

**SARDAR PATEL UNIVERSITY
VALLABH VIDYANAGAR**



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

**Subject: Food Biotechnology
Semester: II**

PH02CFBT21 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.

Course Learning 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

PH02CFBT22 RECOMBINANT DNA TECHNOLOGY**(100 MARKS - 4 HOURS, CREDITS -4)****Objective:**

- To understand the gene cloning methods and the tools and techniques involved in gene cloning and genome analysis and genomics.
- To explain the heterologous expression of cloned genes in different hosts, production of recombinant proteins and PCR techniques.
- To explain comparative genomics and proteomics.

Content:**Unit 1**

- (a) Concept and emergence of r-DNA technology.
- (b) Generation and cloning of DNA fragment:
Restriction and modification, and enzymes used in r-DNA technology
c-DNA preparation, Oligonucleotide synthesis, Modification of DNA extremities.

Unit 2**Cloning Vectors:**

- (a) Plasmids from *Escherchia Coli and other microorganisms (B. subtilis Psuedomonas, Yeast)*, Mu, M-13 and other animal and plant viral vectors. Specialized vectors (expression, translation vectors etc.) Invitro packaging, Ligation to vector molecules.
- (b) Transformation and transfection in bacteria, yeast, fungi, other eukaryotic systems.
- (c) Creation and screening library (Recombinant selection)
- (d) Expression of a cloned DNA.

Unit 3**Characterization of cloned DNA:**

- (a) Sequencing of DNA, Gene expression from strong and regulatable promoters.
- (b) Fusion protein increasing protein stability.
- (c) *In vitro* mutagenesis, transporon mutagenesis.
- (d) Heterologous protein production in eukaryotic cells.
- (e) Maximizing expression of foreign DNA

Unit 4

- (a) Principle of agarose gel electrophoresis, radiolabeling of DNA / RNA, Southern hybridization, Northern and Western blot, Colony and plaque hybridization immune chemical detection, hybrid released and hybrid arrested translation.
- (b) Sequencing and amplification of DNA:
Nested PCR, AFLP-PCR, Real-time PCR/qPCR, SYBR green assay, Taqman assay, Site directed mutagenesis.
- (c) Current status of genome sequencing projects: Introduction to Functional genomics, Microarrays, Serial Analysis of Gene expression (SAGE), Subtractive hybridization, DIGE, TOGA, Yeast Two hybrid Systems, Proteogenomics, Applications of genome analysis and genomics.

Unit 5

Application of r DNA Technology

- (a) Applications of genetic engineering in improvement of plants, animals and microbes; Gene therapy, pharmaceutical products and molecular diagnostics; Marker Assisted Selection; Restriction and regulation for the release of GMOs.
- (b) Commercial products (Insulin, growth hormones etc.)

Course Learning Outcome:

- The students after completing this course would be aware of cloning technology of genes.
- The students would be aware of commercially important recombinant proteins.
- The students would be aware of gene and genome sequencing techniques.
- The students would be aware of microarrays, Analysis of Gene expression and proteomics.

Reference Books:

1. Sandy Primrose, Richard M. Twyman and Robert W. Old : Principle of gene manipulation, 5th Edition, Wiley.
2. Brown T.A. ; Gene Cloning and DNA Analysis, 6th edition, Wiley.
3. Glick, B.R. and J.J. Pasternak. "Molecular Biotechnology : Principles and Applications of Recombinant DNA" 4th Edition. ASM, 2010.
4. Primrose SB and R. Twyman "Principles Of Gene Manipulation & Geneomics Blackwell Science Publications, 2006.

PH02CFBT23: PRACTICALS BASED ON PH02CFBT22

(50 MARKS - 4 HOURS, CREDITS -2)

1. Total DNA extraction from E. coli.
2. Large scale plasmid preparation using chloramphenicol amplification.
3. Restriction analysis of plasmid DNA.
4. Size determination of DNA using electrophoresis.
5. Gene introduction into plasmid (splicing and ligation).
6. Plasmid transformation.
7. Identification of cloned plasmid by insertional inactivation.
8. Plaque purification of bacteriophage λ
9. Large scale preparation of bacteriophage λ
10. Extraction of bacteriophage λ DNA.

PH02CFBT24 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, ω -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 nutraceuticals for various health claims

Reference Books:

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

PH02CFBT25 PRACTICALS BASED ON PH02CFBT24

(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.

PH02CFBT26 ENTREPRENEURSHIP DEVELOPMENT

(50 MARKS - 2 HOURS, CREDITS-2)

Objective:

- To acquaint students regarding intricate procedures of starting their own business
- To provide knowledge about competencies and functions of entrepreneurs, financing agencies and institutional support available to entrepreneurs in India, as a motivation to them to start their own business

Content:

Unit: 1 Entrepreneur

- a) Evaluation of the concept of entrepreneur
- b) Characteristics
- c) Distinction between entrepreneur and manager
- d) Functions of entrepreneur
- e) Types of entrepreneurs

Unit: 2 Entrepreneurs

- a) Concept
- b) Function
- c) Growth
- d) Problems
- e) Recent trends in development

Unit: 3 Entrepreneurship

- a) Concept
- b) Growth in India
- c) Major entrepreneurial competencies

Unit: 4 Small Enterprise- An introductory framework

- a) Definition
- b) Business ownership structures (proprietorship, partnership, company, co-operative)
- c) Characteristics and scope
- d) Problems of Small Scale Industries (SSI)

Unit: 5 Project identification, selection and formulation of project report (meaning, significance and major contents)

Unit: 6 Financing

- a) Need
- b) Sources (internal and external)
- c) Term loans (short and long)

Unit: 7 Institutional Finance to Entrepreneurs

- a) Scheduled commercial banks
- b) Other financial institutions (Industrial Development Bank of India- IDBI, Industrial Finance Corporation of India-IFCI, Industrial Credit and Investment Corporation of India- ICICI, Industrial Reconstruction bank of India-IRBI, Life insurance Corporation of India- LIC, Unit Trust of India- UTI, State Financial

Corporation-SFC, State Industrial Development Corporation- SIDC, Small Industries Development Bank of India – SIDBI, Exim Bank)

Unit: 8 Institutional support to Entrepreneurs

- a) Need for institutional support
- b) Supporting institutions (National Small Industries Corporation- NISC, Small Industries Development Organisation- SIDO, Small Scale Industries Board- SSIB, Small Scale Industries Development Corporations – SSIDC, Small Scale Industries Service Institutes – SISIs, District Industries Centres- DICS, Industrial Estates, Technical Consultancy Organisations – TCOs)

Course Learning Outcome:

- The students will gain knowledge about intricacies of starting their own business.
- The students will gain knowledge regarding agencies promoting entrepreneurship development.

Reference Books:

1. The Dynamics of Entrepreneurial Development and Management by Vasant Desai, Himalaya Publishing House (2009) ISBN- 978-81-8488-588-0
2. Entrepreneurial Development by S.S. Khanka, S. Chand & Company Ltd., New Delhi (1999) ISBN- 81-219-1801
3. Project Planning and Entrepreneurship Development by T.R.Banga, CBS Publishers and Distributers (1990)

PH02CFBT27 PRACTICAL BASED ON FOOD ANALYSIS

(50 MARKS - 4 HOURS, CREDITS-2)

1. Estimation of moisture from food sample.
2. Fat constants – Acid value, Peroxide value, Iodine value, TBA
3. Carbohydrates – Lactose, Reducing Sugar, Dietary fiber
4. Protein – Nitrogen analysis
5. Pigments – β -Carotene, Bixin
6. Minerals – Calcium, Iron, PH0sPH0rous

PH02C FBT28 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.

PH02EFBT21 FOOD PROCESSING TECHNOLOGY

(100 MARKS - 4 HOURS, CREDITS -4)

Objectives:

- 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

**PH02EFBT22 PRACTICALS BASED ON PH02EFBT21
(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 physic-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.

PH02EFBT23 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:

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

PH02EFBT24 PRACTICALS BASED ON PH02EFBT23

(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.