

**SARDAR PATEL UNIVERSITY
VALLABH VIDYANAGAR**



**MASTER OF SCIENCE (Home Science)
SYLLABUS EFFECTIVE FROM: 2017-18**

**Subject: Food Biotechnology
Semester: I**

**PH01CFBT21 PRINCIPLES & APPLICATIONS OF INSTRUMENTS AND
TECHNIQUES:**

(100 MARKS -4 HOURS, CREDITS-4)

Objective:

This course will enable the students to:

- Understand the principles of various analytical techniques available for nutrition and food science research.
- Familiarize with the applications of the above techniques.

Content

Unit: 1 Electrolytic dissociation-acid, bases, salts, buffers, indicators, Henderson Hasselbach equation, titration, pH and its measurements.

Unit: 2 Spectroscopy-colorimetry, PH0tometry, fluorimetry, atomic absorption, spectro PH0tometry, infra-red spectroscopy and their applications.

Unit: 3 (a) Chromatography-Paper Chromatography, TLC-HPTLC, column Chromatography GLC, HPLC etc.
(b) ElectroPH0resis- acrylamide gel electroPH0resis (PAGE and SDS PAGE), 2-D gel electroPH0resis.

Unit: 4 (a) ELISA
(b) PCR, RT-PCR, Gel documentation system

Unit: 5 (a) Principle and applications of centrifuge.
(b) Isotope and their use in biological search.
(c) Microscopy-Electron microscope.
(d) Computer and its uses.

Course Learning Outcome:

- Each graduate will understand the various aspects of instruments used routinely in nutritional analysis.
- Each graduate will demonstrate knowledge of commonly used operation of instrumentation.
- Each graduate will demonstrate knowledge of industrial process with instrumentation

- Each graduate will demonstrate knowledge of basic fundamentals and terms.

Reference Books:

1. DA Skoog. Instrumental methods of analysis
2. Plummer, An introduction to practical Biochemistry
3. Chatwal and Anand, Instrumentation
4. Biochemical Calculations by Segel. I. R. - 1995 - John Wiley and Sons.
5. Spectrometric Identification of Organic compounds by R M Silverstein and F X Webster, (2002)
6. Spectroscopy: D.R.Browning
7. Validation Standard Operating Procedures, 2nd edn., by Haider, SI (2006) CRC Press Taylor and Francis Group, NY
8. Analytical biochemistry by Wilson and walker.
9. Biochemical Methods by Pingoud A. etl.

PH01CFBT22 PRACTICALS BASED ON PH01CFBT21**(50 MARKS - 4 HOURS, CREDITS -2)**

1. Determination of λ max of a compound
2. Verifying Lambert-Beer's law
3. Acid-base titration using pH meter
5. Use of fluorometer for studying fluorescent compounds (riboflavin)
6. Separation of amino acids using paper chromatography
7. Separation of β -carotene using adsorption chromatography
8. Separation of lipids by TLC
9. Separation of fatty acids by GC
10. Separation of serum proteins by electrophoresis
11. Visit to research laboratory having sophisticated instruments

PH01CFBT23: BASIC BIOCHEMISTRY

(100 MARKS - 4 HOURS, CREDITS-4)

Objective:

This course will enable the students to:

- Augment the biochemistry knowledge acquired at the postgraduate level
- Understand the mechanisms adopted by the human body for regulation of metabolic pathways
- Get an insight into interrelationships between various metabolic pathways
- Become proficient for specialization in nutrition
- Understand integration of cellular level metabolic events to nutritional disorders and imbalances

Content

Unit: 1 Cell as a unit of living organism. Prokaryotic vs. Eukaryotic cell. Structure and functions of cell organelles, cell membrane, mitochondria, chloroplasts, endoplasmic reticulum, golgi complex, nucleus, nucleolus, cytoskeleton elements. Cell division: mitosis, meiosis. Process of differentiation and aging. Structure and composition of Plant and animal cells. Techniques involved in cell fractionation and study of the composition and structure.

Unit: 2 Chemistry and metabolism of carbohydrates.

Unit: 3 Chemistry and metabolism of proteins

Unit: 4 Chemistry and metabolism of lipids.

Unit: 5 Chemistry of nucleic acids, vitamins and Co-enzymes

Unit: 6 Classification of enzymes, properties, kinetics of enzyme action. Inhibitors, activators, co-enzymes and isoenzymes.

Course Learning Outcome:

- Get knowledge about the structures and functions of cell.
- Get knowledge about the structures and functions of various biomolecules.
- Understand the pathways involved in metabolism of various biomolecules and appreciate the complexities involved therein.
- Understand in detail the structure, functions and characteristics of enzymes and enzyme kinetics.

Reference Books:

1. Essentials of Cell and Molecular Biology: by de Robertis E. D. P. and E. M. F. , Holt Saunder's International Edition (new edition)
2. Molecular biology of the Cell by Bruce Alberts.
3. Lehninger Principles of Biochemistry by David Nelson and Michael Cox , Fifth Edition Freeman Company. (2005)

4. Biochemistry by Jeremy Berg, John Tymoczko and Lubert Stryer, Fifth Edition, Freeman Company
5. Enzymes: Biochemistry, Biotechnology, Clinical Chemistry by Trevor Palmer. East-West Press Edition (2004)

PH01CFBT24 PRACTICALS BASED ON PH01CFBT23

(50 MARKS - 4 HOURS, CREDITS -2)

1. Qualitative and quantitative analysis of carbohydrates.
2. Quantitative estimation of starch. quantitative estimation of cholesterol
3. Determination of the following chemical constants of fats & oils. Saponification value Iodine value Peroxide value Acid value R. M. value
4. Determination of the total serum protein, albumin, globulin and albumin/globulin ratio.
5. Estimation of cellular protein by Lowry method.
6. Enzyme kinetics with reference to the determinations of optimum pH, and temperature.

PH01CFBT25 CELL AND MOLECULAR BIOLOGY

(100 MARKS - 4 HOURS, CREDITS-4)

Objective:

- Enable students to acquire knowledge on the fundamentals of Cell and Molecular Biology
- To understand emerging and advanced concept in modern biology
- Describe the general principles of gene organization and expression in both prokaryotic and eukaryotic organisms.
- Explain various levels of gene regulation
- empower the students to have advanced focus on the molecular basis of diseases

Content

- Unit: 1** Chemistry of nucleic acids, DNA as hereditary molecule.
- Unit: 2** Genomic organization: genomic organization in eukaryotes, chromatin and chromosome structure, repetitive DNA.
- Unit: 3** DNA replication: Mechanism of DNA polymerase catalyzed synthesis of DNA in prokaryotes and eukaryotes, Types of DNA polymerases and their role, role of telomerases in Replication of eukaryotic chromosomes

Unit: 4 (a) Gene transcription, translation of m-RNA into protein in prokaryotes and eukaryotes.

(b) Gene regulation with specific examples lac, trp, ara etc.

(c) Gene expression in eukaryotes with different control.

Unit: 5 Molecular basis of mutation and DNA repair

Unit: 6 (a) Transportable genetic elements in prokaryotes and eukaryotes, mechanism of transposition.

(b) Bacterial recombination-transduction, transformation and conjugation.

Course Learning Outcome:

- Graduates of the program will be having strong background modern biology and molecular technology
- Graduates will be able to use these tools in industry and/or institutes where ever necessary.

Reference Books:

1. Essentials of Cell and Molecular Biology: by de Robertis E. D. P. and E. M. F. , Holt Saunder's International Edition (new edition)
2. Essentials of Molecular Biology, 4th edn., by Malacinski GM (2003) Jones & Batiett, London. (ISBN: 0-7637- 2133-6)
3. Molecular biology of the Cell by Lodish .
4. Molecular Biology of the Gene, Fifth Edition by: James D. Watson, Tania A. Baker, Stephen P. Bell, Alexander Gann, Michael Levine, Richard Losick
5. Genes IX: Lewin
6. Genomes 3: T. A. Brown
7. Molecular biology by David Freifelder

PH01CFBT26 PRACTICALS BASED ON PH01CFBT25

(50 MARKS - 4 HOURS, CREDITS -2)

1. Estimation of DNA.
2. Estimation of RNA.
3. Isolation of auxotrophic mutants.
4. Isolation of antibiotic resistant strain.
5. RNA isolation from yeast.
6. Total chromosomal DNA isolation.

7. Plasmid isolation.
 - (a) Mini preparation with 2ml
 - (b) Mini preparation with 5ml.
8. Bacterial transformation.
9. Bacterial conjugation.
10. Characterization of DNA by gel electrophoresis.

PH01CFBT27 COMPREHENSIVE VIVA – VOCE

(25 MARKS, 2 HOURS – CREDIT-1)

At the end of semester students will appear for a viva voce based on course content covered in all the theory and practical of the first semester.

PH01EFBT21 FOOD MICROBIOLOGY

(100 MARKS - 4 HOURS, CREDITS -4)

Objective:

- To acquaint the students with different groups of micro-organisms associated with food, their activities, destruction, enumeration in food and their hazards.

Unit: 1 (a) Brief history of food microbiology, spontaneous generation theory, contributions by Pasteur and Koch

(b) Types of media and inoculation techniques

(c) Microbiology of water: Number and kinds of micro-organisms present, tests for contamination, test for coliform bacteria. *Escherichia coli*, *Enterococci* etc.

Unit: 2 (a) Estimation of microbial number-Aseptic collection of samples, direct microscopic count (DMC). Electronic particle count, plate count, dye-reduction test, turbidity tests, immunological tests and latest techniques in brief.

- (b) Classification of bacteria relevant to food microbiology, Microbial growth in general-growth curve, growth and survival of micro-organisms in foods, intrinsic and extrinsic parameters of foods which affect microbial growth.

Unit : 3 (a) General principles underlying food spoilage, chemical changes caused by microorganisms, food spoilage and contamination in different kinds of foods - cereal and cereal products, pulses, vegetables and fruits, meat and meat products, eggs and poultry, milk and milk products and canned foods.

- (b) General principles underlying food preservation and methods in brief.

Unit: 4 Food Hazards: Food borne infections, food intoxication (poisoning), symptoms and methods of prevention and control.

Unit: 5 (a) Microbes in fermented foods - in alcoholic beverages, in indigenous fermented foods like idli, Khaman, in bread, in milk and milk products-butter and cheese, fermented milks, in soybean based fermented foods and in other oriental fermented foods e.g. sauerkraut, Minchin, poi etc.

- (b) Probiotics, prebiotics and their benefits

Course Learning Outcome:

- After completion of the course students will be able to master the history of microbiology, learn about the growth of microorganisms in foods, and understand the beneficial role of microorganisms in foodpreparation and in the human body.

Reference Books:

1. Banwart GJ. 1989. Basic Food Microbiology. 2nd Ed. AVI Publ.
2. Frazier J & Westhoff DC. 1988. Food Microbiology. 4th Ed. McGraw Hill.
3. Garbutt J. 1997. Essentials of Food Microbiology. Arnold Heinemann.
4. Jay JM, Loessner MJ & Golden DA. 2005. Modern Food Microbiology. 7th Ed. Springer.
5. Ray B. 2004. Fundamentals of Food Microbiology.3rd Ed. CRC.
6. Robinson RK. (Ed.). 1983. Dairy Microbiology. Applied Science.
7. Steinkraus KS. 1996. Handbook of Indigenous Fermented Foods. Marcel Dekker.

PH01EFBT22 PRACTICALS BASED ON PH01EFBT21

(50 MARKS - 4 HOURS, CREDITS -2)

1. Staining techniques - Gram staining, Methylene blue staining, spore staining, capsule staining.
2. Bacteriological examination of water-SPC of different sources of water.
3. Bacteriological examination of milk and curd- MBRT test and to assess the quality of milk. SPC using nutrient agar, lactobacillus count on MRS agar.
4. Microbial count of different foodstuff- SPC on nutrient agar, yeast and mould count on PDA from different food stuffs e.g. sweet preparations ice-creams, street foods.

PH01EFBT23 PHYSIOLOGY AND CLINICAL BIOCHEMISTRY:

(100 MARKS - 4 HOURS, CREDITS -4)

Objective:

This course will enable the students:

- To understand the physiology of human body
- To comprehend the structure of the human body, with special emphasis on functioning of the body in terms of organ, tissue, cellular and molecular aspects.
- To gain knowledge about the disorders and diagnostic tools for the same

Unit: 1 Composition, functions, blood group, factors affecting haemopoiesis, haemoglobin formation etc. Disorders of the above and diagnostic tools for assessment. Blood-Genesis of white blood cells, body's resistance to infections-inflammation, phagocytosis, antibodies and immunity Disorders and diagnostic tools. Genesis of platelets, blood clotting mechanism. Disorders and diagnostic tools.

Unit: 2 Digestive system- organ, composition and functions of digestive juices, digestion and absorption of foods, disorders of digestive system

Unit: 3 (a) The heart-Anatomy, working, control of heart rates, electrocardiogram. Disorders and diagnostic tools.

(b) Circulation-Blood flow, blood pressure and factors maintaining it, blood vessels and tissue fluids, Disorders and diagnostic tools.

Unit: 4 (a) Respiration-Physiology of respiration, transport and exchange of gases, regulation of respiration-chemical and nervous mechanisms and effect of altitude on respiration. Disorders of the above.

(b) Pregnancy and lactation. The mammary glands, lactation, menopause.

Unit: 5 Excretion-Organs, regulation, composition of urine, diluting and concentrating mechanism by the kidney. Disorders and diagnostic tools.

Course learning outcome:

- Describe about the genesis and functions of major constituents of blood.
- Discuss about the functioning of different systems of human body, their disorders and diagnostic tools for the same.

Reference Books:

1. Arthur Guyton and Hall : Textbook of Medical Physiology, 12th Edition,
2. C.C. Chatterjee : Human Physiology- Volume I and II, 11th Edition, Medical Allied Agency, Calcutta
3. K.Sembulingam – Essentials of Medical Physiology, Sixth Edition.

PH01EFBT24 PRACTICALS BASED ON PH01EFBT23

(50 MARKS-4 HOURS, CREDITS-2)

1. Estimation of following parameters from serum.
 - Glucose
 - Cholesterol
 - Urea
 - Creatinine
 - Bilirubin
 - ALP
 - AST
 - ALP
2. Estimation of following parameters from urine.
 - Urea
 - Creatinine
3. Enumeration of RBC and WBC