

Programme: M. Sc. Integrated Biotechnology

Semester	Sem III & IV (22+22 Credits)						Workload
	Theory			Lab			
	Course	Credit	hours	Course	Credit	hours	
Foundation	1	2	2	-	-	-	2
Elective	1	2	2	-	-	-	2
Core 1	3	2+2+2	2+2+2	1	3	6	6 Th + 6hr (per batch)
Core 2	3	2+2+2	2+2+2	1	3	6	6 Th + 4hr (per batch)
Total	8	16	16	2	6	12	22+22

Semester-III

Core 1

Course 1: Instrumentation & Techniques-I

Course 2: Applied Microbiology

Course 3: Fundamentals of Immunology

Core 2

Course 1: Plant Physiology-I

Course 2: Animal Physiology-I

Course 3: Microbial Physiology-I

Practical Core 1: Total Experiments-09 (3 from each course)

Practical Core 2: Total Experiments-09 (3 from each course)

Semester-IV

Core 1

Course 1: Instrumentation & Techniques-II

Course 2: Enzymes & Coenzymes

Course 3: Introduction to Molecular Biology

Core 2

Course 1: Plant Physiology-II

Course 2: Animal Physiology-II

Course 3: Microbial Physiology-II

Practical Core 1: Total Experiments-09 (3 from each course)

Practical Core 2: Total Experiments-09 (3 from each course)

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT
M. Sc. Integrated Biotechnology
Syllabus: Semester-III

CORE: 1; Course: 01
INSTRUMENTATION & TECHNIQUES-I

UNIT –1

- **Potentiometry :** pH Electrodes : reference electrode, glass electrode, combined electrode, construction and use of pH meter, its operation, Maintenance of electrodes, ion selective meter and electrode for Ca^{+2} , F^- , Biomembrane electrode.

UNIT –2

- **Microscopy:** Phase contrast microscopy: its principle, instrumentation and application, Dark field microscopy: Principle, instrumentation and Application, Florescence microscopy: its principle instrumentation and application.
- **Radio isotopes techniques :**
 - Detection & measurement and use of radio activity in Biology
 - Geiger-Muller Counter: Working principle and application
 - Scintillation counter: Working principle and application
 - Autoradiography: Technique and applications

UNIT – 3

- **Centrifugation :**
 - Basic principles of sedimentation,
 - types of centrifuges,
 - types of rotors,
 - Separation methods in preparative ultracentrifuges
 - Differential centrifugation
 - density gradient centrifugation
 - Analysis of subcellular fractions
 - Applications of Analytical ultracentrifuge
 - Determination of relative molecular Mass
 - Estimation of purity of macromolecules
 - Conformational changes in macromolecules
 - Safety aspects in use of centrifuge.

UNIT-4

- **Spectrophotometry:**
 - Molecular absorption spectroscopy
 - Laws of photometry
 - Colorimetry: Components of the instruments, Applications
 - Spectrophotometer: Instrument components- single beam and double beam instrument, -Applications
 - Quantitative analysis by spectrophotometer –manual and automated
 - Fluorescence and phosphorence (principle and application)

REFERENCES:

1. Keith Wilson & John Walker (Ed.) (2000): Practical Biochemistry - Principles & Techniques. Cambridge University Press.
2. Skoog, Holler and Nieman, Instrumental analysis – Saunders college publication
3. Skoog, West and Holler , Fundamentals of Analytical Chemistry - Saunders college publication
4. James S. Fritz & George H. Schenk, Jr. (1969): Quantitative Analytical Chemistry (2nd edition). Allyn & Bacon, Inc., Boston.
5. Brown S.B. (1980): An Introduction to Spectroscopy for biochemists. Academic Press London.
6. E.D.P. De. Robertis & E.M.F. De Robertis Jr. (2001) : Cell and Molecular Biology (8th edn.) Lippincott Williams & Wilkins, London.

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VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT
M. Sc. Integrated Biotechnology
Syllabus: Semester-III

CORE: 1; Course: 02
APPLIED MICROBIOLOGY

UNIT 1: MICROBIOLOGY OF WATER

- 1.1 Water purification and sanitary analysis
 - 1.1.1 Sanitary analysis of waters
- 1.2 Wastewater Treatment
 - 1.2.1 Measuring water quality
 - 1.2.2 Wastewater Treatment Process
 - 1.2.3 Home treatment systems

UNIT 2: MICROBIOLOGY OF FOOD

- 2.1 Microorganism Growth in Foods
- 2.2 Microbial Growth and Food Spoilage
- 2.3 Controlling Food Spoilage
- 2.4 Food-borne Diseases
- 2.5 Detection of food-borne pathogens

UNIT 3: MICROBIOLOGY OF FERMENTED FOOD

- 3.1 Microorganism Growth in Foods
- 3.2 Fermented milks
- 3.3 Cheese production
- 3.4 Meat and fish
- 3.5 Production of alcoholic beverages
- 3.6 Production of breads
- 3.7 Other fermented foods

UNIT 4: NEWER PROCESSES

- 4.1 Biodegradation and bioremediation processes
- 4.2 Stimulating biodegradation
- 4.3 Bioaugmentation
- 4.4 Biosensors
- 4.5 Biopesticides

REFERENCES:

1. Willey, J.M., Sherwood, L. M., & Woolverton, C. J., (2008). *Prescott, Harley & Klein's Microbiology*, 7Ed, The McGraw-Hill Companies, Inc.

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VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT
M. Sc. Integrated Biotechnology
Syllabus: Semester-III

CORE: 1; Course: 03
FUNDAMENALS OF IMMUNOLOGY

UNIT 1: INTRODUCTION TO IMMUNE SYSTEM

- 1.1 Overview of host resistance
- 1.2 Cells of the immune system
- 1.3 Organs and Tissues of the immune system
- 1.4 Physical barriers in non-specific resistance

UNIT 2: NON-SPECIFIC HOST RESISTANCE

- 2.1 Phagocytosis
- 2.2 Inflammation
- 2.3 Chemical mediators in non-specific (Innate) resistance
 - 2.3.1 Antimicrobial peptides
 - 2.3.2 Complement
 - 2.3.3 Cytokines
 - 2.3.4 Acute-Phase proteins

UNIT 3: SPECIFIC HOST RESISTANCE-I

- 3.1 Overview of specific immunity
- 3.2 Antigens
- 3.3 Types of specific immunity
- 3.4 Recognition of Foreignness
- 3.5 T cell Biology

UNIT 4: SPECIFIC HOST RESISTANCE-II

- 4.1 B cell Biology
- 4.2 Immunoglobulin Structure
- 4.3 Immunoglobulin Function
- 4.4 Immunoglobulin Classes
- 4.5 Antibody kinetics
- 4.6 Action of Antibodies

REFERENCES:

1. Willey, J.M., Sherwood, L. M., & Woolverton, C. J., (2008). *Prescott, Harley & Klein's Microbiology*, 7Ed, The McGraw-Hill Companies, Inc.

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VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT
M. Sc. Integrated Biotechnology
Syllabus: Semester-III

CORE: 2; Course: 01
PLANT PHYSIOLOGY-I

UNIT – 1 Plant-water relations:

Water relations- Diffusion, Diffusion pressure deficit, Osmosis, types, Osmotic pressure, Turgor pressure, Wall pressure and interrelationship, Solute potential, water potential.

Water absorption-mechanism, factors affecting rate of water absorption.

Transpiration -Definition, types, Significance.

Mechanism of opening and closing of stomata- concept of pH in opening and closing of stomata, Theory of proton transport, stomatal opening in succulent plants, factors influencing transpiration rate, Antitranspirants.

UNIT –2 Ascent of Sap and Organic translocation:

Vital theories, Root pressure theories, Cohesion and adhesion, Physical force theories Merits and demerits of theories.

Electrophysiology- Action potential in plants.

Organic Translocation: Phloem sap, Phloem loading and unloading, Mass-flow (pressure flow) hypothesis- Critical evaluation.

UNIT-3 Physiology of flowering:

Concept of photomorphogenesis -Physiology of flowering, Theories related to flowering, Role of light, Phytochrome system, role and mechanism of action, Florigen concept. Photoperiodism and plant types, Vernalization.

UNIT –4 Growth and development:

Mineral nutrition: Macro, and micronutrients, their role, deficiency.

Growth: general aspects, Pattern and stages of growth, phases of growth, factors affecting growth. Types of plant movements: Tactic, tropic and nastic movements.

REFERENCES:

1. Frank B.Salisbury and Cleon W.Ross (2010), Plant Physiology, Cengage learning products, India Edition.
2. S.K. Verma and Mohit Verma (1999) Plant Physiology Biochemistry and Biotechnology, S Chand.
3. Lincoln Taiz and Eduardo Zaiger (Fourth Edition), Plant Physiology, Sinaur Associates inc. Publishers.
4. S.N. Pandey and K.K Singh, Plant physiology, Vikas Pub.

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VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT
M. Sc. Integrated Biotechnology
Syllabus: Semester-III

CORE: 2; Course: 02
ANIMAL PHYSIOLOGY-I

UNIT-1 Tissues and Glands **(Ch 4, Tortora & Grabowski)**

Concepts and classification- Epithelial tissue, Connective tissue, Muscular tissue, Nervous tissue and Types of glands.

UNIT- 2 Digestive System **(Ch 64-66, Guyton & Hall)**

Histology and functions of gastrointestinal tract and its associated glands; Mechanical and chemical digestion of food; Role of gastrointestinal hormones; Control and action of GI Tract secretions; Absorptions of carbohydrates, lipids, proteins, water, minerals and vitamins; Disorders of the digestive system.

UNIT-3 Nervous System **(Ch 12, 17, Tortora & Grabowski)**

General organization: Neuron resting membrane potential and its basis; Origin of action potential and its propagation in myelinated and unmyelinated nerve fibers; Synaptic transmission and types of synapsis, Neuro-muscular junction; Reflex activity-reflex arc; Types of reflexes, Physiology of hearing and vision.

UNIT 4 Muscle **(Ch 6, 7, Guyton & Hall/ Ch 10, Tortora & Grabowski)**

Histology of different types of muscle; Ultra structure of skeletal muscle; Molecular and chemical basis of muscle contraction; Characteristics of muscle twitch; Motor unit, summation, tetanus and muscle dystrophies.

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VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT
M. Sc. Integrated Biotechnology
Syllabus: Semester-III

CORE: 2; Course: 03
MICROBIAL PHYSIOLOGY-I

- UNIT 1: MEMBRANE BIOENERGETICS**
- 1.1 The Chemiosmotic theory
 - 1.2 Electrochemical energy
 - 1.3 Ionophores
 - 1.4 Measurement of the Δp
 - 1.5 Exergonic reactions that generate a Δp

- UNIT 2: ELECTRON TRANSPORT**
- 2.1 Aerobic and Anaerobic respiration
 - 2.2 The electron carriers
 - 2.3 Organization of electron carriers in bacteria and mitochondria
 - 2.4 Coupling sites
 - 2.5 Patterns of electron flow in *E. coli*

- UNIT 3: METABOLITE TRANSPORT**
- 3.1 Passive diffusion
 - 3.2 Facilitated diffusion
 - 3.3 Active transport
 - 3.4 Group translocation
 - 3.5 Iron uptake

- UNIT 4: METABOLISM OF SUBSTRATES OTHER THAN GLUCOSE**
- 4.1 Lactose
 - 4.2 Galactose
 - 4.3 Maltose
 - 4.4 Mannitol
 - 4.5 Fucose and Rhamnose

REFERENCES:

1. David White (2007). The Physiology and Biochemistry of Prokaryotes, 3rd Edition, Oxford University Press.
2. Moat, A. G., Foster, J. W. and Spector, M. P. (2002). Microbial Physiology, 4th Edition, John Wiley & Sons, USA.
3. Willey, J. M., Sherwood, L. M. and Woolverton, C. J. (2008). Prescott, Harley and Klein's Microbiology, 7th Edition, McGraw Hill International Edition.

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VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT
M. Sc. Integrated Biotechnology
Semester-III
Syllabus: Practical: Core 1

Core-1; Course-1
Instrumentation & Techniques-I

1. Preparation of working solutions as well as different buffers and calibration of pH meter.
3. Study of Binocular Microscope and cell count by Haemocytometer.
4. To study the working of Centrifuge detailing analytical and preparative centrifugation.

Core-1; Course-2
Applied Microbiology

1. Detection of coliforms using P.A. test.
2. Enumeration of coliforms using MPN method.
3. Bacteriological analysis of milk using Methylene Blue Reduction Test.

Core-1; Course-3
Fundamentals of Immunology

1. Study of haemagglutination in blood grouping.
2. Study of bacterial agglutination using qualitative Widal slide test.
3. Study of precipitation reaction using quantitative single diffusion in two dimensions (Mancini Assay).

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VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT
M. Sc. Integrated Biotechnology
Semester-III
Syllabus: Practical: Core 2

Core-2; Course-1
Plant Physiology-I

1. Determination of osmotic potential of cell sap by plasmolytic method
2. To study types of stomata based on the structure and number of subsidiary cells & to determine stomatal index and Frequency of the studied types.
3. To demonstrate that oxygen is evolved during photosynthesis & demonstration of plant movements.

Core-2; Course-2
Animal Physiology-I

1. Preparation of temporary mounts: Squamous epithelium, Ciliated epithelium, Striated muscle fibres and nerve cells.
2. Examination of sections of Mammalian skin, Cartilage, Bone, Pancreas, Testis, Ovary, Pituitary, Adrenal, Thyroid, Parathyroid.
3. Preparation of permanent slide of any five mammalian tissues- Microtomy.

Core-2; Course-3
Microbial Physiology-I

1. Carbohydrate Metabolism by *Escherichia coli*: Glucose, Lactose, Mannitol, Maltose, Sucrose and Xylose.
2. Carbohydrate Metabolism by *Bacillus subtilis*: Glucose, Lactose, Mannitol, Maltose, Sucrose and Xylose.
3. Carbohydrate Metabolism by *Pseudomonas aeruginosa*: Glucose, Lactose, Mannitol, Maltose, Sucrose and Xylose.

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VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT
M. Sc. Integrated Biotechnology
Syllabus: Semester-IV

CORE: 1; Course: 01
INSTRUMENTATION & TECHNIQUES-II

Unit-I

- **Spectroscopy:**
 - Principle, instrumentation, interpretation and applications of IR spectroscopy
 - Working principle of NMR and Mass spectrometry and their applications
 - Atomic spectroscopy:
 - Flame emission spectroscopy: Working principle and applications
 - Atomic absorption spectroscopy – principle, atomizers, source and applications
 - Inductively coupled plasma spectrometry: Principle, applications and advantages.

Unit-II

- **Electrophoretic techniques:**
 - Principles of electrophoresis
 - Support media
 - Electrophoresis of proteins
 - SDS - PAGE
 - Native gels
 - Gradient gels
 - Isoelectric focusing
 - Two dimensional electrophoresis
 - Western blotting
 - Electrophoresis of Nucleic acids
 - Agarose gel of DNA, RNA
 - DNA sequencing gels
 - Southern blotting

Unit-III

- **Chromatography:**
 - Classification of chromatography techniques
 - Plane chromatography: Paper chromatography, TLC and HPTLC – Methods of development –spot detection
 - Principles of GC separation – stationary and mobile phases
 - Detectors – FID, TCD and ECD
 - Limitations of GC
 - Quantitative analysis and Qualitative analysis
 - GC-MS combination

- **Liquid chromatography:**
 - HPLC – layout of instrument and components of instrumentation, Isocratic, binary and quaternary systems. Types of columns, stationary and mobile phases, detectors: UV absorption, PDA, RI and fluorescence,.
 - Ion exchange chromatography: Types of Resins, principles of separation. Detection, applications.
 - Gel filtration chromatography: Principles of separation and applications

REFERENCES:

1. Keith Wilson & John Walker (Ed.) (2000): Practical Biochemistry - Principles & Techniques. Cambridge University Press.
2. Skoog, Holler and Nieman, Instrumental analysis – Saunders college publication
3. Skoog, West and Holler , Fundamentals of Analytical Chemistry - Saunders college publication
4. James S. Fritz & George H. Schenk, Jr. (1969): Quantitative Analytical Chemistry (2nd edition). Allyn & Bacon, Inc., Boston.
5. Brown S.B. (1980): An Introduction to Spectroscopy for biochemists. Academic Press London.
6. Andrews A.T. (1986): Electrophoresis: Theory, Techniques and Biochemical and Clinical Application. Oxford University Press.
7. Hawcroft D.M. (1996): Electrophoresis - The Basics. IRL Press, Oxford.
8. Robards K., Haddad P.R., & Jackson P.E. (1994): Principles and Practice of Modern Chromatographic Methods. Academic Press, London.

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VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT
M. Sc. Integrated Biotechnology
Syllabus: Semester-IV

CORE: 1; Course: 02
ENZYMES & COENZYMES

UNIT 1: INTRODUCTION TO ENZYMES

- 1.1 Historical perspective
- 1.2 Substrate specificity
- 1.3 International classification of enzymes
- 1.4 Fisher 'lock-and-key' hypothesis
- 1.5 Koshland 'induced fit' hypothesis

UNIT 2: COENZYMES IN ENZYME CATALYZED REACTION

- 2.1 Nicotinamide Nucleotides (NAD⁺ and NADP⁺)
- 2.2 Flavin Nucleotides
- 2.3 Adenosine Phosphates (ATP, ADP and AMP)
- 2.4 Coenzyme A
- 2.5 Thiamine Pyrophosphate (TPP)

UNIT 3: ENZYMATIC REACTIONS

- 3.1 Chemical kinetics
- 3.2 Enzyme kinetics
- 3.3 Inhibition
- 3.4 Effects of pH
- 3.5 Bisubstrate reaction

UNIT 4: REGULATORY ENZYMES

- 4.1 Introduction
- 4.2 Role of non covalent binding of Modulators
- 4.3 Allosteric enzymes: as an exception to many general rules
- 4.4 Kinetic behaviour of Allosteric enzymes
- 4.5 Other mechanism of enzyme regulation.

REFERENCES:

1. Lehninger, A., Cox, M. M., & Nelson, D.L., (2008). Principles of Biochemistry, 5th Edition, W. H. Freeman, New York.
2. Trevor Palmer (2004). Enzymes- Biochemistry, Biotechnology, Clinical chemistry, East-West Press Pvt Ltd.
3. Voet D. and Voet J. G. (2011). Biochemistry, 4th Edition, John-Wiley & Sons.

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VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT
M. Sc. Integrated Biotechnology
Syllabus: Semester-IV

CORE: 1; Course: 03
INTRODUCTION TO MOLECULAR BIOLOGY

UNIT 1: CONCEPT OF GENOME AND ITS ORGANIZATION

- 1.1 History: Elucidation of DNA structure
- 1.2 DNA as genetic material
 - 1.2.1 Griffith's Transformation Experiment
 - 1.2.2 Hershey-Chase Experiment
- 1.3 Flow of genetic information
- 1.4 Genome organization: Structure of eukaryotic gene
- 1.5 Packaging of Viral, Bacterial and Eukaryotic DNA

UNIT 2: DNA REPLICATION

- 2.1 General features of DNA replication
- 2.2 Replication in Prokaryotes
- 2.3 Replication in Eukaryotes
- 2.4 Termination of Replication
- 2.5 Regulation of Replication

UNIT 3: TRANSCRIPTION

- 3.1 Establishment of Genetic code
- 3.2 Organization of Genetic code
- 3.3 Transcription in Bacteria
- 3.4 Transcription in Eukaryotes
- 3.5 Transcription in the Archaea

UNIT 4: TRANSLATION

- 4.1 Transfer RNA and Amino acid activation
- 4.2 The Ribosome
- 4.3 Initiation of Protein synthesis
- 4.4 Elongation of polypeptide chain
- 4.5 Termination of Protein synthesis

REFERENCES:

1. Lehninger, A., Cox, M. M., & Nelson, D.L., (2008). Principles of Biochemistry, 5th Edition, W. H. Freeman, New York.
2. Willey, J. M., Sherwood, L. M. and Woolverton, C. J. (2008). Prescott, Harley and Klein's Microbiology, 7th Edition, McGraw Hill International Edition.
3. Pal, J. K. and Ghaskadbi, S. S. (2009). Fundamentals of Molecular Biology, Oxford University Press.

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VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT
M. Sc. Integrated Biotechnology
Syllabus: Semester-IV

CORE: 2; Course: 01
PLANT PHYSIOLOGY-II

UNIT – 1 Metabolic Processes:

Structure of chloroplast; Significance of photosynthesis, photosynthetic pigments, action spectra, concept of two photosystem, photophosphorylation, C₃, C₄, CAM pathway; Photorespiration and its significance.

UNIT-2 Nitrogen Metabolism:

Nitrogen metabolism- Nitrogen cycle, Biology of Nitrogen fixation, Assimilation of Nitrate and Ammonium ions.

Lipid –Formation and metabolism. , Saturated and unsaturated fatty acids.

UNIT-3 Environmental Physiology:

Concept of biological clock and biorhythm.

Stress Physiology- Water stress; Drought, cold and salt- Physiological process affected by drought. Drought resistance mechanisms: Escape, dehydration postponement (Drought avoidance), Osmotic adjustment Osmoprotectants, stress proteins. High Temperature stress.

UNIT-4 Growth Regulation:

Physiological role of Phytohormones -auxins. Cytokinins, gibberellins, ABA and ethylene: their application. Methyl jasmonate, Brassinosteroids and Polyamines as PGRs (brief idea), Hydroponics and aeroponics. Cellular totipotency.

REFERENCES:

1. Frank B.Salisbury and Cleon W.Ross (2010), Plant Physiology, Cengage learning products, India Edition.
2. S.K. Verma and Mohit Verma (1999) Plant Physiology Biochemistry and Biotechnology, S Chand.
3. Lincoln Taiz and Eduardo Zaiger (Fourth Edition), Plant Physiology, Sinauer Associates inc. Publishers.
4. S.N. Pandey and K.K Singh, Plant physiology, Vikas Pub.
5. Medicinal Plant Biotechnology by Ciddi Veerasham. CBS Publishers.

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VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT
M. Sc. Integrated Biotechnology
Syllabus: Semester-IV

CORE: 2; Course: 02
ANIMAL PHYSIOLOGY-II

UNIT-1 Respiratory System

(Ch 23, Tortora & Grabowski)

Histology of trachea and lung; Pulmonary ventilation; Respiratory volumes and capacities; Transport of oxygen in the blood (oxygen-hemoglobin and myoglobin dissociation curve and its influencing factors), Carbon monoxide poisoning; Carbon dioxide transport in the blood; Regulation of acid-base balance; Control of respiration.

UNIT-2 Excretory System

(Ch 26, 27, Tortora & Grabowski)

Histology of kidney, ureter and bladder; Renal blood supply; Mechanism and regulation of urine formation; Regulation of acid-base balance; Renal failure and dialysis.

UNIT-3 Reproductive System

(Ch 28, Tortora & Grabowski)

Histology of male and female reproductive systems, Puberty, physiology of male and female reproduction; Methods of contraception (depicted through flow chart); Disorders of reproductive system.

UNIT-4 Endocrine System

(Ch 18, Tortora & Grabowski)

Histology and functions of endocrine glands; Nature of hormones; Regulation of hormone secretion; Mode of action of hormones, Hypothalamus- principal nuclei involved in control of endocrine system, control of anterior pituitary hormones by hypothalamic releasing hormones (neuroendocrine mechanisms); Effects of abnormal secretions of hormones; Placental hormones.

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VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT
M. Sc. Integrated Biotechnology
Syllabus: Semester-IV

CORE: 2; Course: 03
MICROBIAL PHYSIOLOGY-II

UNIT 1: CENTRAL METABOLIC PATHWAYS

- 1.1 Glycolysis
- 1.2 Pentose Phosphate Pathway
- 1.3 Entner-Doudoroff Pathway
- 1.4 Citric acid Cycle
- 1.5 Glyoxylate Cycle

UNIT 2: METABOLISM OF:

- 2.1 Lipids
- 2.2 Nucleotides
- 2.3 Amino acids
- 2.4 Aliphatic Hydrocarbons
- 2.5 CO₂

UNIT 3: BIOSYNTHESIS OF:

- 3.1 Peptidoglycan
- 3.2 Lipopolysaccharide
- 3.3 Dextran
- 3.4 Glycogen
- 3.5 Extracellular Polysaccharide synthesis

UNIT 4: FERMENTATIONS

- 4.1 Lactate
- 4.2 Butyrate
- 4.3 Mixed acid and Butanediol
- 4.4 Acetate
- 4.5 Propionate

REFERENCES:

1. David White (2007). The Physiology and Biochemistry of Prokaryotes, 3rd Edition, Oxford University Press.
2. Moat, A. G., Foster, J. W. and Spector, M. P. (2002). Microbial Physiology, 4th Edition, John Wiley & Sons, USA.
3. Willey, J. M., Sherwood, L. M. and Woolverton, C. J. (2008). Prescott, Harley and Klein's Microbiology, 7th Edition, McGraw Hill International Edition.

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VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT
M. Sc. Integrated Biotechnology
Semester-IV
Syllabus: Practical: Core 1

Core-1; Course- 1
Instruments & Techniques-II

1. To study the working of spectrophotometer and details of spectrophotometry.
2. Preparation of column and plates in Gel filtration and thin layer chromatography.
3. Preparation of Agarose and SDS polyacrylamide gels in electrophoresis.

Core-1; Course- 2
Enzymes & Coenzymes

1. Effect of pH on the rate of Acid Phosphatase Catalyzed reaction.
2. Effect of Temperature on the rate of Acid Phosphatase Catalyzed reaction.
3. Isoenzyme analysis: Acid Phosphatase.

Core-1; Course- 3
Introduction to Molecular Biology

1. Isolation of Prokaryotic and Eukaryotic DNA.
2. Estimation of DNA by Diphenylamine method.
3. Estimation of RNA by Orcinol method.

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VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT
M. Sc. Integrated Biotechnology
Semester-IV
Syllabus: Practical: Core 2

Core-2; Course-1
Plant Physiology-II

1. Extraction and separation of plant pigments (Chlorophylls and carotenoids) by chemical method through separating funnel.
2. Separation of anthocyanin & chlorophyll pigment by paper chromatography.
3. Identification of Common organic acids –
 - Oxalic acid
 - Malic acid
 - Citric acid
 - Tartaric acid

Core-2; Course-2
Animal Physiology-II

1. Estimation of haemoglobin using Sahli's haemoglobinometer.
2. Preparation of haemin and haemochromogen crystals.
3. Examination of sections of mammalian stomach, intestine, liver, spleen and kidney.

Core-2; Course-3
Microbial Physiology-II

1. Metabolism of Carbohydrate (Starch) by microorganism.
2. Metabolism of Protein (Casein) by microorganism.
3. Metabolism of Lipid (Tributyrene) by microorganism.

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