

**SARDAR PATEL UNIVERSITY  
VALLABH VIDYANAGAR**



**SYLLABUS EFFECTIVE FROM: 2017-18**

**Programme: M.Sc. (Home Science)**

**Subject: Foods and Nutrition**

**Semester: II**

**PH02CFDN21 STATISTICS**

**(50MARKS, 2 HOURS, CREDITS: 2)**

**Objective:**

- To understand the role of statistics in research
- To apply different statistical methods to analyze and interpret the data.

**Content:**

**Unit: 1** (a) Introduction and scope of Statistics

(b) Types of data

(c) Tabulation and graphical presentation of data

**Unit: 2**

(a) Measures of central tendency, Mean (Arithmetic, Harmonic and Geometric means), Median and Mode

(b) Measures of dispersion-standard deviation, coefficient of variation and standard errors.

**Unit: 3**

(a) Bivariate Data: Correlation coefficient, Product and rank correlation coefficients and its application in the field of home science

(b) Regression : simple linear regression and its application in the field of home science

**Unit: 4**

Basic idea of significance test, Statistical Hypothesis, levels of significance, Student's t-test, paired t-test, chi- square and F tests, large sample tests.

**Outcome:**

- Students will identify the different types of data.
- Students will gain the knowledge about the application of specific statistical treatment for different types of data.
- Students will apply the knowledge of statistics for their research.

**Reference Books :**

1. Gupta S.C.: Fundamentals of Statistics, Himalaya Pub. House, 2001.
2. Rao, Viswaswara, K. : Biostatistics: A manual of statistical methods for use in health nutrition and anthropology, Jaypee brothers Medical Pub. Ltd., New Delhi, 2007

## PH02CFDN22 NUTRITIONAL 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 molecular biology
- Become proficient for specialization in nutrition
- Understand integration of cellular level metabolic events to nutritional disorders and imbalances

### Content

**Unit: 1** Metabolism of amino acids

**Unit: 2** Metabolism of nucleic acids

**Unit: 3** (a) Role of minerals in metabolism.

(b) Detoxification mechanism and its usefulness in the human body.

**Unit: 4** Structure of chromosomes and chromosomal replication, Transcription and Translation

**Unit: 5.** The endocrines - histology and secretions, chemistry, mode of action and regulation of metabolism of hormones.

**Unit: 6** Inborn errors of metabolism.

### Course Learning Outcome:

- On successful completion of the course students will be able to:
- Explain the biochemical absorption, storage and metabolic function of macro and micronutrients.
- Describe the role of nutrients in the optimal functioning of key biochemical pathways in the body.
- Integrate biochemical mechanisms with disease pathology and clinical treatment options.
- Provide a coherent argument for the use of nutrient supplementation and food therapy for maintaining and promoting health and wellbeing through optimal biochemical pathway functions.

### Reference Books:

- Lehninger Principles of Biochemistry 5th reprint Edition: Authors: Micheal Cox and David Nelson, Macmillan Publishers India
- Textbook of biochemistry for Medical Students 6th reprint Edition: Authors: D.M. Vasudevan, Sreekumari S. and Kannan Vaidyanathan. Jaypee Brothers Medical publishers.

**PHO2CFDN23 PRACTICALS BASED ON PHO2CFDN22**

**(50 MARKS - 4 HOURS, CREDITS-2)**

1. Estimation of plasma total amino acid content.
2. Estimation of plasma total protein and A/G ratio.
3. Estimation on DNA
4. Estimation of RNA
5. Isolation of DNA from bacteria and animal tissue.

## PH02CFDN24 FOOD AND NUTRACEUTICAL CHEMISTRY

(100 MARKS - 4 HOURS, CREDITS-4)

### Objective:

This course will enable the students to:

- To gain knowledge regarding functional and nutraceutical properties of various food constituents
- To understand the effect of various chemical reactions on the constituents of foods
- To learn about the market strategies of functional foods and nutraceuticals

### Content:

**Unit: 1** Nutraceutical properties of food carbohydrates and their health benefits - Basic aspects of carbohydrate chemistry in brief.

- (a) Starch-structure, gelatinization, enzymic conversion.
- (b) Sugar-sources, concepts of sweetness, solubility and crystallization phenomenon related to texture, sources of sugar-cane sugar, milk sugars etc.
- (c) Other polysaccharides - cellulose, pectins, other gums, cellulose derivatives, starch derivatives, fibers etc., details of structural configuration.
- (d) Non-enzymatic browning reactions.
- (e) Prebiotics (fibre, oligosaccharides, resistant starch etc.) and their chemistry and health benefits

**Unit: 2** Nutraceutical properties of food proteins and their health benefits.

- (a) Basic aspects of protein chemistry-amide linkages, structure, essential and non-essential amino acids etc. Type of proteins, iso-electric point, hydration, solubility, viscosity, gelation, texturization, emulsification and foaming.
- (b) Cereals and pulses-Types of flour, baking qualities, batters, doughs, leavening agents, pulses - protein composition, soaking changes etc.
- (c) Meat-structure, post mortem changes, changes during cooking (in detail), tenderness etc. Egg-colloids, emulsions, functions of eggs in cookery, changes during cooking, role in cake preparations, preparation of angel and sponge cakes.

**Unit: 3** Nutraceutical properties of food lipid and their health benefits -Basic aspects of lipid chemistry, structure, type of lipid, fat-soluble pigments in brief with structure, physical properties-melting, crystallization, fractionation of fat, hydrogenation, inter-esterification, reversion and rancidity, fat sources, their characteristics. Chemistry of fat during heat treatment, degradation, darkening etc., cooking changes.

(a) Chemistry of fruits and vegetables - pigments, changes in pigments during cooking and processing, enzymatic browning reactions, volatile acids in vegetables and effect during cooking.

(b) Food additives: Different types of food additives in detail.

**Unit: 4** Introduction to nutraceuticals: definitions, synonymous terms, basis of claims for a compound as a nutraceutical, regulatory issues for nutraceuticals including CODEX. Concept of angiogenesis and the role of nutraceuticals/functional foods; Nutraceuticals for cardiovascular diseases, cancer, diabetes, cholesterol management, obesity, joint pain, immune enhancement, age-related macular degeneration, endurance performance and mood disorders – compounds and their mechanisms of action, dosage levels, contraindications if any etc.

**Unit: 5** Health aspects of selected nutraceuticals such as polyphenols, lycopene, isoflavonoids,  $\omega$ -fatty acids, prebiotics and probiotics, glucosamine, phytosterols etc.; Glycemic index and its role in human nutrition. Clinical testing of nutraceuticals and health foods; Formulation of functional foods containing nutraceuticals – stability and analytical issues, labelling issues.

### **Course Learning Outcome:**

At the end of the semester, the student will be able to:

- Discuss the relationship between chemical composition and structure of macro□ and micro□ constituents and their functions in foods.
- Describe the major chemical reactions that occur in foods during processing and storage.
- Describe the individual nuraceuticals for various health claims

### **Reference Books:**

1. Owen R. Fennema : Food Chemistry, 3<sup>rd</sup> Edition, Marcel Dekker Inc, New York
2. Lillian Hoagland Meyer : Food Chemistry, Affiliated East-West Press Pvt. Ltd.

**PH02C FDN25 Practicals based on PH01C FDN24 (50 Marks - 4 hours, credits -2)**

1. Market survey of existing health foods;
2. Estimation of total phenolics and flavonoid content
3. Estimation of total antioxidant capacity (DPPHRS and FRAP)
4. Estimation of total food pigments- lycopene, anthocyanin
5. Effect of type of amino acid and sugar on Maillard reaction
6. Estimation of phytic acid
7. Effect of varying concentration sugar, maida and baking powder on quality of cake.

**PH02C FDN26 EXTENSION ACTIVITY**

**(50 MARKS-4HOURS, CREDITS-2)**

Demonstration of recipes, power point presentation, lectures, role play and other activities on:

- Nutritional deficiency diseases
- Therapeutic diets
- Preventive health
- Nutrition during different physiological conditions
- Geriatric Nutrition

Target groups- Anganwadi workers, females of Mahila Mandal, adolescents and college going girls as well as other age groups.

**PH02CFDN27 PRACTICALS BASED ON FOOD ANALYSIS**

**(50 MARKS-4HOURS, CREDITS-2)**

Estimation of moisture from food sample.

1. Fat constants – Acid value, Peroxide value, Iodine value, TBA
2. Carbohydrates – Lactose, Reducing Sugar, Dietary fiber
3. Protein – Nitrogen analysis
4. Pigments –  $\beta$ -Carotene, Bixin
5. Minerals – Calcium, Iron, Phosphorous

**PH02CFDN28 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.

## PH02EFDN21 FOOD PROCESSING TECHNOLOGY

(100 MARKS - 4 HOURS, CREDITS -4)

### Objective:

- This course will enable students to understand the processing steps involved in the commercial manufacture of different food products from different food groups.

### Content:

**Unit: 1** (a) Basic issues of the food processing industry, Basic problems of the food processing industry, present status, status of food processing technology, growth trend and growth strategy, Govt. policies and programmes for food processing industry.

(b) Flesh foods: Meat processing, processed meat products, poultry processing, dried egg powder, fish processing, fish meal.

**Unit: 2** Processing of cereal grains Milling process of rice, milling process of wheat, melting of cereals and legumes, breakfast cereals pasta products, rice flakes, puffed rice, bakery product processing, maize processing-starch preparation, puffed maize; fermentation of cereals, nutrient loss during processing, fortification.

**Unit: 3** Processing of milk and milk products : Pasteurization and sterilization of milk, different types of milk and its processing, milk powder, processing steps and machinery, cheese processing steps and machinery, butter processing steps and machinery, nutrient loss during processing, fortification of processed milk for infant food.

**Unit: 4** (a) Processing of fruits and vegetables: Dehydration of fruits and vegetables, different methods of dehydration, canning, processing steps equipments, nutrient losses eluring processing.

(b) Legume, Oil and oil seed processing: Processing steps, equipments, soya flour processing texturized soya protein foods, legume flour preparation, other legume based products.

**Unit: 5** Packaging: New trends of packaging, packaging for specific foods in detail.



**Course Learning Outcome:**

- Compare and contrast the operation of different food processing operations
- Student will get knowledge of appropriate use of food processing technology.

**Reference Books:**

1. Cereal Processing & Nutritional Quality, Sewa Ram & B. Mishra, 2010, New India Publishing Agency, New Delhi-110088
2. Commercial Fruit Processing Woodroof & Luh, 1975, Connecticut, The Avi Publishing Company, INC.
3. Commercial Vegetable Processing Luh & Woodroof, 1975, Connecticut, The Avi Publishing Company, INC.
4. Edible Oil Processing, Edited By : Hann & Hamilton, Blackwell Publishing
5. Processing Vegetables Science & Technology, Edited by : D.S.Smith, J. N.Cash, W.K.Nip, Y.H.Hui, Technomic Publishing Co., INC
6. Outlines of Dairy Technology, Sukumar De, Oxford University Press
7. Nutritional Evaluation of Food Processing (Second Edition), Edited by : Harris & Karmas, 1975, Connecticut, The Avi Publishing Company ,INC
8. Fundamentals of Food Process Engineering, Romeo T. Toledo, CBS Publishers & Distributors, New Delhi-110002
9. Food Packaging, Neelam Khetarpaul, Darshan Punia, 2008, Daya Publishing House, New Delhi-110035

**PH02EFDN22 PRACTICALS BASED ON PH02EFDN21  
(50 MARKS-4HOURS, CREDITS-2)**

1. Market survey of different processed foods available in the market.
2. Preparation of paneer, green cheese, khoa and evaluation of physico-chemical parameters such as pH, Titrable acidity, moisture.
3. Preparation of flavoured milk, and analysis of pH, Titrable acidity, moisture, total solids, lactose content.
4. Preparation of groundnut milk and soyabean milk paneer and physicochemical analysis.
5. Analysis of ghee and butter- moisture, Free fatty acid, pH, titrable acidity.
6. Preparation of bread, cake and biscuits.
7. Preparation of jam, jelly and ketchup.

## PH02EFDN23 HUMAN GENETICS

(100 MARKS -4 HOURS, CREDITS -4)

### Objectives:

To familiarize students with:

- Basic concepts of genetics and inheritance Chromosomal aberrations and associated genetic disorders
- Mutations and associated human diseases

### Content:

#### Unit 1

**Transmission of Genes – Segregation and Independent Assortment** Justify how Mendel arrived at his laws of inheritance Define and use correctly the terms: homozygous, heterozygous, dominant and recessive Describe the basic principles of inheritance (segregation and independent assortment) Calculate the probability of inheritance of particular genes or traits based on probability Distinguish between “independent” and “dependent” events

**Modes of inheritance and pedigrees** Construct a pedigree from given information Calculate the likelihood of a genetic event based on a pedigree Determine which mode of inheritance is most likely based on information in a pedigree

#### Unit 2

**Variations and Extensions of Mendel's laws** Explain how having multiple alleles for a single gene results in multiple distinguishable traits (rather than two for two alleles). Explain how alleles can have different relationships besides simple recessiveness or dominance. Explain several possible reasons why a given genotype does not always result in the same phenotype. Compare inheritance of the mitochondrial genome with the nuclear genome. Contrast the inheritance of linked genes with unlinked genes.

Linkage, Crossing over and Chromosome mapping Linkage; Sex determination and sex linkage:

**Sexual development and dosage compensation** Distinguish how "phenotypic" sex is different from "gonadal" sex Explain how the outward sex characteristics can be mismatched with genetic sex (the sex chromosomes) Describe what dosage compensation is, and the basic mechanism for how it works in humans. Compare the impact of dosage compensation on individuals with sex chromosomal abnormalities.

#### Unit 3

**Molecular Genetics** Explain the “central dogma” of genetic information transfer Describe the relationship between chromosomes, genes and DNA Distinguish between the theories for how DNA replication might work, and explain how it does work Draw the process of transcription and explain its utility Diagram the processing of mRNA transcripts before translation and explain why they happen Demonstrate how we know the “code” is non-overlapping and redundant. Interpret how mutations might affect protein structure

#### **Unit 4**

**Mutations** Recognize different kinds of mutations (frameshift, insertions, deletions, point mutations), and predict their effect on amino acid sequence and protein structure. Predict the likelihood of a region of DNA incurring a mutation Give examples of how DNA can be mutated Explain why most of us are relatively normal despite the fact that mutations occur in our DNA

#### **Unit 5**

**Applications of DNA technology** Describe the basic idea of PCR, and how/why it is used. Explain how gel electrophoresis works, and interpret data from a gel. Recognize palindromic restriction enzyme sites, and explain why restriction enzymes might be used. Explain the significance of variable regions in DNA Interpret gel electrophoresis data, and explain how gels can be used Explain what an STR is, and HOW STRs can be used in DNA fingerprint analysis

Biochemical Genetics: Inborn errors of metabolism: (Molecular and biochemical pathways in Phenyl ketonuria, Alkaptonuria, Maple syrup urine disease, Albinism, Mucopolysaccharidosis, Lipidosis and Glycogen storage disorders). Human mitochondrial syndromes.

Pharmacogenetics: Definition, drug metabolism, genetic variation

#### **Course Learning Outcome:**

- Providing a solid understanding of the concepts and scientific methods of modern genetics as it applies to humans.
- Development of a better understanding of genetics of human biology and disease.
- Development of conceptual skills to address questions in genetics research and clinical practice

#### **Reference Books:**

1. Gardner, Simmons and Snustad : Principle of Genetics , 8<sup>th</sup> edition, Willey ( India) Ltd.
2. B. D. Singh: Fundamentals of Genetics, 3<sup>rd</sup> Edition, Kalyani Publishers, 2004.
3. P. K. Gupta, Genetics. Rastogi Publications, Meerut, India., ISBN: 81-7133-842-9.

4. Principles of Genetics by Gardener, Eldon John., Simmons, Michael J., Snustad, D. Peter., 8th Edition, John Wiley & Sons Publications, New York. ISBN: 9971-51-346-3.
5. Essentials of Human Genetics by S.M. Bhatnagar et al, 4th Edition, (1999), Orient Longman. ISBN: 81-250-1426-8

**PH02EFDN24 PRACTICALS BASED ON PH02EFDN23**

**(50 MARKS-4HOURS, CREDITS-2)**

1. Isolation of DNA from blood , E –Coli, Yeast
2. Yeast response to UV radiation
3. RNA isolation from yeast