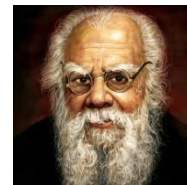


PERIYAR UNIVERSITY

Periyar Palkalai Nagar, Salem-636011

State University – NAAC Reaccredited A++ Grade – NIRF 63 – ARIIA 10



School of Professional Studies

DEPARTMENT OF FOOD SCIENCE AND NUTRITION

M.Sc.

FOOD SCIENCE, TECHNOLOGY AND NUTRITION

[Choice Based Credit System (CBCS) and Outcome Based Education (OBE)]



REGULATIONS AND SYLLABUS 9.0

[2005-06 (1.0); 2008-09 (2.0); 2012-13 (3.0); 2014-15 (4.0); 2016-17 (5.0); 2018-19 (6.0); 2022-23 (7.0); 2023-24 (8.0)]

(Effective from the academic year 2026-2027 and thereafter)

IN 75 % COMPLIANCE WITH TANSCHCE COMMON CURRICULUM STRUCTURE

M. Sc. FOOD SCIENCE TECHNOLOGY AND NUTRITION

OBE REGULATIONS AND SYLLABUS

(With effect from the academic year 2026-2027 onwards)

The Department of Food Science and Nutrition was established in the year 2005 and fosters learning, imparts job specific skills, execute society-oriented research and extension activities in the major thrust areas like Food Science and Chemistry, Food Processing and Technology, Public Health and Clinical Nutrition.

Vision of the Department of Food Science and Nutrition

The Department of Food Science and Nutrition envisions becoming a centre of excellence in skill-based and research-driven education, committed to preparing youth for employment, entrepreneurship, and global opportunities in the food and allied industries. Aligned with the vision of Periyar University, the department strives to integrate teaching, research, and outreach, while imparting new-age skills, fostering innovation, and contributing to the socio-economic and cultural development of society. The department is dedicated to nurturing competent, ethical, and industry-ready professionals who can meet the evolving demands of the food sector and contribute meaningfully at national and global levels.

Mission of the Department

To achieve its vision, the Department adopts the following mission strategies:

a. Industry-Aligned Curriculum

- Design and deliver need-based, industry-relevant programmes in tune with emerging trends in food science and nutrition
- Ensure curriculum alignment with skill frameworks and employability requirements

b. Integration of Theory and Practice

- Promote experiential learning through laboratory training, internships, and field exposure
- Facilitate learning from concept to consumer, bridging the gap between academia and industry

c. Skill Development and Career Readiness

- Equip students with technical, managerial, and entrepreneurial skills
- Transform learners into career-ready professionals with diverse opportunities in industry, research, and business

d. Research and Innovation

- Encourage multidisciplinary and applied research in food science, nutrition, and allied areas
- Promote innovation in product development, food safety, and sustainability

e. Contribution to Society

- Engage in community outreach programmes focusing on nutrition awareness, food safety, and public health
- Support sustainable practices and responsible food systems

f. Governance and Quality Enhancement

- Adopt transparent, participatory, and efficient governance practices
- Ensure continuous quality improvement through academic audits, feedback mechanisms, and policy implementation

Quality Policy of the Department

The Department of Food Science and Nutrition is committed to:

- Delivering quality education that meets national and global standards
- Ensuring continuous curriculum improvement based on industry and stakeholder feedback
- Promoting a learner-centric environment that fosters creativity, innovation, and critical thinking

- Strengthening industry-institute interaction for enhanced employability
- Upholding ethical practices, inclusivity, and sustainability in all academic and administrative activities

The Vision and Mission of the Department are closely aligned with the institutional goals of Periyar University, ensuring a holistic approach to education, research, skill development, and societal contribution, thereby producing competent professionals and responsible global citizens.

1. General Graduate Attributes – Department of Food Science and Nutrition

❖ Communication Skills

The students gain the ability to accurately and effectively communicate information related to food science, nutrition, health, and dietetics through written, visual, and oral reporting formats. They develop competency in presenting scientific findings, nutrition education materials, and technical reports to both professional and community audiences.

❖ Research Related Skills

The students develop the ability to apply scientific principles, experimental design, and analytical methods to investigate problems related to food science, nutrition, nutraceuticals, food technology, food safety, and public health nutrition. They gain skills in literature review, interpretation of scientific data, and critical evaluation of research publications in nutrition and allied sciences.

❖ Team Work

The postgraduates acquire the ability to work effectively as members and leaders within multidisciplinary teams in food industries, healthcare settings, research laboratories, and community nutrition programs. They understand the importance of collaboration, professional ethics, and interpersonal relationships in career development.

❖ Knowledge

The students gain integrated knowledge in various disciplines such as Human Nutrition, Therapeutic Nutrition, Food Chemistry, Food Processing and Preservation, Nutraceuticals and Functional Foods, Food Microbiology, Food Safety and Quality Control, Community Nutrition, Clinical Nutrition, Public Health Nutrition, Research Methodology, and Food Product Development.

❖ Global Perspective

The graduates acquire awareness of current and emerging global trends in food science, nutrition, food technology, sustainable food systems, public health concerns, and nutritional challenges. They understand international standards and practices related to food quality, safety, and nutrition.

❖ Critical Thinking

The graduates develop the ability to analyze, evaluate, and interpret scientific information related to food and nutrition. They gain competency in evidence-based decision-making for solving nutritional and food-related issues.

❖ Problem Solving

The postgraduate students develop the ability to identify, evaluate, and solve problems related to nutrition, health, food safety, food product development, and community dietary practices using scientific evidence and practical approaches.

❖ Analytical Reasoning

The students enhance their logical reasoning and analytical abilities through interpretation of laboratory results, nutritional assessment data, food composition analysis, and evidence-based evaluation of scientific information.

❖ Scientific Reasoning

The students gain an understanding of scientific inquiry, hypothesis formulation, experimental validation, and interpretation of scientific and technical data related to food science and nutrition. They develop intellectual integrity, analytical rigor, and scientific temper.

❖ **Reflective Thinking**

The students improve self-discipline, planning, organizational, and time management skills. They develop the ability to work independently, evaluate their learning experiences, and continuously improve their professional competencies.

❖ **Digital Literacy**

The students acquire skills in using digital tools and technologies for dietary assessment, nutritional analysis, statistical analysis, research documentation, food quality evaluation, and scientific communication. They become proficient in organizing, analyzing, and presenting nutrition-related information using digital platforms.

❖ **Multicultural Competence**

The students develop awareness and appreciation of cultural diversity in food habits, dietary practices, nutritional beliefs, and health behaviors. They understand the social and cultural implications of nutrition and food choices in diverse populations and communities.

2. Programme Outcomes

The learners can able to explore and attain the following theoretical (T), experiential (Practical) (E), professional (Transferable) (P) and attitudinal (A) skills

PO (T): Define and recognize the terms and concepts in food science and technology, food safety and quality control, public health nutrition and personalized nutrition

PO (E): Apply the principles and perform the food science and quality control tests, biochemical tests, data analysis, food safety experiments, diet planning for healthy and diseased individual

PO (P):

1. Disseminate and fulfill the job requirements in teaching and learning institutions, food industries, food testing laboratories, nutrition intervention programmes, fitness centres, diet clinics and hospitals
2. Develop innovative food products, business plan, food quality assurance system, nutrition care process model for a community and individual cases.
3. Evaluate the food products in the market, hygiene, sanitation and quality control in food manufacturing and catering establishments, performance/implementation of government nutritional programmes/schemes and nutritional profile of the community and individual
4. Educate the population on nutritional conservation, food safety measures and initiatives, nutrition and health care, eat right initiatives and food as medicine
5. Operate and create an enterprise in the domain of food, nutrition and dietetics Programme Specific Objectives:

PSO1 – Professional Competency and Employability

To equip learners with technical knowledge, practical skills, and field expertise required for discipline-specific career opportunities in academic institutions, research organizations, food industries, laboratories, corporate sectors, and government agencies.

PSO2 – Research, Innovation, and Nutrition Practice

To enable learners to apply theories, models, and research approaches in innovative product development, food safety management, quality assurance, community nutrition interventions, and individualized nutrition care processes.

PSO3 – Entrepreneurship and Leadership Development

To empower learners with food entrepreneurship and nutriprenurship skills for establishing and managing sustainable ventures in food, nutrition, and allied sectors.

PSO4 – Emerging Trends and Holistic Development

To update learners on emerging trends and advancements in food science, food technology, and nutrition, while fostering intellectual growth, emotional resilience, and professional adaptability.

PSO5 – Food Technology and Processing Skills

To provide learners with comprehensive knowledge and technical skills in food processing, preservation, packaging, value addition, and food technology innovations for the development of safe, nutritious, and sustainable food products.

3. Candidate's eligibility for admission

UG (B.Sc./B.Tech./B.Voc.) degree in Nutrition and Dietetics/Food Science and Nutrition/Food and Nutrition/Food Technology/Nutrition, Food Service Management and Dietetics/Food Processing/Clinical Nutrition and Dietetics/relevant discipline in different nomenclature under Food and Nutrition branch of Home Science/General Home Science (studied 5-8 courses on Food, Nutrition and Dietetics) approved by the Association of Indian Universities are eligible to seek admission.

Duration of the programme

Two years with four semesters.

4. Examinations

Examinations are conducted in semester pattern. The examination for the Semester I & III will be held in November/December and that for the Semester II and IV will be in the month of April/May. 75% attendance is mandatory to appear for the assessment of theoretical knowledge, practical experience, performing skills, and field expertise and outreach activities. Candidates failing in any subject (Theory, practical and skill) will be permitted to appear for such failed subjects in the same syllabus structure at subsequent examinations within next 5 years. Failing which, the candidate has to complete the course in the present existing syllabus structure.

4.1 Scheme for Evaluation and Attainment Rubrics

Evaluation will be carried out continuously throughout the course and conducted on four occasions during the coursework period. The first evaluation will take place in the 7th week, the second in the 11th week, the third in the 16th week, and the End Semester Examination in the 19th week. The assessment may include objective-type questions, short-answer questions, essay-type questions, or a combination of these formats. However, the End Semester Examination will be a University theory examination conducted according to the prescribed question paper pattern.

4.2 Attainment Rubrics for Theory Courses

External : 75 Marks

Internal : 25 Marks

Total : 100 Marks

Time : 3 hours

4.2.1 Theory examination

Evaluation of Continuous Internal Assessment

Test : 5 Marks (Best one out of Two Tests)

Model Examination : 5 Marks

Seminar : 5 Marks

Assignment : 5 Marks
 Attendance : 5 Marks
 Total : 25 Marks

4.2.2 End semester examination question paper pattern

Time duration: 3 Hours

Max.Marks:75

PART- A: 20 X 1 = 20 Answer all the questions

PART- B: 3 X 5 = 15 Answer any three questions out of five questions

(One question should be taken from each unit)

(Questions must be analytical type)

PART- C: 5 X 8 = 40 Answer all the questions

(Either or type one pair from each unit)

The Passing minimum shall be 50% (i.e. 38 marks) out of 75 marks.

4.3 Attainment Rubrics for Practical Examination

Evaluation of Internal Assessment

Test : 20 Marks (Best one out of Two Tests)

Model Practical : 20 Marks

Total : 40 Marks

Evaluation of End Semester Examination

Experiment : 40 Marks

Record : 10 Marks

Viva : 10 Marks

4.4 Attainment Rubrics for Research

Internal Mark : 20 marks

Viva - voce : 20 marks

Project Report : 60 marks

5. Grading system

The performance of students shall be assessed based on the following grading pattern:

5.1 Passing minimum

A candidate shall be declared to have passed in each course if he/she secures not less than 50% marks in the University Examinations and not less than 50% in the aggregate, including CIA and University Examinations marks.

5.2 Marks and grades

Conversion of Marks to Grade Point and Letter Grade (Performance in a subject) as follows.

Range of Marks	Grade Points	Letter Grade	Description
90 – 100	9.0 – 10.0	O	Outstanding
80 – 89	8.0 – 8.9	D+	Excellent
75 – 79	7.5 – 7.9	D	Distinction
70 – 74	7.0 – 7.4	A+	Very Good
60 – 69	6.0 – 6.9	A	Good
50 – 59	5.0 – 5.9	B	Average
00 – 49	0.0	U	Re-Appeal
Absent	0.0	AAA	Absent

Ci = Credits earned for course in any semester

Gi = Grade Point obtained for course i in any semester

n = The semester in which such courses were credited

For a Semester:

5.2.1 Grade Point Average (GPA)

$$GPA = \frac{\sum_{i \in C} C_i G_i}{\sum_{i \in C} C_i}$$

GPA is calculated as the sum of the multiplication of Grade Points and Credits of the courses divided by the total credits of the courses in a semester.

5.2.2 Cumulative Grade Point Average (CGPA)

$$\text{For the Entire Programme: } = \frac{\sum_{i \in C} C_i G_i}{\sum_{i \in C} C_i}$$

CGPA is calculated as the sum of the multiplication of Grade Points and Credits of the entire programme divided by the total credits of the courses in the programme.

5.2.3 Classification of final result

CGPA	Grade	Classification of Final Result
9.5 – 10.0	O+	First Class with Exemplary*
9.0 and above but below 9.5	O	First Class with Exemplary*
8.5 and above but below 9.0	D++	First Class with Exemplary*
8.0 and above but below 8.5	D+	First Class with Distinction*
7.5 and above but below 8.0	D	First Class with Distinction*
7.0 and above but below 7.5	A++	First Class with Distinction*
6.5 and above but below 7.0	A+	First Class
6.0 and above but below 6.5	A	First Class
5.5 and above but below 6.0	B+	First Class
5.0 and above but below 5.5	B	Second Class
0.0 and above but below 5.0	U	Re-Appear

* Candidates who pass in the first appearance and within the prescribed semesters of the PG Programme are eligible for these classifications.

6. Condonation

Students must have 75% of attendance in each semester to appear for the examination. Students who have attendance between 65% and 74% shall apply for condonation in the prescribed form with the prescribed fee to write the examination in the same semester. Students who have attendance between 50% and 64% shall apply for condonation in prescribed form with the prescribed fee along with the Medical Certificate in the current semester but they can write their examinations only in the next semester. Students who have attendance below 50% are not eligible to appear for the examination. But the student can continue the programme to complete the duration. To complete the programme they shall re do the semester(s) after completion of the programme duration to acquire required attendance for appearing missed semester examinations. However, the candidates have to clear all the subjects prescribed for programme within N+3 Years to acquire degree, where N denotes the duration of the programme.

COURSE PLAN: (Food Science and Chemistry- 26UPFSN1C01)

Unit	Intended Learning Chapters	
1. Colloidal System		
	Concept of food and nutrients. Types of water, structure and properties of water in food and water activity. Colloidal system in foods- types & properties. Sols - types and properties. Gels-Types, properties, theory of gel formation and factors influencing gel formation, Emulsion- types, common food emulsifiers, functions of emulsifying agents, emulsification capacity, factors affecting emulsion stability and Nano emulsification. Foams-theory of foam formation, factors affecting foam formation, foaming capacity and stability. Hydrocolloids and its application in food products.	
2. Cereals, Millets, Pulses, Nuts and Oil Seeds		
	Classification, nutritional composition and structure of cereals, pulses, millets, nuts and oil seeds. Types of starch in cereals, pulses, millets, nuts and oil seeds. Principles of starch cookery- gelatinization, gelation, retrogradation, syneresis and dextrinization, starch uses in food systems. Anti-nutrients, Allergens and Toxic constituents in cereals, pulses, millets, nuts and oil seeds. Factors influencing cooking quality of pulses. Complementary proteins.	
3. Sugars, Vegetables and Fruits		
	Sugars- sources, properties, stages of sugar cookery, and selection factor, crystalline and non- crystalline candies and sugar substitutes. Vegetables and fruits- composition, classification pigments, enzymes, polyphenol, pectin, acids & flavors and selection factor of fruits and vegetables. Changes during cooking, effect of cooking on pigments. Enzymatic and non- enzymatic browning reaction in fruits and vegetables. Ripening of fruits. Post-harvest handling, storage and nutrient retention in fruits and vegetables.	
4. Egg, Poultry, Meat and Fish		
	Egg – structure and composition, coagulation of egg protein, factors affecting coagulation of egg protein, egg quality. Meat - structure, composition, postmortem changes, Rigor mortis, aging and tenderization of meat, color of meat, changes of texture of meat during cooking, meat cuts and selection factor of meat. Poultry - Classification, composition, market forms, selection factors, poultry meat cuts and changes in poultry during aging and cooking. Fish - Classification, composition, kinds of fish, characteristics of fresh fish, fish cuts, changes during aging and cooking and selection factor of fish.	
5. Milk, Fats and Oils, Spices, Coffee, Tea and Cocoa beans		
	Milk- types, composition, Physio-chemical properties. Milk proteins –types, properties and functions, effect of heat, acids and enzymes on milk components, non-enzymatic browning reaction and milk substitutes. Fats and Oil – Classification and types of oils and fats, functions of oil and fats in foods, nutritional composition, properties, rancidity - types and prevention, role of fat / oil in food preparation, effect of heat on quality of fat and oil. Spices and condiments - types, uses & abuses, adulteration, role in cookery and medicinal uses. Coffee, tea & cocoa beans- types and composition and alkaloids	
Activity/Assessment		
Problem Based Activity and Assignment		
CO1	Problem Based Activity	Infographic on types of emulsifying agents in the market shelf
	Assignment	Write a review article on the role of nano-emulsification or a specific hydrocolloid (e.g., xanthan gum, carrageenan) in modern food product development.
CO2	Problem Based Activity	Protein supplements and textured vegetable protein- critique on its protein quality and message to food manufacturers
	Assignment	Prepare a herbarium of local cereals, millets, pulses, nuts, and oil seeds with geotagged source information for each specimen.
CO3	Problem Based Activity	Collect the newspaper clipping on ripening-based issues in the market and its outbreaks.
	Assignment	Compile a flashcard set listing the natural pigments (chlorophyll, carotenoids, anthocyanins, flavonoids) found in common fruits and vegetables, with colour-change notes on cooking.
CO4	Problem Based Activity	Prepare a public-awareness notice on selection factors for meat, fish, and poultry
	Assignment	Collect details on cuts of meat in butchering unit and prepare pictograph.
CO5	Problem Based Activity	Visit a local supermarket/kirana store and identify at least 5 milk, fat/oil, or spice products showing signs of possible adulteration (using labels, appearance, or simple field tests). Prepare a short case report on the findings and suggest what a consumer should check before purchase.
	Assignment	Prepare a comparative report on plant-based milk/dairy substitutes (soy, almond, oat, coconut milk) versus conventional cow/buffalo milk — covering composition, nutritional value, functional properties in cooking, and market availability.

COURSE SYLLABUS: (Food Processing Technology-26UPFSN1C02)

Unit	Intended Learning Chapters
1. Cereals, Millets and Pulses/legumes	
	Cereal Processing: Rice - pre-processing, parboiling, milling, by products of rice milling, rice based instant foods. Wheat- pre-processing, wheat milling process, by products of wheat milling; malting of cereals; Pasta products, noodles, Baking Technology- bread, biscuits and cakes Processing of millets - cleaning, decortication, milling and fractions Pulse/legume processing - cleaning, decortication, splitting, grading, milling and germination
2. Milk and Egg	
	Milk - classification, separation, standardization, pasteurization, homogenization, sterilization, evaporation, drying, condensation, membrane fractionation. Milk Products - butter, ghee, cream, paneer, yoghurt, cheese and fortified milk products. Drying Methods - spray drying, Drum Drying, and Vacuum drying. Egg processing – Unit operations in Egg powder and egg protein manufacturing. Drying Methods - foam mat drying, freeze drying and tray drying
3. Fleshy Foods and Oilseeds	
	Meat – Unit operations in meat processing, canning, dehydro-freezing, drying. Processed meat products – hamburgers, sausages and meatballs. Poultry – Unit operations in poultry processing, microwave heating, IR heating, freeze drying and irradiation. Fish - chilling, freezing, canning, smoking, salting and fish oil extraction. Oil Seeds Processing– pre-processing, unit operations in extraction of refined and unrefined oils
4. Fruits, Vegetables and Plantation Products	
	Fruits and vegetables processing– pre and post-harvest processing, drying and dehydration, juice extraction, concentrate preparation, minimal processing and hurdle technology, meat analogs and textured vegetable protein. Plantation products processing- processing of coffee, tea leaves and cocoa. Spices processing – Processing of major (Pepper, cardamom, chillies and turmeric) and minor (garlic, onion, curry leaves and cinnamon) spices
5. Sugar, Starch and Food Additives	
	Sugar – manufacturing of sugar from sugarcane and palm, sugar cubes and powdered sugar. Starch – starch isolation, modification of starch, Resistant starch. Food Additives - Introduction, need, Characteristics and classification, different food additives used in food processing and preservation
Activity/Assessment	
➤ Visit a rice milling industry and identify the steps involved in rice processing ➤ Develop a value added product from milk and state the various steps involved in it along with equipment's ➤ Construct a hybrid preservation method for an animal food products ➤ Derive the common steps involved in primary and secondary processing of fruits and vegetables ➤ Identify the different food additives used in food products along with its E-number	

COURSE PLAN: (Food Science and Chemistry Practical - 26UPFSN1L03)

Practical – Food Science and Chemistry
1. Determination of Water Activity in one Perishable, Semi-Perishable and Non-Perishable Food using Water Activity Meter. 2. Determination of least gelation concentration of a flour and viscosity of the gel using Brookfield viscometer. 3. Evaluation of Emulsification Efficiency of a Natural Bio-Emulsifier. 4. Characterization of Foaming Capacity and Foam Stability of Egg Albumen. 5. Microscopic Morphology Assessment of Cereal and Pulse Flours/Starches. 6. Analysis of Gelatinisation and Retrogradation Characteristics of Cereal/ Pulse Flours using Differential Scanning Calorimeter. (Demonstration) 7. Determination of Pasting Behaviour of Cereal/Pulse Flours Using Viscometric Profiling (Demonstration). 8. Estimation of Gluten Content and Assessment of Gluten Network Formation in Wheat Dough. 9. Evaluating Casein Destabilisation using Acid, Heat, and Enzymatic treatments. 10. Assessment of Egg Freshness and Thermal Coagulation Behaviour of Egg Proteins. 11. Measuring Texture Modifications due to Heat and Enzymatic/Acidic Tenderisers in Meat. 12. Determination of Smoke Point and Frying Readiness of Edible Oils and Fats. 13. Testing the Pectin Strength in Selected Fruits. 14. Effect of Heat on Pigments in Fruits and Vegetables by Determining the Color Value using Hunter Lab Calorimeter. 15. Analysis of Enzymatic Browning Reactions and Inhibition Strategies in Fruits and Vegetables.

COURSE PLAN: (Food Composition Analysis-26UPFSNL04)

Food Composition Analysis
Good Laboratory Practice of FDA and OECD guidelines Good Food Laboratory Practice by FSSAI. Preparation and maintenance of laboratory records and documentation. Evaluation of laboratory. Hygiene, sanitation, and safety measures. (Theoretical)
1. Tests for the presence of sugars. 2. Tests for the presence of protein. 3. Tests for the presence of phytochemicals. 4. Reducing and non-reducing sugar. 5. Total sugar by Lane and Eynon method. 6. Protein by Lowry's method (Practical) and Kjeldahl method (Demonstration). 7. Fat by Soxhlet method, Test for rancidity (Peroxide Value, Acid Number & Reichert Miessl RM). 8. Moisture by hot air oven method and moisture analyzer (FSSAI 03.006:2023). 9. Ash content by AOAC method or (FSSAI 03.011:2023). 10. Crude fiber by acid and alkali digestion method (FSSAI 03.018:2023). 11. Vitamin C by Redox Titration using Iodine Solution. 12. Iron by colorimetric method. 13. Phosphorus by colorimetric method. 14. Estimation of Calcium in Food by EDTA Titration Method. 15. Total Antioxidant capacity by Phosphomolybdenum Assay.

COURSE PLAN: (Analytical Instrumentation for Foods- 26UPFSNE01)

Unit	Intended Learning Chapters
1.	UV-Visible and IR Spectroscopy
	Classification of instrumental methods based on physical properties of molecules - The Electromagnetic spectrum - Interaction of photons with matter - Absorbance and transmittance - Beer and Lambert's laws. Deviation from Beer-Lambert's Law. Ultra violet and Visible spectrometry: Theory - Types of Transitions - Red and blue shifts - Instrumentation - Single beam and double beam spectrophotometers and applications. Fluorimetry: Theory - Factors affecting fluorescence - Instrumentation and applications. Infrared spectrometry: Requirements for IR absorption - Modes of vibrations - Instrumentation- Applications - Finger print region
2.	X-Ray, Flame Photometer, Thermal Methods and Morphology Analysis
	Absorption - Non-dispersive Method - Diffraction - Rotating and powder crystal methods – Applications. Flame photometer, Polarimetry and Refractometry - Principle and instrumentation - Saccharimetry - Analysis of sugar. Thermo gravimetry - Differential Thermal Analysis - Differential scanning calorimetry - Factors affecting the results - Instrumentation and applications. Morphology Analysis - Scanning Electron Microscopy - Transmission Electron Microscopy and Laser diffraction for particle analysis - Principle and Applications.
3.	Electrophoresis and Rapid Techniques
	Basic Principle of paper - Starch gel, agarose, PAGE, SDS-PAGE electrophoresis Immuno affinity techniques - Radio Assay Electrophoresis and applications. Isoelectric focusing, capillary electrophoresis- Microchip and 2D electrophoresis. Recent Development of Rapid Techniques - E sensors - e-nose, e-tongue instrumentation - Applications and working principles - Flow cytometry - Epifluorescence microscopy - Principle and Applications
4.	AAS, NMR and Mass spectroscopy
	Principle, Advantages of ASS over FES - Instrumentation - Interference and applications. Nuclear Magnetic Resonance: Introduction to NMR - Energy levels of nucleus - Equivalent and non-equivalent protons - Chemical shift - Shielding - TMS - Factors affecting chemical shift - Splitting of signals and instrumentation (proton NMR) - Applications. Theory – components of mass spectrometer – Mass spectrum. Resolution of mass spectrometer. Types of ions produced –General rules for Interpretation of mass spectra -Fragmentation methods - Applications of mass spectra
5.	Chromatography Techniques and Hyphenated Techniques
	Introduction - Classification of chromatographic methods: Column chromatography, Thin Layer chromatography, Paper chromatography, Gas chromatography and High-Performance Liquid Chromatography (HPLC) - Principle, important components and their functions mode of separation, Instrumentation and applications. ICP-MS, HR-MS, HPTLC, GC-MS, LC-MS and GC- FTIR – Principle, Instrumentations and applications
Activity/Assessment	
➤ Hands on training on UV spectrophotometer ➤ Demonstration of DSC ➤ Demonstration of Electrophoresis ➤ Demonstration of AAS ➤ Demonstration of HPLC	

COURSE PLAN: (Physiological basis for Nutrition - 26UPFSNE02)

Unit	Intended Learning Chapters
1. Homeostasis and Blood	
	Structural organization of the human body Functions of human life, and requirements for human life Introduction to homeostasis Mechanisms and pathways regulating homeostasis Thermoregulation Body composition Body fluid distribution Blood composition and functions Acid-base balance
2. Cells, Integumentary and Immune System	
	Cell structure and function Cell organelles and cell junctions Cell building blocks, nutrient sensing, metabolism and cell growth control Skin layers and functions, types of hair, nail structure and parts of the fingernail Exocrine glands – sudoriferous (sweat glands), sebaceous, ceruminous and mammary glands Role of the integumentary system in homeostasis Lymphatic system – lymph, lymphatic vessels, ducts, pathways and functions Immune System – Innate and adaptive immunity, Immune responses Immune disorders, autoimmunity and immunodeficiency
3. Respiratory, Nervous and Muscular System	
	Physiological anatomy and functions of the respiratory system Mechanics of respiration Transportation and exchange of respiratory gases in blood Regulation of respiration, respiration in high altitude and acclimatization Structure and functions of the nervous system Neurons, receptors, neurotransmitters, and reflex activity. Structure and parts of the brain and Limbic system of the brain Structure and Physiology of skeletal, smooth and cardiac muscles Muscular system and mechanics of muscle contraction Neuro muscular junction and neurotransmitters
4. Cardiovascular, Gastrointestinal and Excretory System	
	Structure of the heart and circulatory system cardiovascular pathways Cardiac cycle Blood circulation and blood pressure regulation Digestive system and layers of GI tract and accessory organs Accessory digestive organs Digestion and absorption of nutrients Sites of nutrient absorption in gastrointestinal tract Circadian rhythm of salivary, gastric, pancreatic and glucocorticoid secretions Organs and functions of urinary system Formation of urine and maintenance of water and salt balance
5. Senses, Endocrine and Reproductive System	
	Physiology of taste, smell, vision/sight, hearing, touch and spatial sense Role of sense in food intake and dietary behaviour Endocrine glands and hormones Hormone regulation of metabolism Interrelationship between nutrients and hormone signalling Reproductive physiology and nutrition Nutritional determinants of timing of puberty Genetics and inheritance
Activity/Assessment	
➤ Prepare a flowchart illustrating how the human body maintains homeostasis during exposure to high environmental temperatures. Include the roles of thermoregulation, body fluids, blood circulation, and feedback mechanisms. ➤ A healthy individual travels from sea level to a high-altitude region and experiences shortness of breath and fatigue. Analyze the physiological changes in the respiratory and nervous systems that occur during acclimatization. Present your findings using a concept map or infographic. ➤ Select one hormone (e.g., insulin, thyroid hormone, cortisol, estrogen, or testosterone) and prepare a short presentation explaining its source, physiological functions, relationship with nutrition, and the health consequences of its deficiency or excess. Include one real-life example or case scenario.	

COURSEPLAN: (Research Methodology & Statistical Application - 26UPFSNE03)

Unit	Intended Learning Chapters
1.	Research Process and Types of Research
	Meaning , Principles and Purpose of Research, Steps in Research Process , Identifying interest areas and prioritizing, Selection of topic and considerations in selection. Research questions , Review of related literature. Variables- types of variables. Hypothesis- meaning, types and testing of Hypothesis, sample distribution, level of significance, critical regions, Type I and Type II errors. One tailed and two tailed tests. Ethics in Research
2.	Types of Research and Research Design
	Basic and Applied research, Qualitative and Quantitative research. Historical research . Descriptive research methods – survey, case study, correlational study, content analysis, causal-comparative research. Analytic studies- pre-experimental, experimental research, quasi experimental research. Ethnography. Evaluative research, Cross sectional and Longitudinal studies Research Design- Meaning, Features of a Good Design, Concepts relating to Research Design, Different research designs, Basic Principles of Experimental Research Designs
3.	Sampling, Data collection and processing
	Sampling – principles of sampling, sampling terminology, Random and Non Random method of Sampling, calculating the sample size. Primary and secondary data. Measurement and Scaling Techniques. Construction of research tools, Reliability and validation of research tools, pilot testing. Processing of data - Editing, Coding, Organization, Tabulation, Diagrammatic and graphical presentation of data.
4.	Data Analysis- I
	Measures of central tendency-mean, median and mode. Measures of dispersion /variability- range, variance, standard deviation, standard error, coefficient of variation, Probability Distribution- Normal distribution, Binomial distribution and its Properties, Area under normal distribution curve. Tests of significance for Large samples, Tests of significance for small samples
5.	Data analysis- II and report writing
	Chi square test and its interpretation, General features, goodness of fit , Independence of Attributes .Correlation , Regression and its interpretation . F-Test, Analysis of Variance and its interpretation. Research Report - Basic components of a research report, prefatory material, introduction and Review of Related Literature, Methodology, Results, Discussion, Conclusion, Summary, Abstract, Bibliography and Appendices.
Activity/Assessment	
➤ Recognize different Types of variables. ➤ Organising literature using Zotero ➤ Construction of tools for data collection a) types of questions b) Questionnaire c) interview schedule d) observation scales , e) Online questionnaires (can be enhanced with AI-generated questions) ➤ Differentiate between • basic and applied research (Exercise to be based on actual research papers published in accredited journals) • qualitative and quantitative research ➤ Based on Journal contents undertake a critical appraisal of studies/research papers and discuss types of Research with examples. ➤ For given topic students to frame and discuss the different possibilities of methods and tools. ➤ standard normal curve ➤ jamovi- Statistical Analysis. ➤ test the hypothesis ➤ sample size calculation	

COURSE PLAN: (Entrepreneurship and Innovative Food Product Development- 26UPFSN1S01)

Intended Learning Chapters	
	1. Introduction to Entrepreneurship 2. Ideation and Concept Development 3. Market and Grocery Store Research Experiment 4. Consumer Concept Testing 5. Formulation and Prototype Development 6. Material Balance Determination 7. Standardization and Portion Control 8. Product Quality Testing 9. Packaging and Labelling 10. Shelf Life Evaluation
Activity/Assessment	
	➤ Develop unique products/items and organize their sale.

