(Bachelor of Science)
(B.Sc) (Biotechnology) Semester V

| Course Code | US05MABTE01 | Title of the Course | Enzymology & Metabolism |
|---|---|---|---|
| Total Credits Of the Course | 04 | Hours per Week | 04 |

| | |
|---|---|
| Course Objectives: | 1. To understand mechanism of enzyme catalysis, enzyme kinetics<br>2. To understand enzyme immobilization and industrial application of enzymes.<br>3. To understand the concept of the metabolic reaction of cells that is essential for the sustenance of life.<br>4. To make them able to understand to ATP synthesis, electron transport chain and photosynthesis.<br>5. To understand the pathways for degradation and biosynthesis of carbohydrate, lipid & nucleic acids. |

Course Content

| Unit | Description | Weightage* (%) |
|---|---|---|
| 1. | Enzymology—General characteristics, classification of enzymes Structure of active site of enzymes, specificity of enzyme action-Types and factors affecting enzyme activity. Brief introduction of allosteric enzymes. Enzyme kinetics—Derivation of Michaelis and Menten equation and its modifications (Line-weaver Burk plots). | 25% |
| 2. | Mechanism of action of enzymes, Catalytic mechanism (Proximity and orientation, strain and distortion, acid-base and covalent catalysis) (chymotrypsin, lysozyme). Enzyme inhibition: Mechanism and types (Reversible & Irreversible) Immobilization: Definition, techniques and applications. Industrial application of amylase, protease & lipase. | 25% |
| 3. | Metabolism- Introduction, Definition of Anabolism & Catabolism.<br>Glycolysis, Pentose phosphate pathway, Gluconeogenesis, Glycogenolysis and glycogen synthesis. TCA cycle.<br>Electron Transport Chain, Oxidative phosphorylation, Chemiosmotic theory, ATP synthase | 25% |
| 4. | FAS complex enzyme. Synthesis of saturated fatty acids, β oxidation of saturated fatty acid, Ketone-body metabolism. Nucleotide biosynthesis. Denovo and salvage pathway, Photosynthesis, Urea cycle. Inborn errors of metabolisim. | 25% |

| | |
|---|---|
| Teaching-Learning Methodology | Classroom interaction,Use of blackboard and chalk<br>ICT tools involving smartboards, powerpoint presentation,videos, animations & models.<br>Assignments Seminar, unit test,andquiz |

| Evaluation Pattern | | |
|---|---|---|
| Sr. No. | Details of the Evaluation | Weightage |
| 1. | Internal Written/Practical Examination(As per CBCS R.6.8.3) | 25% |
| 2. | Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3) | 25% |
| 3. | University Examination | 50% |

| Course Outcomes: Having completed this course, the learner will be able to | |
|---|---|
| 1. | Explain enzyme characteristics, enzyme specificity and enzyme kinetics |
| 2. | Understand the different techniques of enzyme immobilization and industrial applications of enzymes |
| 3. | Students will get an understanding of how living organisms get energy at molecular level through metabolic activities. |
| 4. | Make them able to understand to ATP synthesis, electron transport chain and photosynthesis. |
| 5. | Understand the pathways for degradation and biosynthesis of carbohydrate, lipid & nucleic acids |

| SuggestedReferences: | |
|---|---|
| Sr.No. | References |
| 1. | Biochemistry–Zubay |
| 2. | Enzymology- Palmer; |
| 3 | Fundamentals of Enzymology–Nicolas Price &Lewis Stevens |
| 4 | Biochemistry–Stryer |
| 5 | Textbook of biochemistry-Vasudevan &Shreekumari |
| 6 | Principle of Biochemistry–Lehninger |
| 7 | Fundamentals of Biochemistry- Voet & Voet |
| 8 | Biochemistry- U Satyanarayan |

| On-line resources to be used if available as reference material |
|---|
| On-line Resources |
| Nptel.ac.in |
| SANDHAN BISAG |

*****

**(Bachelor of Science)**
**(B.Sc) (Biotechnology) Semester V**

| Course Code | US05MABTE02 | Title of the Course | Fundamentals of Immunology |
|---|---|---|---|
| Total Credits Of the Course | 4 | Hours/ Week | 4 |

| Course Objectives: | 1. To study basic concepts of Infection, Immunology& epidemiology<br>2. To study the concepts of antigen, antibody,complement and antibody reaction.<br>3. To study various cells, organs, and receptors of immune system and their effect.<br>4. To have an idea about various immune disorders and immune-prophylaxis. |
|---|---|

Course Content

| Unit | Description | Weightage* (%) |
|---|---|---|
| 1. | Concept of Infection (source, method of transmission, types of infection, factors predisposing infection).<br>Immunity: Innate immunity- Innate Immunity- mechanism of Innate immunity (anatomical barrier, phagocytosis, cellular innate response and Inflammation)<br>Acquired Immunity (Active and Passive) Primary and secondary immune response, Introduction to Primary lymphoid organs and secondary lymphoid (spleen and lymph nodes) organs.<br>Epidemiology: Concept, Epidemiology markers, carrier, Epidemic disease (Plague and Influenza), Herd immunity. | 25 |
| 2. | Antigen and Immunogen, Hapten Epitope, adjuvant, Properties of Antigen.<br>Antibodies - structure of IgG, classes of Ig (physiochemical and biological properties and function).<br>Complement – function and Complement pathways.<br>Properties and Mechanism of Ag-Ab reaction (Zone phenomenon, Lattice formation,), Principle application of Ag-Ab reaction (agglutination reaction, Precipitation reaction immune- diffusion, Immunoelectrophoresis, immuno-fluroscence, ELISA, CFT, RIA). | 25 |
| 3. | Introduction to Hematopoesis and Immune cell (B cell, T cell, APC), Concepts of Humoral and cell mediated immune response.<br>MHC molecules- structure and function.<br>Receptor and signaling- introduction to B-cell and T cell receptor cytokines (general properties and attributes), overview of chemokine.<br>Effectors response- Cell and antibody mediated. NK cell mechanism.<br>Immunodeficiency disorder (Primary(SCID) and secondary (HIV)) | 25 |

| | | |
|---|---|---|
| 4. | Immune Disorder: Hypersensitivity (gel and Coomb's classification), introduction to tolerance system, Mechanism and disorder of Autoimmunity (Hashimotos thyroiditis, antibody stimulating and blocking-gravis and Myasthenia gravis, Systemic reaction (SLE, Rheumatoid arthritis),Introduction to transplantation immunology (types of graft, mechanism andtypesofrejection. infectious disease(influenza and TB)<br>vaccine: Introduction and types of vaccine. | 25 |

| | |
|---|---|
| Teaching-Learning Methodology | Chalk board, PowerPoint presentation, quizzes, Video available on NPTEL and BISAG |

| Evaluation Pattern | | |
|---|---|---|
| Sr. No. | Details of the Evaluation | Weightage |
| 1. | Internal Written/Practical Examination (As per CBCSR.6.8.3) | 25% |
| 2. | Internal Continuous Assessment in the form of Practical ,Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3) | 25% |
| 3. | University Examination | 50% |

| CourseOutcomes:Havingcompleted thiscourse,thelearnerwill beable to | |
|---|---|
| 1. | Understand infection, types ofimmunityandepidemiology |
| 2. | UnderstandAntigen, Antibody, Complement and Ag-Abreaction |
| 3. | Understand hematopoiesis MHC and immune effectors response and immunodeficiency diseases. |
| 4. | Understand Immune disorderandImmuno-prophylaxis. |

| SuggestedReferences: | |
|---|---|
| Sr. No. | References |
| 1. | Immunology,Kuby |
| 2. | Textbook of Microbiology ,Ananthanarayan and Panikar |
| 3. | Immunology: Roitt's |
| 4. | Basic Immunology ,Abul K Abbas, Andrew h Lichtman, shiv pillai |
| 5. | Immunology: a textbook, Rao. C. vaman |

| On-line Resources |
|---|
| Nptel.ac.in |
| SANDHAN,BISAG |

*****

**SARDARPATELUNIVERSITY**
**Vallabh Vidyanagar, Gujarat**
**(Reaccredited with 'A' Grade by NAAC)**
**Syllabus with effect from the Academic Year 2025-2026**

## (Bachelor of Science)
## (B.Sc) (Biotechnology) Semester V

| Course Code | US05MABTE03 | Title of the Course | Biotechnology Practical |
|---|---|---|---|
| Total Credits Of the Course | 4 | Hours/ Week | 8 |

| | |
|---|---|
| Course Objectives: | 5. The student will have a practical approach on enzyme activity and various factors affecting enzyme activity<br>6. The student will study various clinical analysis of in born error of metabolism<br>7. The student will study various clinical diagnosis blood and urine test. |

| Course Content | | |
|---|---|---|
| | **Section-I** | Weightage* (%) |
| | 1. To study effect of substrate concentration<br>2. To stud effect of pH /temperature and time on enzyme activity.<br>3. Immobilization by Calcium alginate and check its activity.<br>4. To estimate reducing sugar by Nelson –Somogyi method<br>5. Qualitative analysis of Protein.<br>6. SGPT/SGOT<br>7. Estimation of creatinine by Jaff's method.<br>8. TLC<br>9. Extraction of amylase from the germinating seeds.<br>10. Study of competitive and non competitive inhibition of amylase enzyme. | 50 |
| . | **Section –II** | |
| | 1. Total count of WBC/RBC<br>2. DC of WBC<br>3. RID<br>4. QPA<br>5. Medical microbiological case study of (any organism)<br>6. Estimation of blood sugar by GOD-POD method<br>7. Estimation of blood urea by DAMs method<br>8. Urine analysis<br>9. Estimation of Bilirubin test<br>10. Widal test.<br>11. Dot Elisa<br>12. Repot/presentation analysis of Disease. | 50 |

| | |
|---|---|
| Teaching-Learning Methodology | Chalkboard, PowerPoint presentation, quizzes, Video available on NPTEL and BISAG |

| Evaluation Pattern | | |
|---|---|---|
| Sr. No. | Details of the Evaluation | Weightage |
| 1. | Internal Written/Practical Examination (As per CBCS R.6.8.3) | 25% |
| 2. | Internal Continuous Assessment in the form of Practical,Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3) | 25% |
| 3. | University Examination | 50% |

| Course Outcomes: Having completed this course, the learner will be able to | |
|---|---|
| 1. | To understand enzyme activity and various factors affecting enzyme activity |
| 2. | To understand estimate and understand various inborn errors of metabolism. |
| 3. | To understand clinical diagnosis of disease. |
| 4. | To understand various antigen-antibody interaction. |

| Suggested References: | |
|---|---|
| Sr. No. | References |
| 1. | Experimental Microbiology- Rakesh J patel |
| 2. | Histology techniques by KLaxminarayan |
| 3. | On-line resources |

| On-lineResources |
|---|
| Nptel.ac.in |
| SANDHAN, BISAG |

*****

**SARDAR PATEL UNIVERSITY**

**Vallabh Vidyanagar, Gujarat (Reaccredited with 'A' Grade by NAAC)**

**Syllabus with effect from the Academic Year 2025-26**

## (Bachelor of Science)

## (B.Sc) (Biotechnology) Semester V

| Course Code | US05MIBTE01 | Title of the Course | Clinical Diagnosis |
|---|---|---|---|
| Total Credits of the Course | 02 | Hours per Week | 02 |

| | |
|---|---|
| Course Objectives | 1. To understand the blood components and its separation and storage in blood banks.<br>2. To understand various diseases and its diagnosis. |

| Course Content | | |
|---|---|---|
| Unit 1 | Introduction and scope of Clinical diagnosis, Introduction to haematology, Blood (Normal constituents of blood, functions, HB structure), blood bank (Collection, storage, plasma, anticoagulation factors), body fluids (CSF), preparation of serum and overview of serodiagnosis. | Weightage*(%)<br>50% |
| Unit 2 | Clinical biochemistry: Blood sugar regulation (Hormonal) and abnormalities, HB abnormalities (Sickle cell anaemia/Thalassemia), Inborn error of metabolism (bilirubin), Lipoprotein metabolism disorder (Cholesterol), Urine formation and examination (Physical, chemical, microscopic) | 50% |

| | |
|---|---|
| Teaching-Assignments, Learning | Lecture, Recitation, Group discussion, Guest speaker, Debate, Seminar, Quizzes. |

| Evaluation Pattern | | |
|---|---|---|
| Sr. No. | Details of the Evaluation | Weightage |
| 1. | Internal Written/Practical Examination (As per CBCS R.6.8.3) | 25% |
| 2. | CEE: Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance, etc | 25% |
| 3. | University Examination | 50% |

| Course Outcomes:<br>Having completed this course, the learner will be able to | |
|---|---|
| 1. | The students will be able to understand blood as a diagnosis tool and components. |
| 2. | Students will be able to understand the various disorder pertaining to human body. |

| Suggested References: | |
|---|---|
| Sr No | References<br>1. Histology techniques by K Laxminarayan<br>2. Introduction to genetic analysis by Griffith<br>3. Human genetics by Vogel |
| On-line resources to be used if available as reference material | |
| On-line Resources | |
| Relevant entries on Nptel.ac.in, Sandhan, Bisag, Encyclopaedia Britannica | |
| | |

**(Bachelor of Science)**
**(B.Sc) (Biotechnology) Semester V**

| Course Code | US05MIBTE02 | Title of the Course | Practicals |
|---|---|---|---|
| Total Credits of the Course | 02 | Hours per Week | 04 |

| Course Objectives | 1. To understand the various aseptic and safety practices used in a medical laboratory.<br>2. To introduce blood and urine to understand various disorders. |
|---|---|

| Course Content |
|---|
| 1. Aseptic practice in laboratory and safety precautions<br>2. Preparation of serum<br>3. Estimation of haemoglobin by Sahli's method<br>4. Total count of blood cells (WBC/RBC)<br>5. Differential count of WBC<br>6. Urine analysis- (Physical/chemical /microscopic)<br>7. Estimation of Bilirubin.<br>8. Estimation of blood sugar: GOD-POD method |

| Teaching-Assignments, Learning | Lecture, Recitation, Group discussion, Guest speaker, Debate, Seminar, Quizzes. |
|---|---|

| Evaluation Pattern | | |
|---|---|---|
| Sr. No. | Details of the Evaluation | Weightage |
| 1. | CEE: Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance, etc | 50% |
| 2. | University Examination | 50% |

| Course Outcomes:<br>Having completed this course, the learner will be able to | |
|---|---|
| 1. | The students will be able to use various laboratory tools with clean and safely approach. |
| 2. | The students will be able to perform various blood and urine analysis. |

| Suggested References: | |
|---|---|
| Sr No | References<br>4. Experimental microbiology by Rakesh J. Patel<br>5. Histology techniques by K Laxminarayan |
| On-line resources to be used if available as reference material | |
| On-line Resources | |
| Relevant entries on Wikipedia and Encyclopaedia Britannica | |