DEPARTMENT OF FOOD SCIENCE & NUTRITION
M.Sc. FOOD SCIENCE
Proposed Curriculum Plan (2018-2019)

Semester	Course Code	Course Title	Hours	Credits	Marks
I	PFS 4401	Food Science	6	4	80
	PFS 4403	Food Chemistry	6	4	80
	PFS 4305	Food Microbiology	5	3	60
	PFS 4407	Principles of Food processing and Preservation	6	4	80
	PFS 4309	Laboratory - Food Chemistry and Food Microbiology	3	3	60
	PFS 4311	Functional foods and Nutraceuticals	4	3	60
		Total	**30**	**21**	**420**
II	PFS 4402	Advances in Food Science	6	4	80
	PFS 4404	Sensory evaluation of Processed Foods	6	4	80
	PFS 4406	Technologies of Fruits and Vegetables	6	4	80
	PFS 4308	Research methodology and biostatistics	5	3	60
	PFS 4310	Laboratory - Advances in Food Science	3	3	60
	PFS 4315	Obstetrics and Neo Natal Nutrition	4	3	60
		Total	**30**	**21**	**420**
		Summer Internship			
III	PFS 5501	Food Analysis, Safety and Food Laws	6	5	100
	PFS 5503	Dairy Technology	6	5	100
	PFS 5405	Food Packaging	6	4	80
	PFS 5407	Food Biotechnology	6	4	80
	PFS 5309	Laboratory - Food Analysis and Food Biotechnology	3	3	60
	PFS 5311	Project work	3	3	60
		Total	**30**	**24**	**480**
IV*	PFS 5502	Clinical nutrition and diet therapy	6	5	100
	PFS 5302	Laboratory – Clinical nutrition and diet therapy	4	3	60
	PFS 5504	Technologies of Meat and poultry	6	5	100
	PFS 5304	Laboratory – Technologies of meat and poultry	4	3	60
	PFS 5506	In-Plant Training	6	5	100
	PFS 5306	In-Plant Training	4	3	60
	PFS 5508	Technologies of cereals and legumes	6	5	100
	PFS 5308	Laboratory - Technologies of cereals and legumes	4	3	60
	PFS 5810	Project report	10	8	160
		Total	**30**	**24**	**480**

* (Any two)

Courses offered by the Department of Food sciences to Non-Major Students:

Buffer Courses

SEM	Course No.	Course Title	Hrs.	Cr	Marks
I	PFS 4313	Food Service Management	4	3	60
II	PFS 4317	Ethnic foods	4	3	60
		Total	**8**	**6**	**120**

PFS 4401 FOOD SCIENCE (6h/wk) (4cr)

This course on Food Science deals with sensory science and various food products such as cereal, legumes, fats and oil seeds, fruits, vegetable and dairy products, poultry, meat and marine foods and confectionery products.

UNIT 1. Introduction to Food Science: Food science - aims and scope - branches. Water - properties, biological importance, activity and role in food processing & preservation. Dietary sources - Constituents of foods - Quality factors in food - Quality standards - Government regulation of food supply and labeling - Federal food, drug and cosmetic act - Additional food laws - Legal categories of food substances - food additives and color additives - International food standard and Codex Alimentarius.

UNIT 2. Cereals, Millets, Fats and Oil Seeds Rice: Composition, primary and secondary processing-raw and boiled rice. Millets: Types, composition, processing. Legume: Types, composition, milling, germination, cooking & processed products. Oilseeds: Use of oilseeds and oilseed meals, sunflower and gingelly oil- composition-processing.

UNIT 3. Fruits and vegetables: Fruits and vegetables: Composition, pectin, plant acids, types of pigments, effect of cooking on colour and texture of vegetables. Dairy and Dairy Products-Milk and milk products: Composition, functionality in food system, processing of different products like ghee, butter, milk powders, khoa, paneer, cheese, milk products and ice creams.

UNIT 4. Poultry, Meat and Marine Foods: Eggs **-** Quality grading, structure, composition, functional properties and products. Flesh foods - Types, composition, structure of muscle, and conversion of muscle to meat - physicochemical changes, cooking and processing. Marine foods - Types, composition, cooking and processing.

UNIT 5. Confectionery: Sugar and Jaggery: Principles of sugar crystallization, stages of cookery and role in Indian traditional sweet preparations, manufacturing of candies and sweets

Text Book:

Meyer, I.H. Food Chemistry. Reinhold Pub. Corpn., New York, Charles R. Turtle Co., Tokyo, [1960].

References:

Deman, J. M. Principles of Food Chemistry, AVI Publishing Company, [1980].
Stryer L. Biochemistry, 4th Ed. W. H. Freeman and Company, [1995].
Stanier R Y and others. General Microbiology, Macmillan, India.[1986]
Frazier and Westhoff. Food Microbiology.3rd Ed. Tata McGraw Hill, [1978].

PFS 4403 **FOOD CHEMISTRY** **(6h/wk) (4cr)**

Theory course on Food chemistry includes introduction, methods of analysis, chemistry of carbohydrates, amino acids, proteins, lipids, plant pigments and essential oils.

UNIT 1. Introduction to chemistry of foods: composition and factors affecting the composition of foods, Proximate Composition of Foods; Instrument and methods used in food analysis, Colorimetry, Spectrophotometry, Fluorimetry, Atomic absorption spectroscopy and Chromatographic methods

UNIT 2. Carbohydrates: occurrence and classification; structure determination, diagrammatic representation of isomers, sugar derivatives; caramelization; Chemistry of cellulose, starches and other polysaccharides; starch degrading enzymes; commercial sources gel formation and starch retrogradation; pectic substances: their occurrence, structure, properties and use in foods; gums, mucilages and their commercial sources. Metabolism of carbohydrates.

UNIT 3. Amino acids and proteins: classification of proteins, chemical and physical properties of proteins, structure of proteins and techniques used in elucidation of protein structure; denaturation of proteins; forces involved in protein conformation, functional properties of proteins in foods, hydrolysis of proteins, major food proteins and their sources; changes in proteins during processing- Metabolism of proteins.

UNIT 4. **Lipids and plant pigments**: chemistry, occurrence, classification and composition; physical and chemical properties of fats. Emulsions-types of emulsions, emulsifying agents; metabolism of lipids. Plant pigments: their occurrence, chemistry, functions and changes during processing, Plant acids, acid and taste relationship; Essential oils: Chemistry, occurrence and extraction; Terpeneless oils and their use in foods

UNIT 5. Enzymes: Classification, nomenclature, general properties, mechanisms of enzyme action, regulation of enzyme activity. Role of Coenzymes and cofactors in enzyme activity. Factors affecting enzyme activity Enzyme inhibition, Isoenzymes, immobilized enzymes, clinical significance of enzyme assays.

Text Book:

Owen R. Fennema (1996) Food Chemistry Third Edition Marcel Dekker, Inc. New York.

References:

H.D.Belitz, W.Grosch, P.Schieberle (2009) Food Chemistry 4th revised and extended edition Springer publishers.

Potter, N.N. and Hotchikiss, J.H. (2006), Food Sciences, Fifth edition, CBS publishers and Distributors, New Delhi.

Fennema, O.R, 2006, Food Chemistry, Academic Press.

Meyer, L.H. 1987. *Food Chemistry*. CBS publishers and Distributors, New Delhi.

PFS 4305 FOOD MICROBIOLOGY (5h/wk) (3cr)

This course provides information on basic microbiology, food spoilage and preservation, food borne bacterial and viral diseases and food borne parasitic diseases. It also provides information on use of microorganisms in food preparation.

UNIT 1. Overview of Basic Microbiology An introduction to microbial world: Bacteria, Fungi, Yeast, Viruses Importance and significance of microorganisms in food science - Factors affecting the growth of microorganisms in food - Intrinsic and extrinsic factors that affect microbial growth.

UNIT 2. Food Spoilage and Preservation Definition, sources of contamination and microorganisms involved in spoilages of various foods: Milk, Bread, Canned food, Vegetables and fruits, Fruit juices, Meat, Eggs and Fish Physical and chemical means used in destruction of microbes: Definition of sterilization and disinfection, Thermal- role of heat, pasteurization, Non-thermal- filtration and radiation in sterilization, use of chemical agents-alcohol, halogens and detergents.

UNIT 3. Food Borne Bacterial and Viral Diseases Bacterial food borne diseases (*Staphylococcal* in toxification, Botulism, Salmonellosis, Shigellosis, Enteropathogenic *Escherichia coli* Diarrhoea, *Clostridium perfringens* gastroenteritis, *Bacillus cereus* Gastroenteritis) Food Borne Viral Pathogens (Norwalk virus, Norovirus, Reovirus, Rotavirus, Astrovirus, Adenovirus, Parvovirus, Hepatitis A Virus). Preventive and control measures.

UNIT 4. **Food Borne Parasitic Diseases** Food Borne Animal Parasites Protozoa – Giardiasis, Amoebiasis, Toxoplasmosis, Sarco cystosis, Crypto sporiodiosis, Cysticercosis/ Taeniasis. Roundworm – Trichinosis, Anisakiasis Mycotoxins: Aflatoxicosis, Deoxyni valenol Mycotoxicosis, Ergotism. Preventive and control measures.

UNIT 5. **Microorganisms and Food Preparation** Fermentation process-kinetics of fermentation process. Prebiotics-Probiotics and single cell proteins. Dairy products (cheese and yoghurt) and traditional Indian fermented foods and their health benefits. Fermented Beverages- wine, beer, toddy and vodka.

Text Book:

Frazier Food Microbiology 4thedi. Tata McGraw-Hill Education.

References:

James Jay, Loessner, Martin J., Golden, David A., Modern Food Microbiology - Springer publishers

Bibek Ray & Arun Bhunia Fundamental Food Microbiology, Fifth Edition CRC Press

M. R. Adams, M. O. Moss Food Microbiology Royal Society of Chemistry,

PFS 4407 PRINCIPLES OF FOOD PROCESSING AND PRESERVATION (6h/wk) (4cr)

This theory course on Food processing and preservation includes principles of food storage, processing and preservation by heat and water removal. It also includes cold preservation, preservation of food by irradiation, chemical and Nonthermal methods.

UNIT 1. Pre and post-harvest processing: Nature of harvested crop, plant, animal products. Maturity index-assessing the maturity index of different crops. storage of grains, storage conditions, effect of cold storage and quality

UNIT 2. Processing and Preservation by Heat and Water Removal: Blanching, pasteurization, sterilization and UHT processing, canning, extrusion cooking, dielectric heating, microwave heating, baking, roasting and frying. Retort processing of Ready to eat (RTE) products. Drying – water activity, microbial spoilage due to moisture. Dehydration of fruits, vegetables, milk- freeze drying.

UNIT 3. Cold Preservation: Mechanism of action, effect on food and micro-organisms refrigeration, freezing- methods of freezing, chilling injuries, defects in cold storage-psychrotrophs, cryopreservation- refrigerated gas storage.

UNIT 4. Food Irradiation and Chemical Preservation: Technology, application and safety assessments, legal aspects for UV, IR and gamma irradiation. Effects on food and microorganisms. Chemicals in food preservation, safety of preservatives, GRAS and permissible limits for chemical preservatives. Food additives; Definition, types and functions, permissible limits and safety aspects. Merits and demerits.

UNIT 5. Processing and Preservation by Non-Thermal Methods

High pressure, pulsed electric field, ultra sound, Cold plasma technology, Use and application of enzymes and microorganism in processing and preservation of foods; food fermentations and pickling.

Text Book:

Chakraverty, A. 1988.Postharvest Technology of Cereals, Pulses and oilseeds. Oxford and IBH, New Delhi.

References:

Girdhari Lal, Siddappa,G.S. and Tandon,C.L. “Preservation of Fruits and Vegetables”. ICAR, New Delhi. [1967].

Potter. Food science, 2nd Edition, AVI Publishing Company, [1973].

Norman W. Desrosier and Donald K. Tressler, Fundamentals of food freezing, AVI publishing company [1977].

Ranganna, S. Hand book of analysis of quality control for fruit and vegetable products.Second edition, Tata McGraw Hill Pub. Co., New Delhi [1986].

PFS 4309 LAB - FOOD CHEMISTRY AND MICROBIOLOGY (3h/wk) (3cr)

Laboratory course on Food Chemistry and microbiology includes exercises such as basic analytic techniques, quantitative estimation of proteins, carbohydrates, lipids, oils and crude fibre and also includes exercises such as preparation of media, various staining procedures, isolation of specific culture and microbiological analysis of unprocessed and processed food.

Quantitative analysis of proteins- Kjeldahl method

Qualitative and quantitative analysis of carbohydrates, such as free and total sugar, starch and pectin; Determination of sugars- polarimetry

Analysis of oils and fats; methods for physical and chemical characterization of fats

Estimation of crude fibre

Analytical techniques – Basics of spectrophotometer

Blood analysis – Glucose, cholesterol, protein; Hematology – hemoglobin, hematocrit, Differential count, RBC, WBC

Precautions and safety regulations, sterilization techniques

Staining: Gram's staining, acid-fast, spore, capsule and flagellar staining, Motility of bacteria, Staining of yeast and molds.

Microbiological analysis of a typical unprocessed food

Microbiological analysis of typical processed food.

Isolation of specific culture – Monoculture

Wine fermentation –fermentation kinetics

Text Book:

Berg JM, Tymoczko JL and Stryer L. (2002) Biochemistry 5th ed. W.H.Freeman.

References:

Conn EC, Stumpf PK, Bruening G and Doi RH (2001) Outlines of Biochemistry. 5th ed. John Wiley and Sons (Asia).

Devlin TM. (2002) Text Book of biochemistry with Clinical Correlations 5th ed. John Wiley and Sons.

Bibek Ray & ArunBhunia Fundamental Food Microbiology, Fifth Edition CRC Press

M. R. Adams, M. O. Moss Food Microbiology Royal Society of Chemistry,

PFS 4402 ADVANCES IN FOOD SCIENCE (6h/wk) (4cr)

This course on Advances in Food Science deals with sensory science and various food products such as cereal, legumes, fats and oil seeds, fruits, vegetable and dairy products, poultry, meat and marine foods and confectionery products.

UNIT 1. Sensory Science Sensory science - Introduction to sensory science - Panel selection methods in sensory analysis, Instrumentation - Recent Development in sensory science - Colour and texture of foods - Colour measuring systems- CIE system, tintometers - Physical characteristics of foods - Texture measurement- instrumental methods - Texture profile analysis - Rheology of foods - Flow behaviour of fluid foods - Viscosity measurement-consistometers and viscometers - On-line viscosity measurement

UNIT 2. Emerging trends in food processing -Emerging technologies in food processing – necessity and advantages. Minimal processing, power ultrasound, Microwave, PEF, HPP, Ohmic Heating, Spray-freeze drying, Dense phase CO_2, super critical fluid extraction processes in food materials.

UNIT 3. Value added products - Extrusion - cold and hot extrusion – production of pasta - principles- extrusion cooking, applications, - value addition by flaking, Puffing, Parching, - encapsulation – micro and nano level process – process and methods – selection of core and wall materials – quality of encapsulated products - coating – coating materials and equipments – battering and breading, seasoning. Foods for future- Space foods.

UNIT 4. Waste and by-product utilization and disposal -Waste materials, sources and classification, Utilization of by-products and wastes from food industries- meat and fish processing industries, Dairy plants, Milling Industries, Beverage industries. Waste treatment. and – production of paper and paperboards, particle board, fuel briquettes - production of fibre, activated carbon, furfural and adhesive

UNIT 5.Energy auditing and pollution control in food industries - Energy management and audit – definition – objectives – types, Energy auditing case studies. Industrial energy auditing and conservation measures - Policy recommendations. Energy auditing report preparation, pollution control- Environmental Audits-Regulations on pollution control.

Text Book:

Stanier R Y (1986). General Microbiology, Macmillan, India.

References:

Frazier and Westhoff. (1978). Food Microbiology.3rd Ed. Tata McGraw Hill,

Fellows, P. (1988). Food Processing Technology. Ellis Horwood International Publishers, Cambridge.

Marcus Karel Owen R. Fennema and Daryl B.Lund. (1975). Principles of Food science Part II, Physical principles of Food Preservation, Marcel Dekker, Inc. New york.

PFS 4404 SENSORY EVALUATION OF PROCESSED FOODS (6h/wk) (4cr)

This course on sensory evaluation of processed foods deals with sensory science and various methods of sensory and objective evaluation for different food products followed by textural profile analysis and factors influencing sensory verdicts.

UNIT 1.Introductions to sensory techniques and sense organs: Introduction, History, Development of Sensory Testing, Human Subjects as Instruments, Conducting a Sensory Study. The Human Senses – Vision, Touch, Olfaction, Chemical/Trigeminal Factors, Gustation, Hearing.

UNIT 2. Sensory attributes and sensory evaluation methods: Introduction, Sensory Attributes -Appearance, Odor/Aroma/Fragrance, Consistency and Texture, Flavor, Noise. Introduction - The Unified Approach to Difference and Similarity Testing, Triangle Test, Duo-Trio Test, Two-out-of-Five Test, Same/Different Test (or Simple Difference Test), "A" – not "A" Test, Difference-from-Control test, Sequential tests.

UNIT 3. Controls for Testing Panels: Introduction, Test Controls -Development of Test Room Design, Location, Test Room Design, The Booth, Descriptive Evaluation and Training Area, Preparation Area, Office Facilities, Entrance and Exit Areas and Storage.

UNIT 4. Factors Influencing Sensory Verdicts: Introduction, Physiological Factors – Adaptation, Enhancement or Suppression. Psychological Factors - Expectation Error, Error of Habituation, Stimulus Error, Logical Error, Halo Effect, Order of Presentation of Samples, Mutual Suggestion, Lack of Motivation, Capriciousness vs. Timidity -Poor Physical Condition.

UNIT 5. Objective evaluation techniques: chemical methods, physico- chemical methods (pHmeter, digital salt meter, Brik's refractometer, polariscope, butyrometer) - Microscopic examination - Physical methods. Instruments used for textural evaluation – bakers jel meter, visco meter, consisto meter, penetro meter, farino graph,pressure tester, succulo meter. Texture meter, tenduro meter, compressimeter.

Text Book:

Meilgaard, M., Civille, G.V., Thomas Carr, (1999). Sensory Evaluation Techniques, third edition, CRC Press, New York.

References:

Meyer, I.H. (1960) Food Chemistry. Reinhold Pub. Corpn., New York, Charles R. Turtle Co., Tokyo.

Deman, J. M. (1980) Principles of Food Chemistry, AVI Publishing Company.

Stryer L. (1995) Biochemistry, 4th Ed. W. H. Freeman and Company.

PFS 4406 TECHNOLOGIES OF FRUITS AND VEGETABLES (6h/wk) (4cr)

This course focuses on post-harvest technology of fruits and vegetables, storage and transportation, thermal processing of vegetables and fruits, preparation of juices, jam, tomato products, pickles and chutney.

UNIT 1. Post-harvest technology: Pre- and post-harvest physiology, maturation changes, and maturity indices. Pre- and post-harvest pathology, pathological spoilages. During storage and ripening and control measures. Storage disorders. Post-harvest handling, packaging, storage, transportation, marketing and export. Methods of precooling, post-harvest treatments to hasten and delay ripening.

UNIT 2. Storage and Transportation: Cold storage, controlled/modified atmosphere storage. Cold storage construction and requirements. Transportation by road/ rail /air /surface. Export requirements. Quarantine requirements, quality management, insect and pest infestation and control measures.

UNIT 3. Minimal and thermal processing: Minimal processing of fruits and vegetables. Thermal processing. Quality requirements for processing. Raw material - preparation, blanching, preparation of syrups and brines, canning and bottling operations for commercially important fruits and vegetables. Machinery used for the operations. Dehydrated fruits and vegetables.

UNIT 4. Juices and Jams: Beverages, RTS, Squashes, syrups, sherbat, recipes, preparation, packaging, quality standards and specifications. Juice concentrates, unit operations and equipments. quality control and specifications. Packaging and storage. Jams, jellies, preserve and marmalades and technology of their production. Packaging, quality control and specifications.

UNIT 5. Purees, pickles and chutney: Tomato products, raw material quality for different types of products, preparation of products - juice, puree, paste, ketchup, soup and sauces. Packaging, storage, quality control and specifications. Pickles and chutney, their types and production. Packaging of pickles and chutneys. Spoilage, quality control and specifications.

Text Book:

Thompson A K. (2003). Fruit and Vegetable-Harvesting, Handling and Storage, 2nd Edition, Wiley-Blackwell publishers.

References:

Salunkhe D.K., Kadam, S.S. (1995) Hand book of fruit science and technology: Production, composition, storage, and processing. Marcel Dekker, Inc. 270 Madison Avenue, New York, New York.

Wills, R.B.H.; Lee, T. H.; Graham, D. McGlasson, W. B. and Hall, E. G. (1981) Postharvest: An introduction to the physiology and handling of fruits and vegetables. AVI Publishing Co. Westport, Conn.

Kader, A. A. (1991) Postharvest Technology of Horticultural Crops. University of Calofornia Publication No 3311, Oakland, Calf.

PFS 4308 RESEARCH METHODOLOGY AND BIOSTATISTICS (6h/wk)(3cr)

This course has two parts. First part deals with research methodology, research problem and methods of data collection. The second part deals with statistics and data analysis using statistical tools.

UNIT 1. Research Methodology: Meaning, objectives and Significance of research. Types of research, research approaches and scientific methods. Research process and criteria of good research.

UNIT 2. Definition and Identification of a Research Problem: Selection of research problem, Justification, development of hypothesis, basic assumptions. Limitations and delimitations of the problem.

UNIT 3. Methods of Data Collection: Schedules and questionnaires; Interview, Case study, Home visits, scaling methods, Reliability and validity of measuring instruments, Statistical issues, Basic principles and regulations in humans and animal research, Analysis and reporting of data.

UNIT 4. Introduction to Statistics: Introduction and Describing data: frequency distributions and descriptive statistics – Sampling and Experimental design – classification, tabulations of statistical data – Diagrammatic representation – graphs – plotted curve – Sampling method and standard errors – random sampling – means – confidence limits – standard errors – variance.

UNIT 5. Data Analysis: Hypothesis Testing, Paired Comparison Designs, Pairwise Ranking Test: Friedman Analysis—Comparing Several Sample, Multisample Difference Tests — Block Designs, Simple Ranking Test: Friedman Analysis — Randomized (Complete) Block Design, Parametric Tests: t-test, z-test, chi-squares test, ANOVA.

Text Book:

Myra L. Samuels, Jeffrey A. Witmer, Andrew Schaffner. (2012). Statistics for the Life Sciences, 4th edition. Prentice Hall.

References :

John A. Rice. (2010). Mathematical Statistics and Data Analysis, Duxbury Press.

John M. Lachin. (2010). Biostatistical Methods: The Assessment of Relative Risks, 2nd Edition, Wiley-Blackwell Pub.

Snedecor, George, W.Cochran and William, G. (1967). Statistical Methods, Sixth edition, Oxford and IBH Publishing Co., Oxford.

PFS 4310 LAB - ADVANCES IN FOOD SCIENCE (3h/wk) (3cr)

Laboratory course on advances in food science deals with recent processing techniques, which enhances the texture and quality of the finished food products. It also focuses on the importance of water treatment plant analysis in food industry.

Sensory Evaluation …… (Same as per given syllabus)

Analysis and Interpretation of sensory data.

Minimal processing of fruits and vegetables.

Color measurement

Viscosity measurement

Textural Profile Analysis (TPA) of fresh and processed foods

Value added product using extrusion technology and quality assessment.

BOD and COD analysis of waste

Case study on energy auditing of a food industry

Visit to a modern food industry.

Text Book:

Potter,N.N., Joseph,H., Hotchkiss. (1997). Food Science. CBS Publishers and Distributors. New Delhi.

References:

Balasubramanian, P. (2013) Energy Auditing made Simple, Consultancy Services Publishers, India.

Fellows, P. (1988). Food Processing Technology. Ellis Horwood International Publishers, Cambridge.

Marcus Karel Owen R.Fennema and Daryl B.Lund. (1975). Principles of Food science Part II, Physical principles of Food Preservation, Marcel Dekker, Inc. Newyork.

PFS 5501 FOOD ANALYSIS, SAFETY & FOOD LAWS (6h/wk) (5cr)

This course has three sections. First section on food analysis focuses on preparation of the sample and sample analysis using various methods. Second unit on Food safety includes concepts of Food safety and food safety programs. The third on food laws focuses on principles of food laws and various governing bodies.

UNIT 1. Preparatory measures of food analysis: Sampling and preparation of samples-quality criteria for sampling-grinding dry materials, grinding moist materials, Enzymatic in activation and microbial act, and reporting results of given samples.

UNIT 2. Methods of Food analysis: Theory of spectroscopy absorption of radiation, Rotations, Vibration, Electro transition, Molecular Energy states, problems and measurement of color by using colorimetry and their function. Theory of Electrophoresis paper and thin layer chromatography about their functions and applications- HPLC, LCMS, GCMS.

UNIT 3. Food Safety: Food safety concept - Importance of food safety in the food processing industry, Risk classification, National and international food regulatory agencies, General food laws and food safety regulations, Nutritional labeling regulation (mandatory and optional nutrients, nutritional descriptors and approved health claims); Microbial contamination (including cross contamination/ indirect contamination) Chemical contamination, Physical contamination, Allergen contamination.

UNIT 4. Food Safety Programs: Definitions and importance, HACCP, Good Manufacturing Practices (GMPs), Pest Control Program, Facility Maintenance, Personal Hygiene, Supplier Control, Sanitary, Design of Equipment and Infrastructure, Procedures for Raw Material Reception, Storage and Finished Product Loading, Sanitation Program. (Sanitation Standard Operating Procedures (SSOPs), Product Identification, Tracking and Recalling Program, Preventive Equipment. Hurdle technology.

UNIT 5. Food Laws: Principles in the general National and International food laws, governing bodies. Principles of self-control, risk analysis on food, Indian Food regulations – History of Indian Food Regulations: BIS, ISI, FPO, PFA and FDA. Food Safety and Standards Act 2006.

Text Book:

1. Food safety: The science of keeping food safe. Ian C. Shaw, Wiley-Blackwell, 2013.

References:

The Microbiology of Safe Food, 2nd Edition. Stephen J. Forsythe, Wiley-Blackwell, 2010.
ILBCO's Food Safety and Standards Act, Rules, Regulations -12 edition 2014.
Food safety for the 21st Century: Managing HACCP and food safety throughout the global supply chain Wallace, C. A. Wiley-Blackwell, 2010.
Advances in microbial food safety. Sofos, John. Woodhead Publishing, Cambridge, 2013.

PFS 5503 **DAIRY TECHNOLOGY** **(6h/wk) (5cr)**

The course on dairy science includes introduction to dairy science, processing of milk, principle and preparation of milk products, packaging of milk and milk products.

UNIT 1. **Introduction to milk**: chemical composition of milk, unit operations in dairy industry-filtration, clarification, pasteurization, homogenization and sterilization. Processing of milk-types of processed milk-pasteurized, toned, flavoured, fermented, powdered and infant formula milk.

UNIT 2. Methods in milk processing: Use of bio-protective factors for preservation of raw milk: effects on physicochemical, microbial and nutritional properties of milk and milk products, present status of preservation of raw milk by chemical preservatives.

UNIT 3. Thermal processing of milk: Pasteurization-Methods of determining lethality of thermal processing, UHT processed milk products, their properties and prospects, types of UHT plants, aseptic fillers, heat stability and deposit formation aspects, effect on milk quality; techno- economic considerations; retort processing.

UNIT 4. Milk and milk products: Preparation methods and principles- different types of milk- milk powder, ghee, butter, ghoa, paneer, cheddar cheese, curd, yoghurt, ice cream. Packaging, storage and quality evaluation packaging and storage of milk and milk products, quality evaluation. Food laws and standards of dairy products.

UNIT 5. Current trends in cleaning and sanitization of dairy equipment: biological; detergents; Automation; Ultrasonic techniques in cleaning; bio-detergents, development of sanitizers- heat; chemical; radiation, mechanism of fouling and soil removal; Bio-films, assessing the effectiveness of cleaning and sanitization of dairy products.

Text Book:

Modern Technology of Milk Processing & Dairy Products (4th Edition) 2013 NIIR Board Publishers.

References :

Ellen Muehlhoff, Anthony Bennett, Deirdre McMahon 2013 Milk and Dairy products in human nutrition Food and Agriculture Organization of The United Nations Rome, www.fao.org/ publications

Early, Ralph 1997 Technology of Dairy Products 2nd Edition Springer US publications

Varnam, A., Sutherland, Jane P. 1994 Milk and Milk Products Technology, chemistry and microbiology Springer US publications

PFS 5405 FOOD PACKAGING (6h/wk) (4cr)

This theory course on Food packaging includes introduction, packaging materials and their properties, packaging systems and methods, packaging aspects of fresh and processed foods and packaging design and environmental issues in packaging.

UNIT 1. Introduction to food packaging: Packaging terminology- definition. Functions of food Packaging, Packaging environment. Characteristics of food stuff that influences packaging selection.

UNIT 2. Packaging material and their properties: Glass, Paper and paper board, Corrugated fibre board (CFB), Metal containers: Tin and Aluminum, Composite containers, Collapsible tubes, Laminations, Metalized films, Co extruded films, physical testing of polymeric packaging materials. Food Packaging Polymers (Polyethylene, PET, PVC, Polypropylene, Polystyrene & Nylon)

UNIT 3. Packaging Systems and methods: Canning-Vacuum Packaging, controlled atmospheric packaging, modified atmospheric packaging, Aseptic Packaging, Retort processing, Active Packaging, intelligent packaging, shrink and stretch packaging-cling.

UNIT 4. Packaging aspects of fresh and processed foods: Packaging of Fruits and vegetables, Fats and Oils, Spices, meat, Poultry and sea foods, Dairy Products, Bakery, beverages, Dehydrated and frozen foods. Liquid and powder filling machines – like aseptic system, form and fill (volumetric and gravimetric), bottling machines. Form Fill Seal (FFS) and multilayer aseptic packaging machines.

UNIT 5. Packaging Design & Environmental Issues in Packaging: Food marketing and role of packaging-Packaging aesthetic and graphic design; Coding and marking including bar coding; Consumer attitudes to food packaging materials; Packaging Laws and regulations, safety aspects of packaging materials; sources of toxic materials and migration of toxins into food materials; Packaging material residues in food products; Environmental & Economic issues, recycling and waste disposal.

Text Book:

Gardon L. Robertson (2012) Food Packaging: Principles and Practice, Third Edition, CRC Press, India.

References :

Richard Coles, Derek McDowell,.Mark J. Kirwan.(2003).Food Packaging Technology, Blackwell Publishers.

Aaron L. Brody, E. P. Strupinsky, Lauri R (2001). Active Packaging for Food Applications, CRC Press, U.S.A.

F.A.Paine (1962).Fundamentals of packaging .John willey and Sons, London.

H.Y.Paine and F.A.Paine (1983). Hand book of Food Packaging, Leonarol Hill Publishing Company.

PFS 5407 FOOD BIOTECHNOLOGY (6h/wk) (4cr)

Theory course on Food Biotechnology deals with use of genetic engineering, cloning and cell culture in Food Biotechnology, prospects, traditional applications, xenobiotics and its elimination and role of Biotechnology in food industries.

UNIT 1. Prospects of Biotechnology: Definition, scope and applications. Application of biotechnology in food. Basic principles of molecular biology and biotechnology: Recombinant DNA Technology.

UNIT 2. Genetic Engineering, cloning and cell culture: Fundaments of molecular biology and genetics. Central dogma. Concept of genetic engineering and molecular cloning. Plant and animal culture, transgenic plants, application of genetic engineering in food science and technology. Genetically modified foods – concept, types and application.

UNIT 3. Food Nanotechnology: Nanomaterials - Definition - History – Properties. Food Nanotechnology: Current developments and future prospects; Nanotechnology and applications in food safety; Nanotechnology for food: delivery system; Nanostructured encapsulation systems: food antimicrobials. Barrier Packaging – Antimicrobial Packaging- Antimycotic Packaging- Bio-based Packaging- Bio-degradable Packaging- Active Packaging – Smart Packaging. Safety of Nanomaterials in Food

UNIT 4. Xenobiotics: Definition, components, drug adverse reactions, nutrient drug interactions, industrial chemicals, Bio- dynamics of xenobiotics, overall metabolic fate of xenobiotic in the body Naturally occurring food toxicants and its elimination: Sources, toxicity, elimination- protease inhibitors, goitrogens, haemagglutinins, glucosinolates, cyanogens, saponins, gossypols, lathyrogens, favism and carcinogens.

UNIT 5. Role of Biotechnology in Food Industries: Production of organic acids**,** vitamins, amino acids- downstream processing-Food additives, synthesis, sweeteners – glucose syrup and High Fructose Corn Syrup (HFCS): thickeners and gelling agents, xanthan gums. Food industry solid waste management – utilization and disposal, effluent treatment: resource recovery, recycle, reuse, treatment and disposal.

Text Book:

1. Green P.J (2002), Introduction to Food Biotechnology, CRC press, U.S.A.

References :

Mansi, EMT, Bryce, CFA, Demain,A.L and Allman, R (2003) Fermentation Microbiology and Biotechnology, Taylor and Francis, NewYork,.

Primrose, S.B (2001), Molecular Biotechnology, second edition, Panima Publishing Corporation, New Delhi.

Satyanarayana, U, (2007). Biotechnology, Books and Allied (P) Ltd., Kolkata.

Fischer, A and F. Kampers (2011). Nanotechnology in the Agri-Food Sector: Implications for the Future - Wiley-VCH.

PFS 5309 LAB IN FOOD ANALYSIS AND FOOD BIOTECHNOLOGY (3h/wk) (3cr)

Laboratory course on food analysis and food biotechnology deals with analysis of food composition, determination of moisture, ash, estimation of minerals, vitamins, and food additives. It also deals with fermentation and enzyme immobilization techniques.

Analysis of food composition: Proximate analysis – Moisture, ash, crude fibre, fat and protein.

Analysis of minerals – Iron, calcium, zinc – AAS

Carbohydrates – Free sugars, Starch (Total & available), Dietary fiber.

Mineral estimation – Dry and wet ashing, calcium, iron, phosphorous.

Vitamin estimation – Ascorbic acid, thiamine, riboflavin and β carotene.

Determination of additives (colours, preservatives, artificial sweeteners etc.,)

Identification and estimation of common adulterants

Identification of antinutritional factors

Enzyme immobilization techniques

Analysis of probiotic potential of microbial cultures

Fermentation monitoring and control

Text Book:

Jordan, K. Woodhead (2011). Food chain integrity: A holistic approach to food traceability, safety, quality and authenticity. Cambridge Press.

References :

Nollet LML, (2013).Food analysis (2013) CRC Press Inc.USA

Nollet, L. Marcel Dekke (2004). Handbook of food analysis : Methods and instruments in applied food analysis r Inc., New Delhi.

Gould (2001). Total Quality Assurance for the Food Industries. W.A CTI Publications Inc., USA.

PFS 5502 CLINICAL NUTRITION AND DIET THERAPY (6h/wk) (5cr)

This theory course on clinical nutrition and diet therapy focuses on guidelines for dietary planning, therapeutic diets, nutritional intervention and nutrient counselling. It also includes role of dietitian in clinical nutrition.

UNIT 1. Guidelines for Dietary Planning Weights and Measures, Determining nutritional needs, Basic Guidelines for diet planning, Nutritional status of Indians, Cultural aspects of dietary planning.

UNIT 2. Therapeutic Diets: Functional foods and nutraceuticals- Modifications of normal diet, therapeutic diets for various disease conditions. Identification of high risk patients - nutritional assessment, nutritional diagnosis, nutrition intervention, monitoring and evaluation of nutritional care. Assessment components-medical and nutritional care - record types and uses. Format for medical and nutrition charting and documentation record.

UNIT 3. Nutritional Intervention Nutritional intervention and diet modification-diet prescription, modifications of the normal diet. Nutrition care for hospitalized patients-standard hospital diet, other types of diet in hospital, modifications of food intake

UNIT 4. Nutrition Counseling Nutritional counseling –concept, recipient and counseling environment, the problem-solving counseling method. Activities for behavior changes, intervention counseling models, types of counseling session in patients. Empowerment, interpersonal skills. Nutritional counseling components – planning, implementation and evaluation.

UNIT 5. Role of Dietitian Role of dietitian for hospitalized and outdoor patients and development of nutritional care plan. Specific functions of a therapeutic, administrative and consultant dietitian. Team approach in patient care. Psychological considerations in patient care. Interpersonal relationship with patients. Objectives of diet therapy- regular diet and rationale for modifications in energy and other nutrients, texture-fluid, soft diets.

Text Book:

Sari Edelstein (2015). Life Cycle Nutrition – An evidence-based approach.2nd Edition. (Ed.) Jones & Barlett Learning.

References :

A.Catherine Ross, Benjamin Caballero, Robert J.Cousins, Katherine L. Tucker, Thomas R.Ziegler (2014). Modern Nutrition in Health and Disease.11th Edition. (Eds.). Walters Kluwer / Lippincot Williams & Wilkins, Philadelphia,.

L.Kathleen Mahan, Suylvia Escott – Stump, Janice L.Raymond(2012). Krause's Food and the Nutrition Care Process. 13th Edition. (Eds.). Elsevier Saundres,.

P.Insel; D.Ross; K.McMahon&M.Bernstein (Eds). (2011). Nutrition.4th Edition. Jones & Bartlett Publishers, Massachusetts,

Gail. C.Frank (2008). Community Nutrition.2nd Edition.Jones & Bartlett Publishers,

PFS 5302 LAB - CLINICAL NUTRITION AND DIET THERAPY (4h/wk) (3cr)

This course emphasizes skill development in planning therapeutic diets using food exchange lists. It provides greater exposure to dietetic practices followed in Indian hospitals.

Planning of routine hospital diet: Clear fluid diet, Full fluid diet, Soft diet, High calorie and low-calorie diet, High residue and low residue diet.

Planning of diet in deficiency diseases: Vitamin A deficiency, Calcium deficiency, PEM

Planning of diet in infectious diseases: Typhoid, Tuberculosis.

Planning of diet in cancer, surgery and burns.

Planning of diet in kidney diseases: Low sodium diet

Meal planning for Diabetes Mellitus

Meal planning for Peptic ulcers and celiac sprue

Meal planning for Viral hepatitis and cirrhosis of liver

Meal planning for Cardiovascular disease

Text Book:

Bhala S.M.L, Bhatia N, Gopinath (1983). Diet Manual for heart patient, CTC, AHMS, New Delhi.

References :

1. Gibney M.J, Elia, M Ljingquist. O (2005), Clinical Nutrition, Blackwell Science Publishing Co. USA.

Robinson. C.H. et.al., (1986) Normal and Therapeutic Nutrition, 17th edition,MacMilian Publishing Co.

Raheena, B (2009) A Textbook of Food, Nutrition and Dietetics, Sterling Publishers, New Delhi.

Joshi, S. A (1998) Nutrition and Dietetics,4th edition, Tata McGraw Hill Publications, New Delhi.

PFS 5504 TECHNOLOGIES OF MEAT AND POULTRY (6h/wk) (5cr)

This course deals with meat and muscle, spoilage of meat, storage and preservation of meat by different methods, quality of meat and egg preservation.

UNIT 1. Meat and Muscle: Origin of meat animals –Sheep/goat, cattle and poultry basic aspects of slaughter techniques- pre and post slaughter techniques. Structure of Muscle- Proportion of muscle, tissue and muscle fiber structure. Chemical and Biochemical constitution of muscle- Chemical aspects, muscle protein, intramuscular fat, muscle function, post mortem glycolysis, onset of rigor mortis, conditioning. Conversion of muscle to meat-pre-slaughter handling, glycogen loss, stunning, bleeding conditioning, protein denaturation, proteolysis, and chemical changes. Meat analog.

UNIT 2. Spoilage of meat - Endogenous infection and exogenous infection, symptoms of spoilage, organisms associated with meat spoilage, spoilage due to temperature, pressure, pH, oxidation reduction potential, and other atmospheric conditions. Prophylaxis-hygiene conditions, biological controls, antibiotics and ionizing radiations

UNIT 3. Storage of meat- temperature control, storage above freezing point, fresh and chilled carcass, prepackaging and storage conditions**.** Storage below freezing point- effect of freezing on muscular tissue, freezing of meat. Thermal processing- Pasteurization, sterilization process.

UNIT 4. Preservation of meat: Principal of dehydration, freezing and hurdle concept, biochemical aspects, physical aspects and sensory aspects. Preservation by curing - chemical and biochemical aspects of curing ingredients, smoking, and maturing. Functional properties of additives used in meat product formulations and fresh meat processing, Preservation by ionizing radiation and by chemicals- chemical and biological aspects

UNIT 5. Quality of meat, Cooked meat and Egg preservation - Quantity and chemical nature of myoglobin, discoloration, water holding capacity, juiciness, Drip loss. Quality of cooked meat- protein aspects on cooking under different conditions, texture and tenderness and flavour components in meat. Toxic compounds formed during processing and cooking of meat. Tenderization by Marination, natural and artificial tenderizers, Egg structure, preservation of egg, physiological and chemical changes during egg preservation. Chemical aspects of protein and lipid associated with egg and functional properties. Nutritional aspects of meat, poultry and egg

Text Book:

1. Warriss, P.D. (2000) Meat Science: An Introductory Text, CABI Publishesrs.

References :

Lawrie, R.A and David Ledward, (2006), Lawrie's Meat Science, 7th Edition, Woodhead Publishers..

Olson, V.M, Shemwell G A and Pasch, S (1998) Egg and Poultry Meat Processing, VCHP, New York

PFS 5304 LAB- TECHNOLOGIES OF MEAT AND POULTRY (3h/wk) (3cr)

This laboratory course on meat and poultry deals with basic composition of meat, hygienic meat production, measurement of physical properties of meat, tenderization, egg quality evaluation and meat evaluation.

Basic composition- Moisture, pH, fat, protein

Rigor mortis-change in pH and drip loss

Hygienic meat production

Microorganisms in meat-

Dehydration and Freezing of meat-textural changes

Measurement of meat texture and colour

Water holding capacity of meat

Traditional/Convenience/novel meat products-processing effects on protein, and sensory

Meat tenderization-Marinating, additives identifications

Egg quality evaluation

Salting and curing of meat

Sensory quality evaluation, products formulation and development

Text Book:

Warriss, P.D. (2000) Meat Science: An Introductory Text, CABI Publishesrs.

References :

Lawrie, R.A and David Ledward, (2006), Lawrie's Meat Science, 7th Edition, Woodhead Publishers..

Olson, V.M, Shemwell G A and Pasch, S (1998) Egg and Poultry Meat Processing, VCHP, New York.

PFS 5508 TECHNOLOGIES OF CEREALS AND LEGUMES (6h/wk) (5cr)

The course on cereals and legumes focuses on classification of cereals, physical properties, drying, parboiling of rice, wheat production, rheology, legumes, course cereals and pseudo cereals.

UNIT 1. Cereals and Rice: classification of cereals, production, chemistry, nutritional importance, usage and consumption pattern. Rice: production, agronomy, botany, varieties, chemical composition, grain structure, distribution of nutrients, classification of rice. Physical properties of paddy and rice, morphology, grain dimensions, grading systems, density, porosity, angle of repose

UNIT 2. Processing of Rice: Drying of paddy, occurrence and prevention of crack formation. Aging and curing of paddy Physico-chemical properties of rice, nutrients, viscosity, gelatinization, gel consistency, cooking qualities, solid loss, water uptake and volume expansion. Parboiling of rice; methods of parboiling, changes in physico-chemical properties of rice after parboiling, advantage and disadvantages of parboiling.

UNIT 3. Wheat: Production, varieties, chemistry, grain morphology, flour quality, protein quality in relation to baking characteristics, functional properties of wheat flour, protein-lipid-carbohydrates interaction and their influence on the quality of the baked product. Rheology: basic approaches to dough rheology, influence of flour constituents on dough rheology.

UNIT 4. Legumes: production, types of legumes, chemical aspects, morphological aspects, cooking quality of legumes, functional properties of legume proteins, water uptake, foaming properties, minor pulses

UNIT 5. Coarse cereals, Millets and Pseudo cereals: Maize, sorghum, millets, grain morphology, production, chemical composition, nutritional quality and health benefits. Pseudocereals: Production, chemistry, nutritional significance, food uses

Text Book:

Chakraverty, A. 1988.Postharvest Technology of Cereals, Pulses and oilseeds. Oxford and IBH, New Delhi.

References :

Khalil Khan and Peter R Shewry. Wheat: Chemistry and Technology. Fourth Edition. AACC International PRESS

Mathews, R.H. Ed. 1989. Legumes: Chemistry, Technology and Human Nutrition. Marcel Dekker, New York.

PFS 5308 LAB - TECHNOLOGIES OF CEREALS AND LEGUMES (3h/wk) (3cr)

The laboratory course focuses on physico – chemical properties of paddy, rice, wheat and millets. It also enables to know the characteristics of legumes.

Measuring physical parameters of rice, length-breadth, 1000 kernel weight and angle of repose

Changes in physical parameters of rice after parboiling, color measurement, crack detection

Measuring the volume expansion and solid loss of rice on cooking, comparison between raw and parboiled rice

Detection of cooking time of different legumes

Morphology of cereals

Determination of bulk density and sphericity of sorghum and millets

Water absorption capacity of wheat flour

Foaming capacity and water uptake of different legumes

Estimation of equilibrium moisture content of paddy as a function of steeping temperature

Milling experiment-milling yield.

Estimation of moisture content analysis in grains.

Text Book:

Durbey, S.C. (1979). Basic Baking: Science and Craft. Gujarat Agricultural University, Anand (Gujrat).

References :

Elaine T Champagne (2004). Rice: Chemistry and Technology. Third Edition: AACC International press.

Kent, N.L. (1983). Technology of Cereals.3rd edition. Pergamon Press, Oxford, UK.

Pomeranz, Y. (1978). Wheat: Chemistry and Technology. Am. Assoc. of Cereal Chemist. St. Paul, minnesota.

Pomeranz, Y. (1987). Modern Cereal Science and Technology. VCH Pub., New York.

Salunkhe, D.K., Kadam, S.S.(1989). Handbook of World Food Legumes: Chemistry, Processing and Utilization, (3 vol. set). CRC Press, Florida

PFS 4311 FUNCTIONAL FOODS AND NUTRACEUTICALS (4h/wk) (3cr)

This course enables to gain knowledge on sources of functional foods and nutraceuticals. It also helps to understand the role of functional foods, nutraceuticals and dietary supplements in health and disease.

UNIT 1: Functional Food and Nutraceuticals: Definition, history, types and classification- difference between functional foods & Nutraceuticals. Health claim – FDA - FOSHU - safety - consumer acceptance.

UNIT 2: Natural occurrence of phytochemicals- antioxidants and flavonoids, omega 3 and 6 fatty acids, carotenoids, phytoestrogens, glucosinates, organo sulphur compounds, isoprenoid derivatives, phenolic substances, fatty acids and structural lipids

UNIT 3: Probiotics - Taxonomy and important features of probiotic micro- organisms. Health effects of probiotics including mechanism of action. Probiotics in various foods: fermented milk products, non-milk products etc.

UNIT 4: Prebiotics - Definition, chemistry, sources, metabolism and bioavailability, effect of processing, physiological effects, effects on human health and potential applications in risk reduction of diseases.

UNIT 5: Potential Health Benefits - Role of nutraceuticals in health and management of inborn errors of metabolism, obesity, neurological disorder, diabetes mellitus, hypertension, CVD, cancer, arthritis, and AIDS.

Text Book:

Aluko Rotimi (2012). Functional Foods and Nutraceuticals,Springer-Verlag New York Inc.

References :

Brar Satinder Kaur, Surinder Kaur and Gurpreet Singh (2014), Nutraceuticals Functional Foods. Nova science pub, Newyork.

Robert E.C. Wildman, Robert,Wildman, Taylor C, (2002). Handbook of Nutraceuticals and Functional Foods, Third Edition,Wallace,

PFS 4313 FOOD SERVICE MANAGEMENT (4h/wk) (3cr)

This course deals with the basic principles of organization and management in food service units and develop skills in food selection, purchase, storage and service of food and train students in implementing sanitary procedures in food services.

UNIT 1.Food Service: Introduction, Definition of food service industry, principles of food service industry, objectives, types of food service industry.

UNIT 2.Tools of management: Definition, classification- tangible tools, intangible tools, Organization chart, structure, function, work improvement techniques.

UNIT 3.Kitchen Layout: Factors in menu planning for large groups, systems for maintaining quality in food preparation and service, types of kitchen, kitchen control and maintenance of Kitchen records.

UNIT 4.Financial Management: Definition, scope of financial management, financial accounting, budgeting, costing, cost control-portion control.

UNIT 5.Personnel management: Definition, scope, concept of personnel management, approaches of personnel management, personnel policies, staff employment, training, placement, promotion, personnel records, work appraisals.

Text Book:

Mohini S (2005) Institution Food Management. New Age International Publishers. New Delhi.

References:

Bessie WB and Levelle W (1988) Food Service in Institutions. Sixth Edition. Macmillian Publishing Company New York.

2.Thangam Philip (2008) Modern Cookery for Teaching and Trade. Part I & II Orient Longman,Chennai.

PFS 4315 OBSTETRICS AND NEO NATAL NUTRITION (4h/wk) (3cr)

This course deals with the basic sciences relevant to obstetrics and gynecology. It Provides effective and adequate care and diet to the obstetrical and neonatal diseases.

UNIT 1.Pre-natal Period: Signs & symptoms, Biochemical and endocrine changes during pregnancy, complications – Food fads & taboos.

UNIT 2.Foetal Growth and Development: Anatomy of foetus, foetal physiology and foetal circulation - Development, structure and function of placenta, umbilical cord and amniotic fluid- importance of micro nutrients.

UNIT 3.Postpartum Period: Risk in Labour- Still birth -Pre-mature - cord around the neck-Cross section.

UNIT 4.Neo natal nutrition: Lactation -Importance of breast feeding - Infant Formula - identify normal and sick neonates – immunization schedule.

UNIT 5.Nutritional and Food Requirements: ICMR guidelines for Pregnancy, Lactation and infancy - nutritional needs and diet plan.

Text Book:

Chatterjee CC (1988) Text Book of Medical Physiology. W B Saunder's Co. London.

References:

Srilakshmi B (2014) dietetics, 7th edition, New Age International (P) Ltd, Publishers.

Guyton (1991) Human physiology and Mechanism of diseases. W.B Saunders and Co.London.

PFS 4317 **ETHNIC FOODS** **(4h/wk) (3cr)**

This course helps to understand the historical perspective of traditional foods. It critically evaluates the methods of preparation of ethnic foods.

UNIT 1.Traditional food style: History – Concept and Principles of Traditional Foods – Benefits and nutritional content of Traditional Foods.

UNIT 2.Healthy aspects of traditional foods: National health benefits - impacts of consuming traditional foods.

UNIT 3.Religious and Ethnic diversity: Food in Christianity (Catholic and Jehovah's Witness dietary requirements) Hindu, Halal Requirements for Meat, Poultry and Seafood based on religious and cultural practices. Halal Certification.

UNIT 4.Fermented Ethnic Foods: Traditional fermented foods and drinks. Principles of downstream processing and Product recovery.

UNIT 5.Traditional Cooking Methods: Traditional chimney kiln, modern mechanical fish smoking kiln, examples of smoked and dried products.

Text Book:

1. Kristbergsson K and Oliveira J (2016) Traditional foods: general and consumer aspects. Springer,New York.

References:

1. Pathak YV (2011) Handbook of nutraceuticals Volume 2, CRC Press, USA.

POSTGRADUATE DEPARTMENT OF FOOD SCIENCE & NUTRITION

(w.e.f. 2020-2021)

Semester	Course Code	Course Title	Hours	Credits	Marks
	PFN 4401	Advances in Food Science	5+1	4	80
	PFN 4403	Food Chemistry	5+1	4	80
	PFN 4305	Applied Physiology	4+1	3	60
	PFN 4407	Advanced Food Microbiology	5+1	4	80

I	PFN 4309	Laboratory in Advances in Food Science	3	3	60
	XXX 0000	Elective	4	3	60
		Total	**30**	**21**	**420**
II	PFN 4402	Nutrition Through Life Cycle	5+1	4	80
	PFN 4404	Advanced Nutritional Biochemistry	5+1	4	80
	PFN 4406	Food Investigation Techniques	5+1	4	80
	PFN 4308	Research Methodology and Biostatistics	4+1	3	60
	PFN 4310	Laboratory in Food Analysis	3	3	60
	XXX0000	Elective	4	3	60
		Total	**30**	**21**	**420**
		Summer Internship			
III	PFN 5501	Drug- Nutrient Interactions	5+1	5	100
	PFN 5503	Food Packaging	5+1	5	100
	PFN 5405	Functional Foods and Nutraceuticals	5+1	4	80
	PFN 5407	Food Biotechnology	5+1	4	80
	PFN 5309	Laboratory in Food Biotechnology and Microbiology	3	3	60
	PFN 5311	Project work	3	3	60
		Total	**30**	**24**	**480**
IV*	PFN 5504	Clinical Nutrition and Diet Therapy	5+1	5	100
	PFN 5302	Laboratory in Clinical Nutrition and Diet Therapy	4	3	60
	PFN 5304	Food Processing and Preservation	4	3	60
	PFN 5506	Industrial visit and Report	5+1	5	100
	PFN 5810	Project report	10	8	160
		Total	**30**	**24**	**480**

* Electives (Any two)

Courses offered by the Department of Food sciences to Non-Major Students:

Elective Courses

SEM	Course No.	Course Title	Hrs.	Cr	Marks
I	PFN 4311	Exercise and Sports Nutrition	4	3	60
	PFN 4313	Food Service Management	4	3	60
II	PFN 4314	ObstetricsandNeoNatal Nutrition	4	3	60
	PFN 4316	Nutrition in mental health	4	3	60
	PFN 4318	Ethnic foods (Tamil Traditional Foods)	4	3	60
Total			**8**	**6**	**120**

(Any two electives per year)

Certificate Courses offered by the Department of Food sciences & Nutrition:

Value Added Courses

SEM	Course No.	Course Title	Hrs/ wk	Cr
I	PFN 421V	Value added products from millets	2	2
III	PFN521V	Nutrition Counseling	2	2
Total			**4**	**4**

Programme Outcomes (Pos) for Postgraduates

Postgraduate programmes are expected to have developed in postgraduates the following graduate attributes:

i. Academic Excellence: Being a member of the academic community with advanced discipline-specific knowledge and professional skills in the relevant field with the prowess to communicate complex ideas and to engage in current critical debates with all sensitivity and fairness.

ii. Higher Order Thinking Skills: Ability to critically think, analyse, evaluate, and create new knowledge and skills both in the chosen discipline and across other fields.

iii. Subscription to Quality Research: Ability to design and carry out independent research, to update oneself with current research trends and contemporary inputs in the discipline, and to evaluate research contributions.

iv. Lifelong Learning: Ability to learn, unlearn, and relearn knowledge and skills in the emerging areas of the field of specialization.

v. ICT Literacy: Ability to be digital natives so that they can access a wide range of technologies for personal, academic and professional use and to be members of online communities enjoying the unlimited access blending transparency with accountability and fair practices.

vi. Good Communication: Ability to participate in public discourse on varied themes and topics in one's mother tongue as well as in English as a global link language.

vii. Individuals as Assets: To be academically honest, intellectually curious, ethically responsible, professionally competent, and spiritually inspiring citizens.

viii. Civic and Social Responsibility: Ability to function as matured democratic citizens with participation in issues of equity, gender equality, social justice, sustainable development, and povertyalleviation.

ix. Continuous Professional Development: Ability to continuously develop oneself professionally and to critically improve one's self with a view to taking appropriate decisions in diverse professional and real life environments.

x. Global Citizenship: Ability to work effectively and to live responsibly in a global context of cross-cultural life and capability, to value human diversity and lead life of timeless learning and endless opportunities.

Program Specific Outcomes (PSO)

At the end of the PG Food Science & Nutrition program, the student will be able to:

i. Apply the basic principles in food processing, food preservation, food chemistry, food microbiology and foodbiotechnology.

ii. Critically evaluate the issues in food processing, food quality and food safety

iii. Explain the importance of nutraceuticals, food safety and food laws.

iv. Contribute in creating nutritional awareness in making policies for government.

v. Extend the knowledge on various food processing technologies by further research.

vi. Design project in formulation, standardization of new products and clinical supplementation for starting Small Scale Industries (SSI) or Medium Scale Industries (MSI).

vii. Gain proficiency to become dieticians, food analyst and to be employed in government and privatesectors.

viii. Develop strategies to apply theoretical concepts in clinical interventions, nutritional assessment, diet planning and for health promotion.

ix. Solve complex problems and acquire analytical skills using latest techniques and tools to find out the solution for food, environmental safety.

x. Articulate legal and cultural impacts of policy making.

Mapping of Programme Specific Outcomes (PSOs) with

Programme Outcomes (POs)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
PSO 1	✔					✔			✔	
PSO 2	✔		✔		✔			✔		
PSO 3	✔									
PSO 4	✔	✔			✔			✔		✔
PSO 5	✔		✔							
PSO 6	✔		✔	✔					✔	✔
PSO 7	✔			✔			✔	✔	✔	
PSO 8		✔		✔					✔	✔
PSO 9	✔	✔	✔		✔		✔		✔	
PSO 10	✔						✔	✔	✔	

Mapping of Courses with Programme Specific Outcomes

Course Title	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10
PFN 4401	✔	✔			✔	✔	✔	✔	✔	
PFN 4403	✔				✔	✔	✔			
PFN 4305			✔	✔		✔	✔	✔		
PFN 4401	✔	✔		✔	✔	✔	✔	✔	✔	✔
PFN 4309	✔					✔	✔	✔	✔	
PFN 4402			✔	✔		✔	✔	✔		
PFN 4404	✔	✔			✔	✔	✔	✔	✔	✔
PFN 4406	✔	✔	✔		✔	✔	✔		✔	
PFN 4308		✔		✔		✔		✔	✔	✔
PFN 4310	✔				✔			✔	✔	✔
PFN 5501			✔	✔		✔	✔			✔
PFN 5503	✔	✔	✔		✔					✔
PFN 5405	✔	✔			✔	✔	✔	✔		
PFN 5407		✔	✔	✔	✔	✔	✔	✔	✔	✔
PFN 5309	✔			✔	✔			✔	✔	✔
PFN 5311	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
PFN 5504			✔	✔	✔	✔	✔			✔
PFN 5302			✔	✔	✔	✔	✔			✔
PFN 5304	✔	✔	✔			✔	✔			✔
PFN 5506			✔			✔	✔		✔	✔
PFN 5810	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
PFN4311			✔	✔		✔	✔	✔		
PFN4313			✔			✔	✔	✔		✔
PFN4314			✔	✔		✔	✔			✔
PFN 4316		✔	✔		✔	✔	✔			
PFN4318		✔	✔		✔	✔		✔	✔	

PFN 4401 Advances in Food Science (5+1=6hrs/wk) (4cr)

The course aim at introduce the effect of food processing on bioactive compounds in various aspects and also helps to implement strategies of food waste management and pollution control in industrial basis.

Course outcomes

i. Identify the foods with its nutritional properties and the scope in future foods.
ii. Analyze thescience of starches and sweetener.
iii. Revise the properties of food especially sensory characteristics.
iv. Select appropriate method for the formulation of value added food products.
v. Evaluate the applications and strategies of food waste management.

Unit 1: (12 hrs)

Basic food groups & Specific foods – Composition and nutritive value of Cereals, pulses, nuts & oilseeds, fruits & vegetables, fats & oils, Milk & meat products. Specific foods: Bee products: honey, bee pollen, royal jelly, propolis. Spirulina, Blue-Green algae, Marine phytoplankton, Aloe vera, Hempseed, Coconuts, Camu camu berry, Chlorella, Kelp, Noni, Yacon.

Unit 2: (17 hrs)

Science of starches and sweetener- Modified food starches, Structure and characteristics of polysaccharides-Non starch Polysaccharides- cellulose, hemicellulose, pectin, gums, animal polysaccharides.

Chemistry of sweetener- Sweetening agents- Colligative properties, Textural contribution, Fermentation, Structural relationship to sweetness perceptions.

Unit 3: (17 hrs)

Sensory Science- Nutritional Value of Food, Sensory Properties of Food and evaluation methods, Recent Development in sensory science - Introduction to sensory science - Panel selection methods in sensory analysis, Instrumentation - Recent Development in sensory science - Colour and texture of foods **-** Colour measuring systems- CIE system, tintometers - Physical characteristics of foods **-** Texture measurement- instrumental methods - Texture profile analysis - Rheology of foods **-** Flow behaviour of fluid foods - Viscosity measurement- consistometers and viscometers - On-line viscosity measurement.

Unit 4: (15 hrs)

Value added products - Extrusion - cold and hot extrusion, production of pasta, principles-extrusion cooking, applications, - value addition by Flaking, Puffing, Parching. Encapsulation – micro and nano level process and methods, selection of core and wall materials, quality of encapsulated products. Coating – coating materials and equipment, battering and breading, seasoning. Foods for future- Space foods.

Unit 5: (14 hrs)

Food waste management- Quantities of lost and wasted food and impact on food and nutrition security, Prospects, Origin of food waste and food loss, Management and valorization strategies, Treatment of food waste, Recovery and applications of enzymes from food wastes. Energy auditing and pollution control in food industries, Policy recommendations, Regulations on pollution control.

Text Book:

1. Visakh. P. M, Laura B. Iturriaga, and Pablo Daniel Ribotta, Advances in Food Science and Nutrition, Copyright c 2014 by Scrivener Publishing

References:

1. Stanier R Y (1986). General Microbiology, Macmillan, India.
2. Frazier and Westhoff. (1978). Food Microbiology.3rd Ed. Tata McGraw Hill,
3. Fellows, P. (1988). Food Processing Technology. Ellis Horwood International Publishers, Cambridge.
4. Marcus Karel Owen R. Fennema and Daryl B.Lund. (1975). Principles of Food science Part II, Physical principles of Food Preservation, Marcel Dekker, Inc. Newyork.
5. Charis Galanakis, Food Waste Recovery 1st Edition, Processing Technologies and Industrial Techniques, Hardcover ISBN: 9780128003510, eBook ISBN: 9780128004197
6. Srilakshmi B (2005) Dietetics. New Age International Publishers, New Delhi.
7. David Wolfe, Superfoods: The Food and Medicine of the Futu… (Kindle Edition)

Bloom's Taxonomy	**K1 Remembering**	**K2 Understanding**	**K3 Applying**	**K4 Analyzing**	**K5 Evaluating**	**K6 Creating**
CO 1		2		4		
CO 2		2		4	5	
CO 3			3	4		6
CO 4			3	4	5	6
CO 5			3	4	5	6

Mean- 4.12

PFN 4403 Food Chemistry (5+1=6hrs/wk) (4cr)

The course aims at introduction, methods of analysis, chemistry of carbohydrates, amino acids, proteins, lipids, plant pigments and essential oils.

Course Outcomes

Upon completion of this course, the student will be able to:

i. Analyse the components present in food using various instruments
ii. Explain the Structure and properties ofcarbohydrates
iii. Discuss the classification and properties of aminoacid and proteins
iv. Demonstrate the chemistry various lipids and plant pigments
v. Utilize the enzymes in food industries

Unit 1: (16 hrs)

Introduction to chemistry of foods: Composition and factors affecting the composition of foods, Proximate Composition of Foods; Instrument and methods used in food analysis, Colorimetry, Spectrophotometry, Fluorimetry, Atomic absorption spectroscopy and Chromatographic methods

Unit 2: (15 hrs)

Carbohydrates: Occurrence and classification; structure determination, diagrammatic representation of isomers, sugar derivatives; caramelization; Chemistry of cellulose, starches and other polysaccharides; starch degrading enzymes; commercial sources gel formation and starch retrogradation; pectic substances: their occurrence, structure, properties and use in foods; gums, mucilages and their commercial sources. Metabolism of carbohydrates.

Unit 3: (15 hrs)

Amino acids and proteins: Classification of proteins, chemical and physical properties of proteins, structure of proteins and techniques used in elucidation of protein structure; denaturation of proteins; forces involved in protein conformation, functional properties of proteins in foods, hydrolysis of proteins, major food proteins and their sources; changes in proteins during processing- Metabolism of proteins.

Unit 4: (15 hrs)

Lipids and plant pigment: Chemistry, occurrence, classification and composition; physical and chemical properties of fats. Emulsions-types of emulsions, emulsifying agents; metabolism of lipids. Plant pigments: their occurrence, chemistry, functions and changes during processing, Plant acids, acid and taste relationship; Essential oils: Chemistry, occurrence and extraction; Terpeneless oils and their use in foods.

Unit 5: (14 hrs)

Enzymes: Classification, nomenclature, general properties, mechanisms of enzyme action, regulation of enzyme activity. Role of Coenzymes and Cofactors in enzyme activity. Factors affecting enzyme activity Enzyme inhibition, Isoenzymes, immobilized enzymes, clinical significance of enzyme assays.

Text Book:

1. Owen R. Fennema (1996) Food Chemistry Third Edition Marcel Dekker, Inc. New York

References:

1. H.D.Belitz, W.Grosch, P.Schieberle (2009) Food Chemistry 4th revised and extended edition Springer publishers.
2. Potter, N.N. and Hotchikiss, J.H. (2006), Food Sciences, Fifth edition, CBS publishers and Distributors, New Delhi.
3. Fennema, O.R, 2006, Food Chemistry, Academic Press.
4. Meyer, L.H. 1987. Food Chemistry. CBS publishers and Distributors, New Delhi.

Bloom's Taxonomy	K1 Remembering	K2 Understanding	K3 Applying	K4 Analyzing	K5 Evaluating	K6 Creating
CO 1	1	2	3	4		
CO 2	1	2		4	5	
CO 3		2	3	4	5	6
CO 4	1	2	3		5	6
CO 5	1	2	3	4	5	6

Mean = 3.33

PFN 4305 Applied Physiology (5hrs/wk) (3cr)

The course aimed at the students to understand the structure and basic physiology of various organs of the body. The students will obtain better understanding of the principles of Foods and Nutrition through the study of physiology.

Course Outcomes

Upon completion of this course, the student will be able to:

I. Compare the digestive and excretory system and infer the mechanisms of digestion and excretion in human beings.
II. Explain the functions of circulatory system.
III. Communicate the structure and functions of respiratory system in man.
IV. Analyze the relationship between nervous system and sense organs
V. Discuss the role of hormones and functions of human reproductive system.

Unit 1: (15 hrs)

Cell: General Character, Structure, Cell Membrane, Cytoplasm, Lysosome, Peroxisomes, Mitochondria, Ribosomes, Nucleus, Deoxyribonucleic Acid, Ribonucleic Acid

Muscle physiology: Muscle, Skeletal Muscle, Changes during Muscular Contraction, Neuromuscular Junction, Smooth Muscle

Unit 2: (12 hrs)

Digestive system: Digestive system, Enzymes and hormones, Salivary Secretion, Gastric Secretion, Pancreatic Secretion, Liver and Bilary System, Functions and Secretion of Small Intestine and Large Intestine, Dysfunction of liver,pancreas and gall bladder.

Renal physiology: Function of Kidney, Nephron, Renal Circulation, Urine Formation, Renal Function Test, Role of kidney in maintaining pH of blood. Water, electrolyte and acid base balance, diuretics.

Unit 3: (16 hrs)

Blood and body fluids – Body Fluids, Blood, Plasma Protein, RBC, erythropoiesis, Haemoglobin, WBC, Platelets, Blood Coagulation, Blood Groups, Blood Transfusion, Use of blood for investigation and diagnosis of specific disorders.

Cardiovascular system: Heart, Properties of Cardiac Muscle, Cardiac Cycle, Heart Sound, ECG, Cardiac impulse, coronary circulation, pulmonary circulation, cerebral circulation, hepatic circulation, renal circulation, cutaneous circulation and skeletal muscle circulation.

Unit 4: (16 hrs)

Endocrinology: Endocrine System, Hormones, Pituitary Gland, Thyroid Gland, Parathyroid Gland, Pancrease - Islets of Langerhans and Insulin, Adrenal Gland, Emphasis on physiology of Diabetes and stress hormones.

Respiratory system: Types of Respiration, Pulmonary Circulation, Respiratory Movement, Pulmonary Function Test, Lung Volume, Lung Capacity, Respiratory Gases, pulmonary function tests, Cardio – respiratory response to exercise and physiological effects of training.

Unit 5: (16 hrs)

Nervous system: Neuron, Nerve Fibrosis, EEG, CSF, ANS, properties, myelin sheath, nerve endings, synapse, neuro transmitters, The role of Hypothalamus in various body functions – obesity, sleep, memory, Blood Brain Barrier

Sense organ: sensation of vision, hearing, taste and smell.

Text Book:

1. Ahuja (2001). Textbook of Physiology, CBS Publishers

References:

1. Chatterjee C C (1988). Text Book of Medical Physiology. W B Sounder's Co. London.
2. Elaine N and Marie R N (1997) Human Anatomy and Physiology. Addison Wesley Longman, Inc., UK
3. Ganong (1995). Review of Medical physiology. Prentice Hall international, London.
4. Guyton, A. C, (2009). Function of the Humanbody, 4th Edition, W .B. Sanders Company, Philadephia.
5. Guyton, A. C, and Hall., J. B. (2010). Text Book of Medical Physiology, 9th Edition, W. B. Sanders company, Prime Books (Pvt.) Ltd., Bangalore

Bloom's Taxonomy	**K1 Remembering**	**K2 Understanding**	**K3 Applying**	**K4 Analyzing**	**K5 Evaluating**	**K6 Creating**
CO1	1	2	3	4		6
CO2	1	2	3	4	5	
CO3	1		3	4		6
CO4	1	2	3	4	5	
CO5	1	2	3		5	6

Mean = 3.20

PFN 4407 Advanced Food Microbiology (5+1=6h/wk) (4cr)

The course aims at providing information on basic microbiology, food spoilage and preservation, food borne bacterial and viral diseases and food borne parasitic diseases. It also provides information on use of microorganisms in food preparation.

Course Outcomes

Upon completion of this course, the student will be able to:

i. Outline the importance of microorganisms and the factors responsible for their growth
ii. Discuss the spoilage and deterioration mechanisms in foods and methods to control deterioration and spoilage
iii. Identify the conditions for the growth of food borne bacterial and viral diseases
iv. Compile the conditions for prevalence of food borne and parasitic diseases.
v. Explain the beneficial role of microorganisms in fermented foods and in food processing.

Unit 1: (12 hrs)

Overview of Basic Microbiology: Importance and significance of microorganisms in food science. Introduction to Microbiology – Scope of microbiology - Ancient Microbiology - Refutation of a biogenesis: discovery of penicillin: discovery of vaccination: proposal of one gene one enzyme hypothesis - Major contribution of scientists– Leeuwenhoeck, Edward Jenner, Alexander - Flemming, Joshep Lister, Robert Koch, Louis Pasteur, Hargobind Khorana. Modern Microbiology - Landmark achievements in 20th century - Microbial Taxonomy - Definition and systematics, Nomenclatural rules and identification. Haeckel's three kingdom classification, Whittaker's five kingdom approach - Woese domain system. Major characteristics used in taxonomy – morphological, physiological and metabolic, genetic and molecular taxonomy. Bergey's Classification of bacteria.

Unit 2: (16 hrs)

Determination of microorganisms and their products in food: Sampling, sample collection, transport and storage, sample preparation for analysis. Microscopic and culture dependent methods- Direct microscopic observation, culture, enumeration and isolation methods; Chemical and Physical methods-Chemical, immunological and nucleic acid based methods; Culture independent techniques – PCR Based, DGGE, Metagenomics, etc.; Analytical methods for microbial metabolites- microbial toxins and metabolites.

Unit 3: (15 hrs)

Biology of Microorganisms: Differences between prokaryotic and eukaryotic cell. Biology of bacteria - cell structure, size, shape, arrangement membrane, cell wall, cytoplasmic inclusions, mesosomes, flagella and motility, slime, capsule, pili, chemotaxis, endospore - biology of fungi, structure, physiology and classification – biology of yeast – reproduction - virus (bacteriophages) structure, life cycle (lytic and lysogenic) – biology of algae – Mycoplasma – prions.

Unit 4: (16 hrs)

Food borne diseases: Bacterial food borne diseases (Staphylococcal intoxification, Botulism, Salmonellosis, Shigellosis, Enteropathogenic Escherichia Coli Diarrhoea, Clostridium Perfringens gastroenteritis, Bacillus cereus Gastroenteritics) Food Borne Viral

Pathogens (Norwalk virus, Norovirus, Reovirus, Rotavirus, Astrovirus, Adenovirus, Parvovirus, Hepatitis A Virus) Food Borne Animal Parasites Protozoa – Giardiasis, Amebiasis, Toxoplasmosis, Sarcocystosis, Cryptosporidiosis. Cysticercosis/Taeniasis. Roundworm – Trichinosis, Anisakiasis. Mycotoxins: Aflatoxicosis, Deoxyni valenol Mycotoxicosis, Ergotism

Unit 5: (16 hrs)

Microorganisms and Food Preparation Fermentation process-kinetics of fermentation process. Prebiotics-Probiotics and single cell proteins. Dairy products (cheese and yoghurt) and traditional Indian fermented foods and their health benefits. Fermented Beverages- wine, beer, toddy and vodka. Natural Toxins in Food: Natural toxins of importance in food- Toxins of plant and animal origin; Microbial toxins (e.g. Algal toxins, bacterial toxins and fungal toxins). Natural occurrence, toxicity and significance. Food poisoning; Mycotoxicosis of significance. Determination of toxicants in foods and their management.

Text Book:

1. Frazier Food Microbiology 4thedi. Tata McGraw-Hill Education

References:

1. James Jay, Loessner, Martin J., Golden, David A., Modern Food Microbiology - Springer publishers
2. Bibek Ray &Arun Bhunia Fundamental Food Microbiology, Fifth Edition CRC Press
3. M. R. Adams, M. O. Moss Food Microbiology Royal Society of Chemistry

Bloom's Taxonomy	K1 Remembering	K2 Understanding	K3 Applying	K4 Analyzing	K5 Evaluating	K6 Creating
CO 1	1	2	3	4	5	
CO2		2		4		6
CO 3	1		3	4	5	
CO 4				4		6
CO 5	1	2	3		5	6

Mean = 3.35

PFN 4309 **Laboratory in Advances in Food Science** **(3h/wk) (3cr)**

Course Outcomes

Upon completion of this course, the student will be able to:

i. Analyze the colour and viscosity of foods.
ii. Apply the role of different methods of processing of foods.
iii. To identify the texture profile of fresh and processed foods.
iv. To demonstratethechemicalandbiochemicaloxygendemandfor different waste products.
v. To evaluates different types of food using five basic senses.

Laboratory Experiments

1) Sensory Evaluation……(Same as pergivensyllabus) Analysis and Interpretation of sensorydata.
2) Minimal processing of fruits and vegetables.
3) Color measurement
4) Viscosity measurement
5) Textural Profile Analysis (TPA) of fresh and processed foods
6) Value added product using extrusion technology and quality assessment.
7) BOD and COD analysis of waste
8) Case study on energy auditing of a food industry
9) Visit to a modern food industry.

Text Book:

1. Potter,N.N., Joseph,H., Hotchkiss. (1997). Food Science. CBS Publishers and Distributors. New Delhi.

References

1. Balasubramanian, P. (2013) Energy Auditing made Simple, Consultancy Services Publishers, India.
2. Fellows, P. (1988). Food Processing Technology. Ellis Horwood International Publishers, Cambridge.
3. Marcus Karel Owen R.Fennema and Daryl B.Lund. (1975). Principles of Food science Part II, Physical principles of Food Preservation, Marcel Dekker, Inc. Newyork.

Bloom's Taxonom y	K1 Remembering	K2 Understanding	K3 Applying	K4 Analyzing	K5 Evaluating	K6 Creating
CO 1			3			
CO4 2				4		
CO 3				4		
CO 4		2				
CO 5					5	

Mean = 3.6

PFN 4402 Nutrition Through Life Cycle (5+1=6hrs/wk) (4cr)

The course aims at helping the students to have basic understanding on the nutritional needs from birth to oldage. It provides necessary theoretical background for the field of child guidance.

Course Outcomes

Upon completion of this course, the student will be able to:

i. Evaluate changes in human life span and to predict there changes needed for lifecycle.
ii. Plan a healthy food choice for physical, physiological psychological aspects in infancy.
iii. Discuss the impact of socioeconomic, cultural and psychological factors on food habits of school going children.
iv. Identify socioeconomic and cultural barriers to meet nutrient needs of adolescence and adults.
v. Determine nutrient requirements during oldage.

Unit 1: (15 hrs)

Nutritients in food - Definition for Nutrition, Nutrient, Health, Guidelines of good health, Recommended dietary intake, Factors affecting RDA, Uses of RDA, Sources of nutrients in food, Balanced diet.

Nutrition deficiency disorder – Protein Energy Malnutrition, Vitamin deficiency disorder, Mineral deficiency disorder, Current nutrition programmes in India.

Unit 2: (15 hrs)

Nutrition in pregnancy: Food and nutrient requirements RDA, Physiological changes in pregnancy, Foetal under nutrition and consequences, developmental stages of the embryo, physiological cost of pregnancy and complications in pregnancy.

Nutrition in lactation: Food and nutrient requirements RDA, Physiological adjustments during lactation, Diet of lactating women and nutritional requirements, composition of breast milk.

Unit 3: (18 hrs)

Nutrition during infancy: Nutrition during for infancy Physiologic development, RDA, nutrient requirements composition of human milk and cow milk, Anti infective factors, formula preparation, weaning, supplementary and complementary feeding, growth monitoring, feeding and BW and premature infants.

Nutrition during preschool: Food and nutrient requirements RDA, eating habits and behaviour, growth, packed lunch, Children growth and development during preschool.

Unit 4: (15 hrs)

Nutrition in adolescence and adult: Food and nutrient requirements RDA, changes in growth pattern, puberty, menarche, changes in food habits, nutritional disorders, psychological and peer group pressure on eating habits, factors influencing food intake, nutritional concerns – PEM, Anemia, Dental caries, obesity, anorexia and bulimia.

Nutrition in old age: Nutrition requirements during old age, physical activity and energy relationship, RDA, theories of aging, physiologic changes, nutritional needs, community nutrition programme foroldage.

Unit 5: **(12 hrs)**

Nutrition in fitness and sports – definition, fitness and its measurements, measurement of body composition, methods of measuring energy expenditure, sources of energy, Guidelines for sports person, allowances of nutrition for sports by NIN, Pre-competition, during competition and post competition meal for sports, importance**,** Nutrient requirement in athletes, dietary supplements for athletes.

Nutrition in Space Nutrition – History, Nutrient requirement in space nutrition, advances in space foods, types of space food.

Text Book:

1. Swaminathan M (1985) Advanced Text Book on Food and Nutrition. Vol.II. BAPPOO, No.88, Mysore Road, Bangalore.

References:

2. Whiteny EN and Cataldo CB (1983)Understanding normaland clinical Nutrition. West Publishing Company, NewYork.
3. Krause M V and Mohan L K (1984) Food, Nutrition and Diet Therapy. W. B. Saunders company, Philadelphia.
4. Passmore R and East Wood M A (1987) Human Nutrition and Dietetics. English Language Book Society/ Chruchill, Livingstone.
5. Robinson C H, Lawber M R, Chenoweth W L and Garwick A E (1986) Normal and Therapeutic Nutrition. Seventh Edition, Mc Millan Publishing company, NewYork.
6. Srilakshmi B. (2018) Dietetics, New Age International (P) Ltd, Publishers.

Bloom's Taxonomy	**K1 Remembering**	**K2 Understanding**	**K3 Applying**	**K4 Analyzing**	**K5 Evaluating**	**K6 Creating**
CO1		2		4	5	6
CO2		2	3	4		
CO3	1	2		4	5	6
CO4	1	2	3	4		
CO5		2	3		5	6

Mean=3.33

PFN4404 Advanced Nutritional Biochemistry (5+1=6hrs/wk) (4cr)

The course aims at deals with the metabolism and biochemistry of the carbohydrates, lipids, proteins and other related compounds. It enables an understanding of the physiological mechanisms of action of various nutrition related processes.

Course Outcomes

Upon completion of this course, the student will be able to:

i. Understand the basic knowledge of the regulation of integrated metabolic pathways within cells and tissues and about bioenergetics.
ii. Discuss the metabolism of proteins and biosynthesis of nucleotides.
iii. Explain about the lipid metabolism and oxidative stress.
iv. Summarize the regulation of metabolism.
v. Identify the significance of enzymes in food metabolism.

Unit 1: (15 hrs)

Metabolic pathways: Carbohydrates – Aerobic and anaerobic degradation, glycogenesis, glycogenolysis, gluconeogenesis, HMP shunt pathway. Hormonal regulations of blood glucose. Bioenergetics – Principles of bioenergetics, free energy – endergonic and exergonic process, role of high energy compounds in energy storage, formation of ATP- Biological oxidation and electron transport chain.

Unit 2: (16 hrs)

Protein and amino acids: Protein degradation, fate of nitrotgen (urea cycle), metabolism of aromatic, sulfur containing, BCAA and other amino acid pool. Glutamine and alanine cycle, protein biosynthesis. Nucleic acids- metabolism of nucleic acid components, biosynthesis of nucleotides.

Unit 3: (16 hrs)

Lipids: Metabolism of triaclyglycerol, oxidation of fatty acids, cholesterol. Regulation of lipid metabolism and ketone bodies. Oxidative stress and antioxidants – Free radicals – definition, formation in biological systems, defense against free radicals. Role of free radicals and antioxidants in health and disease. Determination of free radicals, lipid peroxides and antioxidants.

Unit 4: (12 hrs)

Regulation of metabolism: Interrelationship of carbohydrate, protein and lipid metabolism, Role of Vitamins and Minerals in Metabolism, metabolic adaptation during starvation, exercise, stress and diabetes mellitus.

Unit 5: (16 hrs)

Significance of enzymes in food metabolism: Classification, Chemical nature - Enzyme inhibition, enzyme pattern in diseases. Hormones: Classification – synthesis - regulatory functions and mechanism of hormone action - Prostaglandin – structure, biosynthesis, metabolism and biological action and their role in pathology.

Text Book:

1. Murray, R.K., Graner, D.K., Mayes, P.A. and Rodwell, V.W. (2000): 25th Ed. Harpers Biochemistry Macmillan Worth Publishers.

References:

1. Nelson, D.L., and Cox, M.M. (2000): 3rd Ed. Lehninger's Principles of Biochemistry, Macmillan Worth Publishers.
2. Conn, E.E., Stumpf, P.K., Bruening, G. and Doi, R.H. (2001): 5th Ed. Outlines of Biochemistry, Heinemann Medical Books Ltd.

Bloom's Taxonomy	**K1 Remembering**	**K2 Understanding**	**K3 Applying**	**K4 Analyzing**	**K5 Evaluating**	**K6 Creating**
CO 1	1	2		4		
CO 2		2		4	5	
CO 3		2	3		5	
CO 4		2			5	
CO 5	1	2	3	4		6

Mean = 3.18

PFN4406 Food Investigation Techniques (5+1=6hrs/wk) (4cr)

The course aims at Food analysis is a diverse and interdisciplinary field of research that has a significant health, societal and economic impact. It aims to characterize food products in terms of chemical composition, traceability, safety, quality, sensory perception and nutritional value. Food analysis approaches are used by industry, government/control agencies and academia.

Course outcomes

Upon completion of this course, the student will be able to:

1. Apply statistically valid sampling techniques to food materials having widely diverse properties and volumes;
2. Evaluate the principles and methods for the proximate analyses of foods. Evaluation of test methods;
3. Demonstrate competency in the use of standard techniques of food analysis and the treatment of experimental data;
4. Identify modern instrumental methods to analyze chemical and physical properties of foods;
5. Analyze the latest equipment's in food analysis.

Unit 1: (15 hrs)

Food Sampling Techniques and statistical evaluation. Concepts of food analysis; Rules and regulations of food analysis,Definition of sampling, purpose, sampling techniques requirements and sampling procedures for liquid, powdered and granular materials, tools and containers, sampling for microbiological analysis of food, routine versus investigational sampling. Enzymatic inactivation and microbial act, and reporting results of given samples.

Unit 2: (15 hrs)

Techniques for food analysis: Physical and rheological properties of food analysis, Determination of Total fat in foods by different methods; Quality standards, and adulterants; different methods of determination of ash, moisture, protein and amino acids in foods; determination of total carbohydrates, starch, disaccharides and simple sugars in foods.

Unit 3: (15 hrs)

Spectroscopic techniques: Basic Principles- Spectrophotometric analysis of food additives and food Components -IR Spectroscopy in online determination of components in foods; AAS and ICP-AES in mineral elements and toxic metals analysis; use of fluorimeter in vitamin assay- specific use of Tintometer in vanaspati analysis.

Unit 4: (15 hrs)

Chromatographic Techniques- Basic principles and types of Paper chromatography, thin layer chromatography, column chromatography, Ion exchange chromatography, HPTLC, HPLC, UHPLC, GC,GC-MS, Types of detectors,Uses and applications of chromatographic techniques.

Unit 5: **(15 hrs)**

Separation techniques: Basic Principles, application of electrophoresis in food analysis, refractive indices of oils and fats, total soluble solids in fruit juice and honey, specific rotation of sugars, estimation of simple sugars and disaccharides by polarimeter; Ultrafiltration, Ultracentrifugation, Sedimentation, Solid Phase Extraction, Supercritical Fluid Extraction, Immunoassay techniques and its applications in foods.

Text Book:

1. Fung, D.Y.C. and Matthews, R. (1991): Instrumental Methods for Quality Assurance in Foods, Marcel Dekker, Inc. New York.

References:

1. Skoog, D.A., Holler, F.H. and Nieman (1998): Principles of Instrumental Analysis Saunders College Publishing, Philadelphia.
2. Gruenwedel, D.W.; Whitaker, J.R. (editors) (1984): Food Analysis Principles and techniques, Volumes 1 to 8, Marcel Dekker, Inc., New York.
3. Herschdoerfer, S.M. (ed) (1968 – 1987): Quality Control in the Food Industry, Vols. 1 to 4, Academic Press, London.
4. Pomeranz, Y. and MeLoan, C.E. (1996): Food Analysis: Theory and Practice; 3rd Edition, CBS Publishers and Distributors, New Delhi.
5. Wilson and John Walker, Principles and Techniques of Biochemistry and Molecular Biology (2010), Keith Wilson and John Walker, Cambridge University Press.

Bloom's Taxonomy	K1 Remembering	K2 Understanding	K3 Applying	K4 Analyzing	K5 Evaluating	K6 Creating
CO 1	1		3			6
CO 2				4	5	
CO 3	1	2				
CO 4			3			
CO 5			3	4		6

Mean = 3.45

PFN 4308 Research Methodology and Biostatistics (4+1=5h/wk) (3cr)

The course aims at two parts. First part deals with research methodology, research problem and methods of data collection. The second part deals with statistics and data analysis using statistical tools.

Course Outcomes

Upon completion of this course, the student will be able to:

i. Outline various kinds of research, objectives of doing research, research process, research designs and sampling
ii. Demonstrate qualitative, quantitative and mixed methods research, as well as relevant ethical and philosophical considerations
iii. Apply measurement & scaling techniques as well as the quantitative data analysis in research
iv. Analyse the criteria that can be used to select an appropriate statistical test to answer a research question or hypothesis
v. Discuss the link between quantitative research questions and data collection and how research questions are operationalized in educational practice

Unit 1: (12hrs)

Research Methodology: Meaning, objectives and Significance of research. Types of research, research approaches and scientific methods. Research process and criteria of good research. Definition and Identification of a Research Problem: Selection of research problem, Justification, development of hypothesis, basic assumptions. Limitations and delimitations of the problem.

Unit 2: (12 hrs)

Methods of Data Collection: Schedules and questionnaires; Interview, Case study, Home visits, scaling methods, Reliability and validity of measuring instruments, Statistical issues, Basic principles and regulations in humans and animal research, Analysis and reporting of data.

Unit 3: (10 hrs)

Introduction to statistics - meaning and scope, basic ideas, population sample parameter, variable, statistic, estimate and notation. Frequency distribution, histogram, frequency polygon and curve, ogives, symmetric and asymmetricdistributions.Concept of skewness and kurtosis. Measures of central tendency - mean, median, mode - calculations and applications. Finding combined mean, weighted mean. Finding median and mode graphically. Measures of variation - absolute and relative measure - use of range and standard deviation. Introduction to statistical package for social sciences (SPSS)

Unit 4: (10 hrs)

Data Analysis: Hypothesis Testing, Paired Comparison Designs, Pairwise Ranking Test: Friedman Analysis—Comparing Several Sample, Multisample Difference Tests — Block Designs, Simple Ranking Test: Friedman Analysis — Randomized (Complete) Block Design, Parametric Tests: t-test, z-test, chi-squares test, ANOVA.

Unit 5: (16 hrs)

Framing Proposal for acquiring grants: The question to be addressed – Rationale and importance of the question being addressed – Empirical and theoretical framework –

Presenting pilot study / data or background information - Research proposal and time frame – Specificity of methodology – Organization of different phases of study – Expected outcome of study and its implications – Budgeting - Available infra-structure and resources - Executive summary

Text Book:

1. Kothari C.R. (2014) Research Methodology Methods & Techniques, New age international publisher.

References:

1. Myra L. Samuels, Jeffrey A. Witmer, Andrew Schaffner. (2012). Statistics for the Life Sciences, 4th edition. Prentice Hall.
2. John A. Rice. (2010). Mathematical Statistics and Data Analysis, Duxbury Press.
3. John M. Lachin. (2010). Biostatistical Methods: The Assessment of Relative Risks, 2nd Edition, Wiley-Blackwell Pub.
4. Snedecor, George, W.Cochran and William, G. (1967). Statistical Methods, Sixth edition, Oxford and IBH Publishing Co., Oxford.

Bloom's Taxonomy	K1 Remembering	K2 Understanding	K3 Applying	K4 Analyzing	K5 Evaluating	K6 Creating
CO 1	1	2	3	4		
CO 2	1	2	3	4		
CO 3				4	5	6
CO 4	1	2	3	4	5	6
CO 5		2	3	4	5	6

Mean = 3.45

PFN 4310 Laboratory in Food Analysis (3h/wk) (3cr)

The course aims at relies on scientific analysis to identify problems with food products. It provides analytical data on the quality of a product or production process to support quality control in the HACCP system. The objective of quality control is to identify contaminants in raw material, or contamination after a product is produced and before it is placed on the market.

Course Outcomes

Upon completion of this course, the students will be able to:

i. Summarize food analysis experiments, analyzing data and reporting their findings.
ii. Understand basic principles of food analytical procedures
iii. Estimate the chemical composition, structural and physical properties of native and processed food materials.
iv. Evaluate the standard experimental techniques.
v. Choose the appropriate and accurate methods for various food quality characteristics.

Laboratory Experiments

1. Preparation of Primary and Secondary solutions
2. Proximate analysis of marketed food products (Moisture,Ash,Crude, Fat, Crude Protein, Crude Fibre and Carbohydrates)
3. Vitamin estimation (Ascorbic acid)
4. Mineral estimation (Calcium, Phosphorus,iron)
5. Determination of chemical constituents in foods (PH, TA, TSS, RS, Non-RS, Total sugar, Total phenolic compounds)
6. Detection of adulteration in food products (milk, ghee, honey, spices, pulses, oils etc)
7. Detection of non-permitted food additives in market food samples.
8. Identification of antinutritional factors found in food sample.
9. Food adulteration and consumer awareness campaign – Know your food quality.
10. Visit to a state food testing laboratory.

Text Book:

1. Raghuramulu,N.Nair,K.A.AndKalyanasundraram, A.(1983) A manual of Laboratory Techniques, National, Institure of Nutrition, Silver Prints, Hyderabad.

References:

1. Oser, B.L.,(1954) Hawke's Physiological Chemistry, XIV Edition, Tata MC Graw Hill Publishing Company Ltd, Mumbai.
2. Jayaram.J.(1996), Laboratory Manual In Biochemistry, New Age International Ltd, Publishers, New Delhi, Fifth Reprint.
3. The Food Chemistry Laboratory: A Manual for Experimental Foods, Dietetics, and Food Scientists, Second Edition-Connie M. Weaver, James R. Daniel
4. Food Chemistry: A Laboratory Manual -Dennis D. Miller
5. Hand Book of Food Analysis by Nollet&Toldra, CRC publishing ltd.

Bloom's Taxonomy	K1 Remembering	K2 Understanding	K3 Applying	K4 Analyzing	K5 Evaluating	K6 Creating
CO 1	1	2	3	4	5	6
CO 2		2	3	4	5	
CO 3	1	2		4	5	6
CO 4	1	2	3	4	5	
CO 5	1		3		5	6

Mean = 3.45

PFN 5501 Drug -Nutrient Interactions (5+1=6hrs/wk) (5cr)

The course aims at overview of drug nutrient interactions, pharmacology, nutrigenomics, drug nutrient interactions in specific conditions in order to optimize drug efficacy.

Course Outcomes

Upon completion of this course, the student will be able to:

1. Discuss the significance of food and drug interactions in the present clinical scenario.
2. Apply this knowledge in prescribing individualized dietary regimen for various therapeutic conditions in order to optimize drug efficacy.
3. Analyze clinically possible interactions between drugs and nutrients in patients who are on enteral and parenteral nutrition.
4. Explain the importance of nutritional genomics in improving health outcomes.
5. Compile knowledge of pharmacology, gene- nutrient and drug- nutrient interactions into the nutrition care process.

Unit 1: (15 hrs)

Overview of drug nutrient interactions: Drug- definition, Dosage forms (powders, capsulses, tablets, liquids, rectal dosage forms, topical agents, injections), routes for drug delivery (enteral, parenteral and topical). Basic concepts of Pharmacokinetics - absorption, Factors affecting absorption, distribution, metabolism and elimination; Pharmacodynamics- mechanism of drug action, combined effect of drugs (synergism and antagonism), Factors modifying drug action; Pharmacogenomics.

Unit 2: (18 hrs)

Influence of nutritional status on drug disposition and effect: Effect of malnutrition on drug disposition. Influence of food or nutrients on drug disposition and effect. Interactions of frequently used drugs with nutrients- Analgesics, antibiotics, hypoglycemic agents, cardiovascular agents (diuretics, anticoagulants, antihypertensives, antihyperlipidemics), antacids, respiratory agents (bronchodilators, corticosteroids), immunosuppressants, psychotropic agents.

Unit 3: (15 hrs)

Drug nutrient interaction by life stage: Drug–Nutrient Interactions in Infancy and Childhood, Drug–Nutrient Interaction considerations in Pregnancy and Lactation, Drug–Nutrient Interactions in the elderly. Drug–Nutrient Interactions in Nutrition support - (Enteral and parenteral Nutrition)

Unit 4: (15 hrs)

Nutrigenomics: Basics of Nutrigenomics, Tools of Nutrigenomics- Genomics, Transcriptomics, Proteomics, Metabolomics. Interaction between nutrient and gene- direct interactions, epigenetic interactions, genetic variations. Chronic disease and nutritional genomics. Role of nutrigenomics in coronary heart disease.

Unit 5: (12 hrs)

Drug nutrient interactions in specific conditions: HIV/AIDS, organ transplantation, impact on mineral status and cancer. Diet counseling to prevent food and drug interactions, Computers in Nutrient- Drug Interaction management.

Text Book:

1. Joseph I. Boullata, Vincent T. Armenti, (2004), Handbook of Drug-Nutrient Interactions, Humana Press, Totowa. ISBN: 978-1-4757-5359-2 (Print) 978-1-59259781-9 (Online).

References:

1. Beverly J. McCabe, Eric H. Frankel and Jonathan J. Wolfe, (2003) Hand book of food and drug interactions, CRC press, Boca Raton (online).
2. Tripathi K.D, (2003), Essentials of medical Pharmacology, Ed 5, Jaypeebrothers , Medical publishers Pvt., Ltd., New Delhi.
3. Srilakshmi B, Nutrition Science, Ed 5, New Age International (P) Ltd., New Delhi.
4. Sumathi R. Mudambi, M.V. Rajagopal. Fundamentals of food, nutrition and diet therapy, Ed. 6, New Age International (P) Ltd., New Delhi.

Bloom's Taxonomy	**K1 Remembering**	**K2 Understanding**	**K3 Applying**	**K4 Analyzing**	**K5 Evaluating**	**K6 Creating**
CO 1	1	2	3	4	5	6
CO2	1	2	3	4		
CO 3		2	3	4	5	6
CO 4	1	2	3	4	5	
CO 5	1		3		5	6

Mean = 3.37

PFN 5503 Food Packaging (5+1=6hrs/wk) (5cr)

The course aims at Food packaging includes introduction, packaging materials and their properties, packaging systems and methods, packaging aspects of fresh and processed foods and packaging design and environmental issues in packaging.

Course Outcomes

Upon completion of this course, the student will be able to:

i. Outline the functions of packaging along with the influence of various factors on food
ii. Compile about the different packaging materials like cans, bottles, flexible films etc.
iii. Discuss about the various methods of packaging and the equipment's used for packaging.
iv. Outline about the different metal container like tin, aluminium, physical testing of polymer packaging materials.
v. Explain about the dairy products like bakery, beverages, frozen foods etc.

Unit 1: (12 hrs)

Introduction to food packaging: Packaging terminology- definition. Functions of food Packaging, Packaging environment. Characteristics of food stuff that influences packaging selection.

Unit 2: (18 hrs)

Packaging material and their properties: Glass, Paper and paper board, Corrugated fiber board (CFB), Metal containers: Tin and Aluminum, Composite containers, Collapsible tubes, Laminations, Metalized films, Co extruded films, physical testing of polymeric packaging materials. Food Packaging Polymers (Polyethylene, PET, PVC, Polypropylene, Polystyrene & Nylon).

Unit 3: (12 hrs)

Packaging Systems and methods: Canning-Vacuum Packaging, controlled atmospheric packaging, modified atmospheric packaging, Aseptic Packaging, Retort processing, Active Packaging, intelligent packaging, shrink and stretch packaging-cling.

Unit 4: (15 hrs)

Packaging aspects of fresh and processed foods: Packaging of Fruits and vegetables, Fats and Oils, Spices, meat, Poultry and sea foods, Dairy Products, Bakery, beverages, Dehydrated and frozen foods. Liquid and powder filling machines – like aseptic system, form and fill (volumetric and gravimetric), bottling machines. Form Fill Seal (FFS) and multilayer aseptic packaging machines.

Unit 5: (18 hrs)

Packaging Design & Environmental Issues in Packaging: Food marketing and role of packaging-Packaging aesthetic and graphic design; Coding and marking including bar coding; Consumer attitudes to food packaging materials; Packaging Laws and regulations, safety aspects of packaging materials; sources of toxic materials and migration of toxins into food materials; Packaging material residues in food products; Environmental & Economic issues, recycling and waste disposal.

Text Book:

1. Gardon L. Robertson (2012) Food Packaging: Principles and Practice, Third Edition, CRC Press, India.

References:

1. Richard Coles, Derek McDowell,.Mark J. Kirwan.(2003).Food Packaging Technology, Blackwell Publishers.
2. Aaron L. Brody, E. P. Strupinsky, Lauri R (2001). Active Packaging for Food Applications, CRC Press, U.S.A.
3. Ahvenainen, R. (Ed.) 2003 Novel Food Packaging Techniques, CRC Press,.
Han, J.H. (Ed.) 2005 Innovations in Food Packaging, Elsevier Academic Press

Bloom's Taxonomy	K1 Remembering	K2 Understanding	K3 Applying	K4 Analyzing	K5 Evaluating	K6 Creating
CO 1	1	2		4	5	
CO 2		2	3	4	5	6
CO 3		2	3	4	5	6
CO 4		2	3	4		6
CO 5	1	2			5	

Mean = 3.57

PFN 5405 Functional Foods and Nutraceuticals (5+1=6hrs /wk) (4cr)

The course aims at enables to gain knowledge on sources of functional foods and nutraceuticals. It also helps to understand the role of functional foods, nutraceuticals and dietary supplements in health and disease.

Course outcomes

i. To enable students understand the relation between Functional Foods, Nutraceuticals to Food and Drugs along the regulatory aspects
ii. To introduce them to various functional food groups of plant origin
iii. To enable students understand the functional component of animal origin
iv. Discuss the role of prebiotic and probiotics in gut health
v. Study about the herbs and flowers as a source of bio active compounds in treating certain diseases

Unit 1: (15 hrs)

Introduction to Functional Foods and Nutraceuticals: Functional foods and Nutraceuticals – Definition and history.Teleology – definition, primary and secondary metabolites.Organisational Models for Nutraceuticals - a) Food Sources b) Mechanism of Action: c) Chemical Nature. Consumer Marketing - Factors for marketing functional foods and nutraceuticals.

Unit 2: (18 hrs)

Functional Components from Plant Sources: i) Nutrient Molecules: (Phospholipids,Vitamin K,Carbohydrate Derivatives- Dietary fiber - Types and sources, Physical and Physiological properties. Minerals – Zinc, Selenium. ii) Non Nutrient Molecules: Phenolic compounds (Phytoestrogens - Isoflavones, Lignans. Flavonoids – Quercetin,kempferol, Flavones – limonene.Flavols – Catechin), Phenolic acid – Ellagic acid, Caffeic acid), Phytosterols and phytostenols, Saponins, Tannins, Carotenoids(Lycopene, Beta-carotene, Lutein and zeaxanthin).iii) Hypocholesterolemic and antidiabetic components.

Unit 3: (15 hrs)

Functional Components from Animal Sources: Major and minor components in cow's Milk and Human Milk.Proteins – lactalbumin, lactoglobulin, lactoferrin, immunoglobulins, Derived peptides – casein phospho peptides, glycomacro peptides, Lactose, Fat. Mineral – zinc, selenium, Calcium. Dietary lipids **-** Conjugated Linolenic Acid, linoleic acid, oleic acid, GLA. Omega 3 and Omega 6 Fatty Acids. Structured Lipids

Unit 4: (12 hrs)

Microbes as Functional Foods: General Functions of Intestinal Microflora.Prebiotics - Definition, role of prebiotic as functional ingredient, examples.Probiotics - Definition, role of probiotic as functional ingredient, examples.Symbiotics - Definition, functions, examples.

Unit 5: (15 hrs)

Herbs and Flowers as Functional Foods: Action of Herbs and Efficacy on**:**a) Nervous System-Ginseng, St.John's wort, Ginkgo biloba.b) Heart and Circulatory System-Hawthorn plant**.** c) Immune System –Echinacea**.** d) Digestive System-Ginger valerian root fennel**.** e) Respiratory System-Licorice root, kava kava**.** f) Urinary System-Cranberry, Saw palmetto**.** g) Musculoskeletal System-Fever few.

Flowers - Medicinal values, nutritional importance, culinary uses, effect of cooking of Edible flowers – Drumstick, Neem, Agathi, Plantain. Ornamental edible flowers – Hibiscus, lotus, rose

Text Book:

1. Mary K Schmidl and Theodore P.Labuza, Essentials of Functional Foods, Culinary and Hospitality Industry Publications Services 2000.

References:

1. G.Mazza Functional Foods Biochemical Processing Aspects , Culinary and Hospitality Industry Publications 1998.
2. Israel Goldberg Functional Foods Designer Foods Pharma Food, Nutraceuticals ,Culinary and Hospitality Industry Publications 2001.
3. Robert E C Wildman Handbook of Nutraceuticals and Functional Foods ,Culinary and Hospitality Industry Publications 2001.
4. David H Watson Performance Functional Foods ,Culinary and Hospitality Industry Publications 2001

Bloom's Taxonomy	K1 Remembering	K2 Understanding	K3 Applying	K4 Analyzing	K5 Evaluating	K6 Creating
CO 1	1	2		4	5	
CO 2	1	2	3	4	5	6
CO 3	1	2	3			
CO 4			3	4	5	6
CO 5	1	2	3	4	5	6

Mean = 3.39

PFN 5407 Food Biotechnology (5+1=6hrs/wk) (4cr)

The course aims at Food Biotechnology deals with use of genetic engineering, cloning and cell culture in Food Biotechnology, prospects, traditional applications, xenobiotics and its elimination and role of Biotechnology in food industries.

Course Outcomes

Upon completion of this course, the student will be able to:

i. Apply the techniques of molecular biology, biotechnology and r-DNA for the development of foodproducts
ii. Discuss the role of genetically modified plants and animal cells to produce desired food components
iii. Explain the role of nanomaterials for the development of food packaging
iv. Identify different types of food toxicants including xenobiotics
v. Utilize the wastes released from the food industries

Unit 1: (12 hrs)

Prospects of Biotechnology: Definition, scope and applications. Application of biotechnology in food. Basic principles of molecular biology and biotechnology: Recombinant DNA Technology.

Unit 2: (18 hrs)

Genetic Engineering, cloning and cell culture: Fundaments of molecular biology and genetics. Central dogma. Concept of genetic engineering and molecular cloning. Plant and animal culture, transgenic plants, application of genetic engineering in food science and technology. Genetically modified foods – concept, types and application.

Unit 3: (15 hrs)

Food Nanotechnology: Nanomaterials - Definition - History – Properties. Food Nanotechnology: Current developments and future prospects; Nanotechnology and applications in food safety; Nanotechnology for food: delivery system; Nanostructured encapsulation systems: food antimicrobials. Barrier Packaging – Antimicrobial Packaging- Antimycotic Packaging- Bio-based Packaging- Bio-degradable Packaging- Active Packaging – Smart Packaging. Safety of Nanomaterials in Food

Unit 4: (15 hrs)

Xenobiotics: Definition, components, drug adverse reactions, nutrient drug interactions, industrial chemicals, Bio- dynamics of xenobiotics, overall metabolic fate of xenobiotic in the body Naturally occurring food toxicants and its elimination: Sources, toxicity, elimination- protease inhibitors, goitrogens, haemagglutinins, glucosinolates, cyanogens, saponins, gossypols, lathyrogens, favism and carcinogens.

Unit 5: (15 hrs)

Role of Biotechnology in Food Industries: Production of organic acids**,** vitamins, amino acids**-** downstream processing-Food additives, synthesis, sweeteners – glucose syrup and High Fructose Corn Syrup (HFCS): thickeners and gelling agents, xanthan gums. Food industry solid waste management – utilization and disposal, effluent treatment: resource recovery, recycle, reuse, treatment and disposal.

Text Book:

1. Green P.J (2002), Introduction to Food Biotechnology, CRC press, U.S.A

References:

1. Mansi, EMT, Bryce, CFA, Demain,A.L and Allman, R (2003) Fermentation Microbiology and Biotechnology, Taylor and Francis, NewYork,.
2. Primrose, S.B (2001), Molecular Biotechnology, second edition, Panima Publishing Corporation, New Delhi.
3. Satyanarayana, U, (2007). Biotechnology, Books and Allied (P) Ltd., Kolkata.
4. Fischer, A and F. Kampers (2011). Nanotechnology in the Agri-Food Sector: Implications for the Future - Wiley-VCH.

Bloom's Taxonomy	**K1 Remembering**	**K2 Understanding**	**K3 Applying**	**K4 Analyzing**	**K5 Evaluating**	**K6 Creating**
CO 1	1	2	3	4		
CO 2	1	2	3	4	5	6
CO 3	1	2	3	4	5	6
CO 4		2	3		5	6
CO 5	1		3	4	5	

Mean = 3.37

PFN 5309 Laboratory in Food Biotechnology and Microbiology (3hrs/wk) (3cr)

The course aims at food biotechnology deals with isolation of DNA, isolation of lymphocytes, determination of Total Antioxidant Activity and identification of common adulterants. It also deals with fermentation and enzyme immobilization techniques. The laboratory course also focuses on microbiology of food, to detect the food born pathogens.

Course Outcomes

Upon completion of this course, the student will be able to:

i. Ability to apply knowledge in determining the total antioxidant activity in biological samples.
ii. Assess knowledge of adulterants in foods.
iii. Evaluate on fermentation and enzyme immobilization techniques onfoods.
iv. Evaluate the physical and chemical properties of Food Pathogens.
v. Apply methods to detect pathogens in foods.

Laboratory Experiments:

1. Isolation of chromosomal DNA from plant
2. Isolation of lymphocytes from whole blood
3. Determination of Total Antioxidant Activity
4. Enzyme immobilization techniques
5. Fermentation monitoring and control
6. Preparation of common laboratory media and special media.
7. Precautions and safety regulations, sterilization techniques
8. Microbiology of milk.
9. Microbiology of water.
10. Dilution and Plating by spread –plate and pour –plate techniques.
11. Isolation of specific culture
12. Identification of important molds and yeast.

Text Book:

1. Nollet, L. Marcel Dekke (2004). Handbook of food analysis : Methods and instruments in applied food analysis r Inc., New Delhi.

References:

2. Iranpur, V.M., Esmailizadeh, A.K., 2002. Rapid Extraction of High Quality DNA from Whole Blood Stored at 4°C for Long Period, Department of Animal Science, Faculty of Agriculture, Shahrekord University, Shahrekord, Iran (Protocol online).
3. Panda, S. K. and Ravindran, B. (2013). Isolation of Human PBMCs. *Bio-protocol* 3(3): e323. DOI: 10.21769/BioProtoc.323.
4. Benzie, I. F., & Strain, J. J. (1996). The ferric reducing ability of plasma (FRAP) as a measure of "antioxidant power": the FRAP assay. *Analytical biochemistry*, *239*(1), 70-76.
5. Prescott, Harley and Klein- Microbiology-5 th edition; Publisher: McGraw Hill science 2002.
6. John G. Holt, Bergey's Manual of Determinative Bacteriology. Lippincott Williams & Wilkins, 1993.

Bloom's Taxonomy	K1 Remembering	K2 Understanding	K3 Applying	K4 Analyzing	K5 Evaluating	K6 Creating
CO 1	1	2	3	4		
CO 2	1	2	3	4		6
CO 3		2	3	4	5	6
CO 4	1		3	4	5	
CO 5	1	2	3	4	5	6

Mean = 3.33

PFN 5504 Clinical Nutrition and Diet Therapy (5+1=6hrs/wk) (5cr)

The course aims at providing an exposure on the study of aetiology, symptoms and medical nutrition therapy in various diseases. They easily learn the method to plan and prepare diet for various diseases.

Course Outcomes

Upon completion of this course, the student will be able to:

i. Plan and prepare standardized hospital diet for the needed patients.
ii. Select specific foods for management of disease condition.
iii. Apply nutrition principles to health promotion and the prevention of l diseases.
iv. Compare the food exchange list in the control of diseases.
v. Identify the relationship between diet and disease.

Unit 1: (15 hrs)

Therapeutic diets – Principles, Objectives and Diet Therapy, Functions of Indian Dietetic Association, routine hospital diet, different types of diet

Infection, fever, lungs – Fevers and Infection, Typhoid, Tuberculosis, Asthma, Chronic Bronchitis, Emphysema, Injury and Burns

Metabolic disorder –Diabetes Mellitus, Hypoglycaemia, Hypothyroidism, Hyperthyroidism, Gout, Phenylketonuria, Maple Syrup Urine Disease, Galactosemia

Unit 2: (15 hrs)

Hepatic disorder - jaundice, Hepatitis, Cirrhosis, Hepatic Coma, Gall Bladder, Pancreatic Disease, Cystic Fibrosis, Cholecystitis, Cholelithiasis, Acute and Chronic Pancreatitis.

Pancreatic disease - Acute Pancreatitis, Tropical Pancreatitis, Chronic Pancreatitis, Non Calcific, Cystic Fibrosis, Pancreatic Fistulae

Unit 3: (15 hrs)

Disease of oesophagus, gastrointestinal tract, stomach and small intestine - Oesophageal Obstruction, Esophagitis And Hiatus Hernia, Gastro Oesophageal Reflux Disease, Hypochlorhydria, Acute and Chronic Gastritis, Peptic Ulcer, Ulcerative Colitis, Dyspepsia, Constipation, Diarrhoea, Flatulence, Tropical Sprue, Celiac Sprue, Crohns Disease, Irritable Bowel Syndrome, Inflammatory Bowel Disease

Unit 4: (15 hrs)

Renal disease - Glomerulonephritis, Nephritic Syndrome, Nephrosclerosis, Nephrolithiasis, Hyperkalemia, Urinary Calculi, Acute Renal Failure, Chronic Renal Failure, Nephrosis, Uremia, Kidney Transplants

Cardiovascular disease - Myocardial infraction, Atherosclerosis, Hyperlipidemia, Hyperlipoproteinemia, Angina Pectoris**,** Acute And Chronic Cardiac Disorders, Congestive Heart Failure, Hypercholesterolemia

Unit 5: **(15 hrs)**

Inflammatory disease of the mucosa – Regional Enteritis (Crohns Disease), Diverticulosis, Ulcerative Colitis, Diverticulosis, Diverticulitis, Regional Enteritis, Malabsorption Syndrome, Sprue, Glucose Enteropathy

Inborn errors of metabolism – Phenylketonuria, Tyrosinemia, Maple Syrup Urine Disease, Homocystinuria, Histidinemia, Leucine Induced Hypoglycaemia, Galactosemia, Hereditary Fructose and Lactose Intolerance, Wilsons Disease, Gout, Addison Disease.
Immune System Dysfunction, AIDS, Allergy, Cancer, Stress, Surgery, Trauma, Arthritis.

Text Book:

1. Corinne H Robinson, Marilyn R Lawler, Wanda L Chenoweth, Ann E Gerwick, 1989. Normal and therapeutic nutrition, Mac Millan Publishing Company, New York.

References:

1. Garrrow J.S, James W.P.T. and Ralph A, (2000) Human Nutrition and Dietetics, 10th edition, Churchill Livingston, London
2. Mohan K.L. and Krause M.V (2002). 2nd edition Food, Nutrition and Diet Therapy, W.S. Suders Co, Philadelphia.
3. Robinson C.H, Lawler M.R, Cheweth W.L and Gaswick A.E (1990). Normal and Therapeutic Nutrition, Seventeenth Edition, Mac Milan Publishers. New York.
4. Shubhangini A Joshi, 2006. Nutrition and dietetics, Tata Mc Graw-Hill Publishing Limited, New Delhi, Second Edition.
5. Sumati R. Mudambi, M.V. Rajagopal, 2012. Fundamentals of foods, nutrition and diet therapy, New Age International Publishers, 6th Edition.

Bloom's Taxonomy	**K1 Remembering**	**K2 Understanding**	**K3 Applying**	**K4 Analyzing**	**K5 Evaluating**	**K6 Creating**
CO1		2		4		
CO2				4	5	6
CO3		2		4		
CO4			3		5	
CO5	1				5	

Mean = 3.72

PFN 5302 Laboratory in Clinical Nutrition and Diet Therapy (4hrs/wk) (3cr)

Course Outcomes

Upon completion of this course, the student will be able to:

i. To demonstrate in the method to plan and prepare diet for various diseases.
ii. To design the principles of meal planning, diet therapy, therapeutic diets and nutrition support.
iii. To create skill development in planning therapeutic diets using food exchange lists.
iv. To evaluate the concept of food groups and exchanges for planning and preparing a balanced diet for various age groups and physiological conditions.
v. To make appropriate dietary modifications for various disease conditions based on the path physiology.

Laboratory Experiments (Any two diet plan in each)

1. Planning and preparation of Diet for Metabolic disorders
2. Planning and preparation of Diet for Hepatic disorders
3. Planning and preparation of Diet for Pancreatic diseases
4. Planning and preparation of Diet for Disease of oesophagus/ gastrointestinal tract/ stomach and small intestine
5. Planning and preparation of Diet for Renal diseases
6. Planning and preparation of Diet for Cardiovascular diseases
7. Planning and preparation of Diet for AIDS/ allergy/ cancer/ stress/ surgery/ trauma/ arthritis

Text Book:

1. Anderson, L *et.al.,* Nutrition in Health and Disease, Seventh edition, J.B. Lipincott & Co. Philadelphia.

References:

1. Anita F. P. (2002) Clinical Dietetics and Nutrition, Fourth Edition, Oxford University Press, Delhi.
2. Gopalan C, Ram Sastri B.V, and Bal Subramaniam S.C, (2006).Nutritive Value of Indian Foods, Hydrabad, National institute of nutrition, Indian council of medical research.
3. Mahan,L.K. and Arlin, M. T (1972) Kranse's Food, Nutrition and Diet Therapy. 8th edition, W.B. Saunders Company, London.
4. Raheena, B (2009) A Textbook of Food, Nutrition and Dietetics, Sterling Publishers, New Delhi.
5. Robinson. C.H. *et. al.,* (1986) Normal and Therapeutic Nutrition, Seventh edition, Mac Milian Publishing Co.

Bloom's Taxonomy	K1 Remembering	K2 Understanding	K3 Applying	K4 Analyzing	K5 Evaluating	K6 Creating
CO 1	1	2	3	4	5	
CO 2	1	2	3		5	6
CO 3			3	4		6
CO 4	1	2	3	4	5	6
CO 5	1	2	3	4	5	6

Mean = 3.64

PFN 5304 Food Processing and Preservation (4/wk) (3cr)

The course aims at food processing and preservation include principles of food storage, processing and preservation by heat and removal of water. It also includes cold preservation, preservation using irradiation, chemical preservatives and non-thermal methods.

Course outcomes

Upon completion of this course, the student will be able to:

i. Understand pre & post-harvest technologies and its role in providing better quality produce to the consumer.
ii. Plan a processing method to increase the shelf life using Thermal and non-thermal method of processing techniques.
iii. Choose the best processing techniques to be used for a specific group of produce.
iv. Compare the novel technologies with the traditional methods in food preservation.
v. Critique the importance of fermentation and pickling process to enrich the food for diversity of flavour and nutrients and eliminate the antinutrients.

Unit 1: (10 hrs)

Pre & post-harvest processing: Nature of harvested crop, plant & animal products. Maturity index – definition, principle, Assessment methods for various crops. Principles of storage: storage of grains – conditions and effects of cold storage on quality.

Unit 2: (10 hrs)

Processing and preservation by heat: Blanching, Pasteurization, sterilization and UHT processing, canning, extrusion cooking, dielectric heating, microwave heating, roasting and frying. Retort processing. Drying – types, principles, drying curve, water activity, microbial spoilage due to moisture. Dehydration of fruits, vegetables, and animal products – ultra filtration, reverse osmosis.

Unit 3: (10 hrs)

Preservation using low temperature: Refrigeration, freezing, CA, MA & freeze-drying-principles, mechanism of action, and effect on the quality of food product quality, advantages and disadvantages.

Unit 4: (15 hrs)

Food irradiation and chemical preservation: Food irradiation – history and mechanism, forms of radiant energy, principles of using electro-magnetic radiation in food processing, ionizing and non-ionizing radiation, advantages and disadvantages, regulations in food irradiation. Food additives and chemical preservatives- GRAS and permissible limits for chemical preservatives, advantages and disadvantages.

Unit 5: (15 hrs)

Processing and principles using Non-thermal methods: High-pressure processing, Pulse Electric field technology, Cold plasma technology, Power ultra sound, Dense phase CO2, SPF, hurdle technology – principles, advantages and disadvantages. Use and application of enzymes and microorganism in processing and preservation of foods. Food fermentation, pickling and smoking.

Text Book

1. Das, H. “Food Processing Operations Analysis”, Asian Books, 2005.

References:

1. Rao, M.A., S.S.H. Rizvi and A.K. Datta “Engineering Properties of Rood”, 3rd Edition, Taylor & Francis, 2005.
2. Majumdar, A.S. “Dehydration of Products of Biological Origin”, Oxford & IBH Publication, 2004.
3. Fellows, P.J. (2005). Food processing technology: Principle and Practice. 2nd Ed. CRC Publishers
4. Desrosier NW & James N. (2007). Technology of food preservation. AVI. Publishers

Bloom’s Taxonomy	**K1 Remembering**	**K2 Understanding**	**K3 Applying**	**K4 Analyzing**	**K5 Evaluating**	**K6 Creating**
CO 1	1	2				
CO 2	1	2	3	4	5	6
CO 3		2	3			
CO 4	1	2	3	4	5	
CO 5	1	2	3	4	5	6

Mean = 3.09

PFN 4311 Exercise and Sports Nutrition (4 hrs/wk) (3 cr)

The course aims at providing the Learners a complete knowledge to understand the Science of Exercise that will have an improved physiological understanding of how your body responds to exercise. It will give you the knowledge and skills you need in order to achieve your sports nutrition and athletic performance goals.

Course Outcomes

Upon completion of this course, the student will be able to:

i. Explain the body's adaptation to exercise and understand the physiology of exercise.
ii.Compile the importance of nutrition and its impact on sport performance.
iii.Critique the quality of protein and its importance in athlete's diet.
iv.Outlinethe effect of Ergogenic aids, nutaceuticals and herbal diuretics in sports nutrition.
v.Comprehensive understanding of how hydration status effects performance and exact recommended requirement of fluid pre, during, and post-exercise.

Unit 1: (10 hrs)

Introduction to Exercise: Definition – Types of Exercise - Physiology of Exercise - Fuels for Exercise - Acute Adaptations to Exercise (Cardiovascular Responses, Pulmonary System Adaptations, Hormonal Responses to Exercise, Immunological Adjustments) - Chronic Adaptations of Exercise (Skeletal Muscle Adaptations, Ligament and Tendon Adaptations, Metabolic Adaptations) - Absolute Contraindications to Exercise - Precautions with Exercise.

Unit 2: (12 hrs)

Introduction to Sports Nutrition: Definition and scope of Sports Nutrition - Diet and Performance - Importance of Sports Nutrition -Digestion, Absorption & Assimilation - Definition of Energy and ATP Measuring energy expenditure - Measuring Physical activity - Types of Competition/ event/ sport - Athletics - Track & Field - Team Sports - Individual Sports.

Unit 3: (12 hrs)

Protein needs of athletes: Complete and incomplete proteins - assessing the quality of protein - dietary sources of protein - proteins found in dietary supplements (gelatin protein, wheat protein, pea protein, beef, poultry, and fish protein, soy protein, egg protein, milk protein, whey protein, casein, bovine colostrum, fast and slow-proteins)- protein supplementation during training (egg protein, soy protein, milk protein, whey protein, bovine colostrum).

Unit 4: (14 hrs)

Ergogenic Aids: Definition, Benefits & Side effects- Anti doping agency - list of banned drugs/substances - Nutritional Ergogenic Aids - Ergogenic value of carbohydrates & High fibre carbohydrates, Ergogenic value of fat-related nutrients.Nutraceuticals (Beta-D-Glucan, Chitosan, Dietary Fiber, Guar Gum, Gum Arabic, Inulin, Pectin, Psyllium, Phaseolus Vulgaris Extract) – Herbal diuretics.

Unit 5: (12 hrs)

Dehydration & Performance: Assessing Fluid loss - Proper Pre-Hydration, Rehydration / fluid replacement - Electrolytes - Role of electrolytes in Muscular contraction- Electrolyte loss & exercise - Maintaining / Restoring electrolyte Balance - Sports &Energy drinks - Osmolality &osmolarity - Hypotonic, Isotonic, Hypertonic – Acclimatization.

Text Book:

1. Richard B. Kreider, 2019. Essentials of Exercise & Sport Nutrition: Science to Practice Kindle Edition.Lulu publishing services.

References:

1. Heather Mangieri ,2017.Fueling Young Athletes, Versa Press, United states of America.
2. O'Halloran, P and Bhogal, G (Eds). Exercise Medicine for Students: A one-stop resource for the knowledge and promotion of physical activity.

Bloom's Taxonomy	K1 Remembering	K2 Understanding	K3 Applying	K4 Analyzing	K5 Evaluating	K6 Creating
CO 1	1	2	3	4		
CO2	1	2	3	4		6
CO 3	1	2	3	4	5	
CO 4		2	3	4	5	
CO 5	1	2		4	5	6

Mean = 3.17

PFN 4313 Food Service Management (4h/wk) (3cr)

The course aims at the basic principles of organization and management in the food service units and develops skills in food selection, purchase, storage and service of food and train students in implementing sanitary procedures in food services.

Course Outcomes

Upon completion of this course, the student will be able to:
i. Discuss about the scope of food industries.
ii. Explain the function of management organization.
iii. Plan about the developing of kitchen plant.
iv. Compare the electrical and non-electrical equipment's for food storage.
v. Outline the sanitation of plant and safety.

Unit 1: (12 hrs)

Food Service: Introduction, Definition of food service industry, principles of food service industry, objectives, types of food service industry.

Unit 2: (12 hrs)

Tools of management: Definition, classification – tangible tools, intangible tools, Organization chart, structure, function, work improvement techniques.

Unit 3: (12 hrs)

Kitchen Layout: Factors in menu planning for large groups, systems for maintaining quality in food preparation and service, types of kitchen, kitchen control and maintenance of Kitchen records.

Unit 4: (12 hrs)

Financial Management: Definition, managerial accounting,
Costing: definition of costing, cost, cost components, behavior of cost,
Cost control: food cost concept, method of controlling food cost,
Food cost analysis: pricing, definition, methods of pricing – cost plus and rate of returning, calculation of food cost statement, costing of dishes and meals

Unit 5: (12 hrs)

Personnel management: Definition, scope, concept of personnel management, approaches of personnel management, personnel policies, staff employment, training, placement, promotion, personnel records, work appraisals.

Text Book:

1. Bessie W B and Levelle W (1988). Food Service in Institutions. Sixth Edition. Mac million Publishing Company NewYork.

References:

1. Mohini S (2005). Institution Food Management. New Age International Publishers. New Delhi.
2. Mohini Sethi and Surjeet Malhan, 2015. Catering Management An Integrated Approach,New Age International Publishers, 3rd Edition.
3. Thangam Philip (2008). Modern Cookery for Teaching and Trade. Part I & II Orient Longman, Chennai.

Bloom's Taxonomy	**K1 Remembering**	**K2 Understanding**	**K3 Applying**	**K4 Analyzing**	**K5 Evaluating**	**K6 Creating**
CO1	1	2				
CO2	1	2	3			
CO3	1	2	3	4	5	6
CO4		2	3	4	5	
CO5		2	3	4	5	6

Mean = 3.2

PFN 4314 Obstetrics and Neo Natal Nutrition (4hrs/wk) (3cr)

The course deals with the basic sciences relevant to obstetrics and gynecology. It provides effective and adequate care and diet to the obstetrical and neonatal diseases.

Course Outcomes

Upon completion of this course, the student will be able to:

i. Explain the biochemical and endocrine changes during pregnancy.

ii. Discuss the signs and symptoms along with complications.

iii. Outline the anatomy and physiology of foetus and the principles of diet and nutrient modifications for the growth and development of foetus

iv. Outline the importance of lactation in neo natal nutrition and awareness on the immunization schedule.

v. Compute the required RDA as per ICMR guidelines for Pregnancy, Lactation and infancy.

Unit 1: (12 hrs)

Pre-natal Period: Signs & symptoms, Biochemical and endocrine changes during pregnancy, complications – Food fads & taboos.

Unit 2: (12 hrs)

Foetal Growth and Development: Anatomy of foetus, foetal physiology and foetal circulation - Development, structure and function of placenta, umbilical cord and amniotic fluid- importance of micro nutrients.

Unit 3: (12 hrs)

Postpartum Period: Risk in Labour- Still birth -Pre-mature - cord around the neck- Crosssection.

Unit 4: (12 hrs)

Neo natal nutrition: Lactation -Importance of breast feeding - Infant Formula – identify normal and sick neonates – immunization schedule.

Unit 5: (12 hrs)

Nutritional and Food Requirements: ICMR guidelines for Pregnancy, Lactation and infancy - nutritional needs and diet plan.

Text Book:

1. Chatterjee CC (1988) Text Book of Medical Physiology. W B Saunder's Co. London.

References:

1. Srilakshmi B (2014) dietetics, 7th edition, New Age International (P) Ltd, Publishers

2. Guyton (1991) Human physiology and Mechanism of diseases. W.B Saunders andCo.London.

Bloom's Taxonomy	K1 Remembering	K2 Understanding	K3 Applying	K4 Analyzing	K5 Evaluating	K6 Creating
CO 1	1	2		4		
CO 2	1	2				
CO 3	1	2	3	4	5	
CO 4		2	3	4	5	6
CO 5	1	2	3	4	5	6

Mean = 3.14

PFN 4316 Nutrition in Mental Health (4 hrs/wk) (3 cr)

The course aims at providing a wide knowledge on common mental illness and the way to manage through foods and specific function and effects of its components. This course also deals with the food addiction and stress management.

Course outcomes

- Discuss on food addiction and mental health problems in various age groups.
- Analyze the role of food in mental health.
- Identify the role of lipids for a healthy mind.
- Outline the different mental disorders and role of nutrients for prevention and management.
- Critique the stress and its effect on mental health.

Unit 1: (6 hrs)

Mental health problems and food addiction- Mental health problems in adults, children, adolescence, pregnancy and aging.Food addiction- Alcohol addiction, Caffeine addiction.

Unit 2: (6 hrs)

The role of food in mental health problem- The role of diet in relation to specific mental health problem, Nutritional factors affecting mental health; The intersections of nutrition and the mind, Nutrition for the brain, Contents of meal affect the brain.

Unit 3: (6 hrs)

Role of lipids in mental health- EFA, anger & anxiety, violent behavior and EFA, effect of cholesterol in mental health and cholesterol lowering drugs and nutrients.

Unit 4: (6 hrs)

Role of nutrients in mental disorders- Nutrients and autism- Role of lipids, proteins, carbohydrates, vitamins & minerals, Nutrients in attention deficit hyperactivity disorder- Role of lipids, carbohydrates, vitamins and minerals.

Unit 5: (6 hrs)

Nutrition in stress- Stress and food carvings, glucocorticoids and the brain, Essential fatty acids and the brain, Nutrition and stress and the developing fetus.

Text Book:

1. FeliceJacka, Brain Changer: The Good Mental Health Diet, Macmillan Publishers Aus., 26-Feb-2019 - Health & Fitness

References:

1. Patrick Holford, Optimum Nutrition for the Mind, ReadHowYouWant.com, 21-Apr-2009 -Health & Fitness
2. Ruth Leyse-Wallace, Nutrition and Mental Health, CRC Press, 29-Jan-2013 - Medical
3. Shlomo Yehuda, David I. Mostofsky, Nutrients, Stress and Medical Disorders, Springer Science & Business Media, 2006 - Medical

Bloom's Taxonomy	K1 Remembering	K2 Understanding	K3 Applying	K4 Analyzing	K5 Evaluating	K6 Creating
CO 1		2		4		6
CO 2		2			5	
CO 3		2	3	4		
CO 4		2	3	4	5	
CO 5		2	3	4	5	

Mean = 3.5

PFN 4318 Ethnic Foods (Tamil Traditional Foods) (4hrs/wk) (3cr)

The course aims at to understand the historical perspective of traditional foods. It critically evaluates the methods of preparation of ethnic foods.

Course Outcomes

Upon completion of this course, the student will be able to:

i. Understand the historical perspective of nutrient requirements
ii. Explain the emerging concepts in nutrition.
iii. Critically evaluate the methodology and derivation of requirements for specific macronutrients.
iv. Apply the importance of nutrition immunity interactions and their implications.
v. Identify various measures for enhancing nutritional quality of diets

Unit 1: (10 hrs)

Traditional food style: History – Concept and Principles of Traditional Foods – Benefits and nutritional content of Traditional Foods.

Unit 2: (12 hrs)

Healthy aspects of traditional foods: National health benefits - impacts of consuming traditional foods.

Unit 3: (14 hrs)

Religious and Ethnic diversity: Food in Christianity, Hindu. Halal Requirements for Meat, Poultry and Seafood based on religious and cultural practices. Halal Certification.

Unit 4: (12 hrs)

Fermented Ethnic Foods: Traditional fermented foods and drinks. Principles of downstream processing and Product recovery.

Unit 5: (12 hrs)

Traditional Cooking Methods: Traditional chimney kiln, modern mechanical fish smoking kiln, examples of smoked and dried products.

Text Book:

1. Kristbergsson K and Oliveira J (2016) Traditional foods: general and consumer aspects. Springer,New York.

References:

1. Pathak YV (2011) Handbook of nutraceuticals Volume 2, CRC Press, USA.

Bloom's Taxonomy	K1 Remembering	K2 Understanding	K3 Applying	K4 Analyzing	K5 Evaluating	K6 Creating
CO 1	1	2	3	4	5	
CO4 2	1	2	3	4	5	
CO 3	1	2		4		
CO 4	1	2	3	4	5	6
CO 5	1	2	3		5	6

Mean = 3.12

Value Add-on Courses

PFN 421V Value Added Products from Millets (2hrs/wk) (2cr)

This course aims to obtain knowledge on millets their nutritive value and health benefits along with different product developments by incorporating millets. After learning this course the students develop skills in formulation of traditional recipes, bakery products, ready to eat stuffs and instant food mixes using various millets.

Course outcomes:

Upon completion of this course, the student will be able to:

i. Identify different millets and know its composition & nutritive value.

ii. Experiment the traditional food preparations with addition of millets.

iii. Utilize millets in bakery products.

iv. Demonstrate various Ready to eat preparations with millets.

v. Analyze the sensory attributes of Instant food mixes .

Unit 1: Introduction to Millets (8 hrs)

Definition, types, Compositon & Nutritive value: finger millet (Eleusine coracana), kodo millet (Paspalum scrobiculatumi), little millet (Panicum sumatrense), foxtail millet (Setaria italic), proso millet (Panicum miliaceum) and barnyard millet (Echinochloa frumentaceae)

Unit 2: Traditional recipes (6 hrs)

Breakfast food: Idli, Dosa, Idiappam, Rotti, Pittu, Upma, Adai, Porridge, Khakra, Paniyaram and Chappathi.

Sweets: Halwa, sweat kolukattai, Adhirasam, Kesari, Nutritious ball and Kheer.

Snacks: Vadai, Pakoda, Ribbon pakoda, Omapodi, Murukku, Thattu vadai, Hot kolukattai and Vadagam.

Unit 3: Bakery and Pasta products (6 hrs)

Bakery products - Incorporation of millet flour in the preparation of Bread, cookies, Changes in the sensory attributes.

Pasta products - Methods of extrusion for vermicelli, noodles, macaroni, Sensory attributes.

Unit 4: Flaked and Popped products (6 hrs) Ready-To-Eat Value added products from millet flakes - aval uppma, kitchadi, payasam, masala flakes, boli, sweet balls, lemon bath, tamarind bath and tomato bath.

Value added products from popped small millets - uppma, bhelpoori, masala corn, cheeian.

Unit 5: Instant Food Mixes (4 hrs)

Method of preparation Instant Foods (adai, pittu, idiyapam, kali, roti, and kesari), Sensory attributes.

References:

1. Dayakar Rao B, Sangappa, Vishala A.D, Arlene Christina G.D and Tonapi V.A. 2016. Technologies of Millet Value Added Products. Centre of Excellence on Sorghum, ICAR- Indian institute of Millets Research. Rajendranagar, Hyderabad, India. pp 1 – 64
2. Karuppasamy Packiyam, Kanchana S, Hemalatha G 2015. Development and Standardization of Value Added Products from Millets. Scholars' Press, India.

Bloom's Taxonomy	K1 Remembering	K2 Understanding	K3 Applying	K4 Analyzing	K5 Evaluating	K6 Creating
CO 1		2				
CO 2			3			6
CO 3			3	4		
CO 4		2			5	
CO 5			3			6

Mean=3.77

PFN 521V Nutrition Counseling (2 hrs/week) (2cr)

This course aims at the students to understand the concept of nutrition counseling. It is helping to develop the counseling skills among the students with appropriate strategy.

Course Outcomes:

Upon completion of this course, the student will be able to:

i. Outline the process and types of counseling.

ii. Understand the theories relates to counseling.

iii. Identify the importance of nutrition

counseling iv.Analyze required skills for nutrition

counseling.

v. Discuss the various counseling strategy.

Unit 1: Introduction to Nutrition counseling (5 hrs)

Definition – Development and goals- preparation - Counselor-counselee relationship- counseling process: Steps – purposes of counseling.

Unit 2: Theories related to nutrition counseling (5 hrs) Behaviour modification, cognitive behavioural theory and rational-emotive theory (RET), social learning theory, standard behavioral therapy, transtheoretical model, person-centered therapy, theory of planned behavior and theory of reasoned action, gestalt therapy, family therapy, self-management approach, the health belief model, developmental skill training.

Unit 3: Nutrition care process (7 hrs)

Importance of nutrition counseling in nutrition care process- system approach to nutrition counseling,

Unit 4: Counseling skills (7 hrs)

Communication skills, Counseling, Nutrition assessment, Nutrition diagnosis, Nutrition intervention, Monitoring and evaluation.

Unit 5: Counseling strategy (6 hrs)

Motivational interviewing, Expressing empathy, Developing Discrepancy, Rolling with Resistance (Legitimation, Affirmation), Supporting Self-Efficacy, Supporting Self-Efficacy, Establishing Rapport, Assessment Results.

References:

1. Robert J.Gatchel, Andrew Baum & David S.Krantz, An introduction to Health Psychology, 2nd Edition, McGraw Hill, NY,1989.
2. Linda G. SnetselaarNutrition Counseling Skills for the Nutrition Care Process, Jones & Bartlett Learning, 2009.
3. Kathleen. L Mahan and Janice L Raymond, Krauses Food And Nutrition Care Process, 14th Edition, Elsevier Science, 2010.

Bloom's Taxonomy	**K1 Remembering**	**K2 Understanding**	**K3 Applying**	**K4 Analyzing**	**K5 Evaluating**	**K6 Creating**
CO1		2		4		
CO2		2		4		
CO3			3	4	5	
CO4			3	4		6
CO5			3	4	5	

Mean= 3.7