure and function of genes in living organisms at the molecular level
3. Explain the significance of central dogma of gene action
4. Have a conceptual knowledge about DNA as a genetic material, enzymology, and replication strategies
5. Understand the molecular mechanisms involved in transcription and translation
6. Describe the importance of genetic code and wobble hypothesis
7. Discuss the molecular mechanisms underlying mutations,detection of mutations and DNA damage and re mechanisms
8. Explain the concept of recombination, linkage mapping and elucidate the gene transfer mechanisms in pr and eukaryotes

## Student Learning Outcomes (SLO):

Students will:

1. Apply the knowledge to understand the microbial physiology and to identify the microorganisms.
2. Understand the regulation of biochemical pathway and possible process modifications for improved cont microorganisms for microbial product synthesis.
3. Explain principles/concept of Prokaryotic and Eukaryotic genetics, Viral genetics and application in rese
4. Mutagenesis, Mutation and mutants and their significance in microbial evolution.
5. Application of bacterial and eukaryotic plasmids in research.

| **Unit** | **Syllabus** |
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|---|---|
| **UNIT - I** | DNA REPLICATION AND PROTEIN SYNTHESIS :<br>Types and mechanism of DNA Replication, DNA topology; DNA Replication in prokaryotes and eukaryotes, Protein synthesis. |
| **UNIT - II** | GENE REGULATION IN PROKARYOTES AND EUKARYOTES :<br>Operon concept – Lac and trp; Britten Davidson model of gene expression. |
| **UNIT - III** | MUTATION :<br>Types of mutation : Molecular basis, Mutagenic agents DNA damage and repair mechanism; Auxotrophs; Prototrophs and ame's test. |
| **UNIT - IV** | GENETIC RECOMBINATION IN BACETERIA<br>Transformation, Transduction and Conjugation, Genetic mapping, extrachromosomal genetic material; Plasmid, cosmid, transposon, overlapping genes, silent genes. |
| **UNIT - V** | RECOMBINANT DNA TECHNOLOGY :-<br>Isolation of DNA; Enzymes used in recombinant DNA Technology; Use of vectors ; PBR322, PUC 8 phage vectors- M.13 Cosmid, phagemic, TI plasmid, SV40; Gene cloning in prokaryotes; Southern and western blotting. rDNA products; Insulin, Interferons and Immunotoxins. |

**Text Books–**


1. Nicholl, D.S.T 1994 An introduction to genetic engineering, Cambridge university press.

2. Old. R.W. and Primrose. S.B. 2006 Principles of Gene manipulation, 4th edition, Blackwell sci publications, London.

3. Recombinant DNA Tech. by Sardul Singh Sandh, I.K. International. New Delhi.


**Reference Books–**


1. Primrose, S. Twyman, R and Old, B. 2001 Principle of Gene Manipulation, 6th edition, Black Ltd.

2. Chakravary, A.K. 2013, Introduction to biotechnology, OUP India.

3. Chaudhuri K. 2012, microbial genetics. The enegy and resources institute, TERI.

4. Sridhar S. 2005 Genetics and microbial biotechnology. Dominant publishers and distributors.


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# School of Basic And Applied Sciences

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|---|---|---|---|---|
| **Class** | | | | **B.Sc. Microbiology** |
| **Semester / Year** | | | | **II Year** |
| **Subject & Subject code** | | | | **Practical Microbiology- BMBIO20Y203** |
| **Paper** | | | | **Paper- I and Paper- II, Practical** |
| **Max. Marks** | | | | **50= (30+20)** (ETE + IA) |
| **L** | **T** | **P** | **2** | |
| 0 | 0 | 2 | | |

## PRACTICALS

1. Study of osmosis in bacterial cell.
2. Study of plasmolysis in bacterial cell.
3. Effect of pH on the growth of bacteria on solid media.
4. Effect of salt on growth of microorganisms.
5. Effect of temperature on the growth of microorganisms.
6. Effect of antibiotics on bacterial growth by paper disc method.
7. Measurement of size-Micrometer.
8. Measurement of cell number – Haemocytometer.
9. Isolation of DNA from bacteria.
10. Immobilization of yeast cells by sodium alginate method.

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# School of Basic and Applied Sciences

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|---|---|---|---|---|
| **Class** | | | | **B.Sc. Microbiology (Honours)** |
| **Semester/Year** | | | | **II Year** |
| **Subject & Subject Code** | | | | **Microbiology Honours- BMBIO20Y204** |
| **Paper** | | | | **Biophysics and Biochemistry (Paper-III)** |
| **Max. Marks** | | | | 30 (CETE) + 20 (IA) |
| **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. Illustrate the basic principle and techniques to understand the biological problem.
2. Identify the physical principles responsible for maintaining the basic cellular function.
3. Appraise the importance of various biophysical techniques.
4. Practices the techniques of Chromatography and Spectroscopy.
5. Ability to understand fundamental concepts of biology, chemistry and biochemistry.
6. Ability to apply basic principles of chemistry to biological systems and molecular biology.
7. Ability to relate various interrelated physiological and metabolic events.

## 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 |
|---|---|---|

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| UNIT - I | Thermodynamics : Thermodynamic system, Equilibrium, Thermodynamic laws and their applications. Different types of process. Thermodynamic variables and Entropy. Thermodynamic potentials and relations, Maxwell's Equations. Fundamental equation of heat flow. | 15 |
| UNIT - II | General Biophysical methods : Measurement of pH, Radioactive labeling & counting Autoradiography. Diffusion, Sedimentation. Osmosis. Viscosity. Definition. Factors influencing them and their application in biology. Bragg's equation Reciprocal lattice, Miller indices & Unit cell, Concept of different crystal structure, determination of crystal structure. | 15 |
| UNIT - III | Fundamental of Biochemistry : Biochemistry as molecular logic of living beings, Axioms of living matter, Major organic compounds of animate objects a general view. Chemical elements. Structure of atoms, molecules and chemical bonds. Lonic, covalent, coordinate and hydrogen bonds. Structure function and properties of water. Water as universal solvent, Acids, bases | 15 |
| UNIT - IV | Bimolecules : Introduction and occurrence, classification, properties, Importance of carbohydrate, lipids, Proteins, Amino acids and nucleic acids and various types of RNA's. | 15 |
| UNIT - V | Enzymes : Structure, classification and function –Active site, energy of activation, transition state hypothesis, lock and key hypothesis, induced fit hypothesis, Concept of Km – Michaelis Menten equation. Various types of enzyme inhibition and identification using double reciprocal plot. Introduction to Allosterice Enzymes. Definition of holoenzyme. Apoenzyme. Coenzyme, cofactor. Prosthetic group and their example. Concept of | 15 |

**TEXT BOOKS –**


1 Ackerman E.A. Ellis, L.E.E. & Williams L.E. (1979), Biophysical Science, Prentice-Hall Inc.

2 Barrow. C. (1974), Physical Chemistry For Life Sciences, McGraw-Hill.

3 Berns M.W. (1982), Cells, Holt Sounders International Editors.

4 Bloomfield V.A. and Harrington R.E. (1975), Biophysical chemistry, W.A.Freeman and CO.

5 Cantor C.R. and Schimmel P.R. (1980), Biophysical chemistry, W.A.Fremman and Co.


**REFERENCE BOOKS –**


1 Boyer, R.F., Biochemistry Laboratory: Modern Theory and Techniques, 6th ed., Boston, Mass: Prentice Hall, 2012.

2 Plummer D.T., An Introduction to Practical Biochemistry 3rd ed., Tata McGraw Hill Education Pvt. Ltd. (New Delhi), 1998.

3 Wilson K. and Walker J., Principles and Techniques of Biochemistry and Molecular Biology, 7th ed., Cambridge University Press, 2010.

4 Wiley, J.M., Sherwood, L.M. and Woolverton, C.J.. Prescott's Microbiology 10th edition. Mc Graw Hill Higher Education 2017.

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# School of Basic And Applied Sciences

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|---|---|---|---|---|
| **Class** | | | | **B.Sc. Microbiology (Honours)** |
| **Semester / Year** | | | | **II Year** |
| **Subject & Subject code** | | | | **Practical Microbiology Honours- BMBIO20Y205** |
| **Paper** | | | | **Paper- III, Practical** |
| **Max. Marks** | | | | **30 (ETE) + 20 (IA) =50** |
| **L** | **T** | **P** | **1** | |
| 0 | 0 | 1 | | |

## PRACTICALS

1 Qualitative analysis of Carbohydrates, Proteins and Lipids.

2 Quantitative estimation of Protein by Folin – Lowry method.

3 Quantitative estimation of sugar by Nelson Smogyi's method.

4 Determination of enzyme activity by amylase.

5 Study the effect of pH on enzyme activity.

6 Study the effect of tempprerture on enzyme activity.

7 RBC counting by haematocytometer.

8 WBC counting by Differential/or total cell count.

9 Measurement of bleeding and clotting time.