KADI SARVA VISHWAVIDYALAYA, GANDHINAGAR

B.Sc. Curriculum as Per NEP

Microbiology Subject Syllabus
Semester 3

W.E.F. June 2024

KADI SARVA VISHWAVIDYALAYA

B.Sc Semester 3 (Microbiology Subject's Syllabus)

Microbiology Major Course -5

MBM221-2C - INTRODUCTION TO BIOCHEMISTRY

LEARNING OUTCOMES:

- Understand the concept of Biomolecules and Microbial chemistry.
- Develop an understanding of the Chemistry of microbial constituents and awareness of the microbes.
- Gain knowledge about the structure, function and applications of the bacterial cell molecules and its development.

TEACHING AND EVALUATION SCHEME:

Subject Code	Subject Title	Teaching Scheme	Credits	Examination Scheme			Total Marks
				Hrs.	Max Marks		
		Theory hrs Per Week			*CCE	*SEE	
MBM221-2C	**Introduction to Biochemistry**	**4**	**4**	**2.5**	**50**	**50**	**100**

Unit 1: pH, Buffer and Bioenergetic **Teaching Hours: 15 (Weightage 25%)**

- Structure and properties of water
- pH : Hydrogen ion concentration, Handerson – Hasselbalch equation.
- Buffer- definition, Types & Properties of buffer, Buffers of biological importance such as carbonate-bicarbonate, phosphate and acetate buffer.
- Principles of bioenergetics.
- High energy phosphate compounds (ATP, NADH, and NADPH).

Unit 2: Carbohydrates and lipids **Teaching Hours: 15 (Weightage 25%)**

Carbohydrates

- Definition, Nature, properties and significance
- Classification of Carbohydrates
  - Structure and functions of Monosaccharides (trioses, pentoses and hexoses),
  - Structure and functions of Disaccharides (maltose, lactose and sucrose) and
  - Structure and functions of Polysaccharides (starch and cellulose).

Lipids:

- Definition, classification of lipids
- Distribution and functions of lipids in microorganisms.
- Structure and functions of Fatty acids: Saturated and unsaturated

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Unit III: Vitamins, Amino acids and Hormones **Teaching Hours: 15 (Weightage 25%)**

- Vitamins: Classification and its biological importance.
- Amino acids:
  - Structural Features of Amino Acids and properties.
  - Classification, Structure, Zwitterions nature.
- Hormones: Steroid hormones, Structure and function.

Unit-IV: Proteins and Nucleic acids **Teaching Hours: 15 (Weightage 25%)**

- Proteins:
  - Classification, Structure and function.
  - Levels of Protein Structure: Primary, secondary, tertiary and quaternary structure.
  - Protein Denaturation and Folding.
- Nucleic acids:
  - Classification, structures and importance.
  - Structure of nitrogenous bases; Structure and function of nucleotides.
  - Structures of DNA and RNA
  - Types of DNA and RNA

***CCE**: Continuous and Comprehensive Evaluation: It consists of Assignments /Seminars/ Presentations /Quizzes/Surprise Tests.

***SEE:** Semester End Evaluation

Reference Books:

1. Principles of Biochemistry, Author- A.L. Lehniger
2. Fundamentals of Biochemistry, Author- J. L. Jain
3. Biochemistry, Author- Voet and Voet.
4. Textbook of Biochemistry- S.P. Singh.
5. Biochemistry, Author- Stryer.
6. Biochemistry- U. Satyanarayan
7. Introduction to protein structure, Authors- Branden and Tooze.
8. Principles of Biochemistry, Authors – Zubey, Parson and Vance.

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Microbiology Major Course -6

MBM222-2C –FUNDANMENTALS OF IMMUNOLOGY

LEARNINGOUTCOMES:

- Understand the concept of Immune system and Immunity.
- Gain knowledge about the various defense mechanisms of body.
- Learn about various immune disorders and the concept of transplantation.

TEACHING AND EVALUATION SCHEME:

Subject Code	Subject Title	Teaching Scheme	Credits	Examination Scheme			Total Marks
				Hrs.	Max Marks		
		Theory hrs Per Week			*CCE	*SEE	
MBM222-2C	**Fundamentals of Immunology**	**4**	**4**	**2.5**	**50**	**50**	**100**

Unit 1:Immune System and Immune Response **TeachingHours:15 (Weightage25%)**

- Immunity and its types (4hr):
  - Innate immunity: Types of defensive barriers: anatomic, physiologic, phagocytic, and inflammatory (native), Innate immunity: species, racial and individual,
  - Acquired immunity: active and passive, Natural and Artificial
  - Herd immunity
- Overview of Normal Flora of Human Body: Skin, Respiratory, Digestive Tract, Genitourinary Tract, Eyes, Mouth etc
- Cells and organs of the immune system:
  - Types of lymphocyte: B-cells and T-cells, B. Antigens presenting cells: neutrophils, macrophages and dendritic cells (3hr)
  - Primary (central) and secondary (peripheral) lymphoid organs (3hr)
- Immune response (IR) (5 hr):
  - Characteristics of Immune response,
  - Humoral and cell mediated immune response,
  - Primary and secondary immune response

Unit 2: Antigens and Antibodies **TeachingHours:15 (Weightage25%)**

- Antigens: Nature and types of Antigen, Concept of Antigenicity and Immunogenicity, Characteristics of Antigen, Adjuvants and Hapten (5 hr).
- Epitopes, B- Cells and T-cells Epitopes (3hr).
- MHC molecules (2 hr)
- Immunoglobulin: Basic structure, Classes of immunoglobulin, Biological properties of immunoglobulin, Antibody-Mediated Effector Functions (5 hr).

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Unit-3: Antigen-Antibody Reactions	**Teaching Hours: 15 (Weightage 25%)**
➢ General features of antigen-antibody reactions, Mechanism of antigen-antibody reactions: zone phenomenon and lattice formation (3hr) ➢ Agglutination reactions(2 hr) ➢ Precipitation reactions(1 hr) ➢ Immunofluorescence(1 hr) ➢ ELISA and RIA (3hr) ➢ Complement System: Components of complement, Pathways of Complement System-Classical, Alternate and Lectin, Biological activities of complement (5hr).	
Unit-4: Immune Disorders and Immunization	**Teaching Hours: 15 (Weightage 25%)**
➢ Hypersensitivity: Immediate and delayed type (4hr). ➢ Immunodeficiency disease: AIDS (2hr). ➢ Autoimmunity: Mechanism and Classification of Autoimmune diseases (3hr). ➢ Immunology of Transplantation: Classification of Transplants (3hr). ➢ Immunization: Principles of vaccination, Types of Vaccines (3hr).	

***CCE**: Continuous and Comprehensive Evaluation: It consists of Assignments /Seminars/ Presentations /Quizzes/Surprise Tests.

***SEE:** Semester End Evaluation

ReferenceBooks:

1. Immunology, Author- J. Kuby.
2. Microbiology – Presscott, Harley & Klein.
3. Text Book of Microbiology – Ananthnarayan & Paniker.
4. Fundamental Immunology, Author– W.E. Paul.
5. Fundamentals of Immunology, Authors– Coleman, Lombord and Sicard.
6. Immunology – Weir and Steward.
7. Immunology, A Textbook, Author- C.V. Rao.
8. Lecture Notes in Immunology, Author- I.R.Todd.
9. Essentials of Immunology, Authors- Roitt, I.M.
10. Immunology-Understanding of Immune System, Author- Klaus D. Elgert (1996)

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Microbiology Major Course -7

MBM223-2C – Microbiology Practical- III

LEARNING OUTCOMES:

- Gain knowledge about solution preparation.
- Students will acquire the skill to handle the instrument and will be aware of various methods of estimation and analysis of biomolecules.
- Students will gain knowledge of blood cells and understand interactions of antigen with antibody.

TEACHING AND EVALUATION SCHEME:

Subject Code	Subject Title	Teaching Scheme	Credits	Examination Scheme			Total Marks
		Practical hrs Per Week)		Hrs.	Max Marks		
					CCE	SEE	
MBM223-2C	**Microbiology Practical- III**	**8**	**4**	**5**	**50**	**50**	**100**

Unit-1 **Teaching Hours : 60** **(Weightage:50%)**

1. Preparation of standard solutions
2. Qualitative analysis of carbohydrates
3. Qualitative analysis of Protein
4. Quantitative estimation of protein by Folin Lowry's Mehod
5. Quantitative estimation of carbohydrates by DNSA Method
6. Quantitative estimation of Protein by Biuret Method.
7. Quantitative estimation of reducing sugar by Cole's Method
8. Quantitative estimation of Sugar by Anthrone method.
9. Determination of Free Fatty Acid or Acid value of an Oil

Unit 2 **Teaching Hours : 60** **(Weightage:50%)**

1. Blood Grouping
2. Estimation of haemoglobin by Sahli's method
3. Total count of W.B.C
4. Total count of R.B.C
5. Differential W.B.C. count
6. Flocculation reaction- VDRL
7. Agglutination reaction- Widal test
8. Immuno-diffusion techniques- ODD and RID

Reference Books:

- Rakesh Patel. Experimental Microbiology. Delhi Aditya Book Centre.

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B.Sc Semester 3 (Microbiology Subject's Syllabus)

Skill Enhancement Course

SEC261-2C - Basics of Pathology and Hematology

LEARNING OUTCOMES:

- Students will gain knowledge on the soil microflora and its association with plants.
- Students will acquire knowledge on the importance and applications of beneficial microbes in crop improvement.

TEACHING AND EVALUATION SCHEME:

Subject Code	Subject Title	Teaching Scheme Per Week		Credits	Examination Scheme			Total Marks
		Theory hrs Per Week	Practical hrs Per Week		Hrs.	Max Marks CCE	Max Marks SEE	
SEC261-2C	Basics of Pathology and Hematology	2	0	2	2	25	25	50

Unit 1 **Teaching Hours: 15**

- Introduction to pathology: History -Evolution of pathology,
- Normal Cell
- Cell Injury- types of cell injury, etiology of cell injury, morphology of cell injury, cellular swelling.
- Cell death: types- autolysis, necrosis, apoptosis and gangrene
- Cellular adaptations-atrophy, hypertrophy, hyperplasia & dysplasia, Neoplasia
- Inflammation and repair
  - Acute inflammation – Definition, vascular and cellular response, Chemical mediators and their role
  - Chronic and granulomatous inflammation
  - Repair and regeneration – Wound healing and factors influencing repair.
  - Repair in specialized tissues, bone, muscle, nerve, parenchymal organs.

Unit 2 Hematology and Blood banking **Teaching Hours: 15**

Hematology

- Introduction to haematology and laboratory organization Lab safety and Instrumentation.
- Haematopoietic Growth Factors (HGFs). Haematopoiesis.
- Composition of blood: Red blood cells, White blood cells, Platelets
- Haemostasis: Introduction, Role of Platelets in Haemostasis, Plasma Proteins in Haemostasis,

Mechanism of Blood Coagulation.
- Functions of blood
- Various anticoagulants, their uses, mode of action and their merits and demerits.

Blood banking

- Different blood groups and their Clinical significance. Blood grouping, Significance of reverse grouping and cross-matching
- Introduction and Clinical Significance of Blood Transfusion, Indications of Blood Transfusion
- Selection criteria of blood donors and adverse donor reactions and management.
- Collection of Blood for Transfusion.
- Preparation and use of blood components.
- Storage of Blood and blood components for transfusion
- Transfusion reactions and Hemolytic Diseases.

Reference Books:

1. Text Book of Pathology – V. Krishna
2. Text Book of Pathology – Datta
3. Mini Atlas Pathology – Harsh Mohan
4. Robbins Basic Pathology – Vinay Kumar, Abul K Abbas, Jon C. Aster
5. Essentials of Haematology- S. M. Kawathalkar
6. Atlas and Text of Haematology – Dr.Jitender Singh
7. Clinical Hematology Atlas – Bernadette F. Rodak, Jacqueline H. Carr
8. Wintrobe's Clinical Hematology – John P. Greer, Daniel A. Arber

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Multidisciplinary Subject

MDC221-2C - Basic Statistical Techniques

LEARNING OUTCOMES:

- Demonstrate a good understanding of descriptive statistics and graphical tools for data representation.
- Students will analyze the different type of data using appropriate statistical method.
- Students will learn interpretation of commonly reported statistical measures and importance of statistics in biological research.

TEACHING AND EVALUATION SCHEME:

Subject Code	Subject Title	Teaching Scheme		Credits	Examination Scheme			Total Marks
						Max Marks		
		Theory hrs Per Week	Practical hrs Per Week		Hrs.	CCE	SEE	
MDC221-2C	Basic Statistical techniques	2	4	4	2.5	50	50	100

Unit 1: Introduction to Biostatistics **Teaching Hours: 15**

- Definition and Scope of Biostatistics
- Sources and Presentation of Data:
  - Types of data and methods for collection of data
  - Classification & presentation of data: Tabulation, Diagrammatic and Graphical representation, Frequency distributions of data.
- Sampling: Introduction, Definition and methods, Types of population, Sample, Sample size, sampling error

Unit 2: Tools and Techniques for data-analysis **Teaching Hours: 15**

- Descriptive Statistics:
  - Introduction and types of descriptive Statistics
  - Measures of central Tendency: Mean Median and Mode (Merits and Demerits).
  - Selection of the appropriate measure of central Tendency: Arithmetic mean, Geometric mean and Harmonic mean (Merits and Demerits).
  - Measures of Dispersion: Standard Deviation and Variance
- Inferential statistics
  - Introduction and types of inferential statistics
  - Introduction to Hypothesis, types of errors, confidence interval, level of significance(p value)
  - Student t-test: Introduction, Student's t-Distribution, Application of t Distribution

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Practicals **Teaching Hours: 60**

1. Problem sum for Arithmetic mean, Geometric mean and Harmonic mean.
2. Problem sum for Median.
3. Problem sum for Mode.
4. Problem sum for Standard Deviation.
5. Problem sum for Variance.
6. Hypothesis testing using students t test.

Reference Books:

1. Biostatistics Authors S. Prasad
2. Arora, P. N. (2007). Biostatistics. Himalaya Publishing House.
3. Sundar Rao, P. S. S. (2006). Introduction to Biostatistics and Research Methods. 4th Edition. Prentice-Hall of India Private Limited, New Delhi.
4. Gurumani, N. (2005). An Introduction to Biostastistics. 2nd Edition. MJP Publishers, Chennai.
5. Bernard Rosner, Fundamental of Biostatistics 8th Edition. USA.
6. P. Hanmanth Rao & K. Janardhan. (2010). Fundamentals of Biostatistics, 1st edition, I.K International Publishing House Pvt. Ltd.