

# **M.Sc. in Food Science & Nutrition**

**SYLLABUS (2021)**



**P.G. DEPARTMENT OF FOOD SCIENCE  
TECHNOLOGY AND NUTRITION  
SAMBALPUR UNIVERSITY  
JYOTI VIHAR  
BURLA**

## Courses of Studies for the M. Sc Food Science & Nutrition (Under Course Credit Semester System)

<b>Ist Semester</b>		
Course No.	Title	Credit Hour
FSN. 411	Food Commodities	4 (Theory)
FSN. 412	Biochemistry of Food	4 (Theory)
FSN. 413	Food Microbiology	4 (Theory)
FSN. 414	Basic Concepts of Nutrition	4 (Theory)
FSN. 415	Practical related to 411& 412	4 (Practical)
FSN. 416	Practical related to 413& 414	4 (Practical)
	<b>Total</b>	<b>24</b>
<b>IInd Semester</b>		
Course No.	Title	Credit Hour
FSN. 421	Food ingredients	4 (Theory)
FSN. 422	Techniques in Food Analysis	4 (Theory)
FSN. 423	Food Quality Control	4 (Theory)
FSN. 424	Advanced Human Physiology	4 (Theory)
FSN. 425	Practical related to all the theory papers	4 (Practical)
FSN. 426	Summer Internship	2
	<b>Total</b>	<b>22</b>
<b>IIIrd Semester</b>		
Course No.	Title	Credit Hour
FSN. 511	Therapeutic Nutrition	4 (Theory)
FSN. 512	Research Methodology and Biostatistics	4 (Theory)
FSN. 513	Industrial Food Biotechnology	4 (Theory)
FSN 514	Elective Paper (any one)	4 (Theory)
	a. Clinical Dietetics	
	b. Public Health Nutrition	
	c. Institutional Food Management	
	d. Food Preservation and Packaging	
FSN 515	Practical on Diet Therapy	4 (Practical)
FSN. 516	Seminar-I	3
	<b>Total</b>	<b>23</b>
<b>IVth Semester</b>		
Course No.	Title	Credit Hour
FSN. 521	Nutritional Status Survey	2
FSN 522	Final Project Report	14
FSN. 523	Seminar-II	3
FSN. 524	Industrial Tour Report	2
	<b>Total</b>	<b>21</b>

### Instruction to Paper Setters

1. In theory papers questions will be set unit-wise with 2 questions from each unit (total 8 questions). The students shall answer any one question from each unit.
2. 60% of the questions shall be long-answered type and 40% short-answered type

**DETAILED COURSES OF STUDIES**

**VISION:**

To impart a solid understanding of standards of clinical nutrition and dietetics practice and develop essential leadership skills to play a pivotal role to promote nutrition and healthy lifestyle choices in our society and beyond.

**MISSION:**

M1: •To develop experts in clinical nutrition practice from a wide range of perspectives within the health system, from disease prevention to palliation.

M2: •To generate a team of well-equipped clinical nutrition practitioners to help the community in maintenance of optimal health and well-being.

M3: •To expose students to research and practice in the field of nutrition and dietetics by developing newer food formulas in the prevention and treatment of lifestyle diseases.

**PROGRAM EDUCATIONAL OBJECTIVES (PEO):**

The Post Graduates of Food Science and Nutrition Program will be

PEO1: To inculcate domain knowledge and procedural assertiveness of clinical nutrition and dietetics and relevant disciplines to develop robust society.

PEO2: To apply principles of diet when planning food and nutrition programmes and supervising meal preparations in hospitals and other food service establishments.

PEO3: To educate the community on recommended dietary modifications based on the severity of illness and complications of disease.

PEO4: To demonstrate proficiency in communicating competently in groups and organizations, competence in interpersonal communication; possess skills to effectively deliver formal and informal presentations to a variety of audiences in multiple contexts.

PEO5: To apply Nutrition principles and practices in arriving an optimal solution for any health problems in corporate offices or gyms or hospitals or primary health care centers.

PEO6: To exhibit constant enhancement in their profession through life-long learning thereby escalating human wellness either as sovereign patient counselors or as a team with multidisciplinary healthcare approach.

**PROGRAM SPECIFIC OUTCOMES (PSO) FOR FOOD SCIENCE AND NUTRITION:**

PSO1: To obtain the knowledge of clinical nutrition and dietetics, and work independently as self-driven, lifelong learners and innovators so as to prevent or treat diseases being faced by the humans.

PSO2: To work in association with the health care team and apply the knowledge of the subject in novel situations to solve new problems.

PSO3: To think critically and apply appropriate contemporary research techniques, resources and modern devices to compute nutritional needs with appropriate consideration for public

health and safety, food safety and security, health and sanitation, environment, and gender concerns

PSO4: To get dynamic involvement in the community settings and working towards the attainment of wholesome nutritious communal along with the administrators.

**PROGRAM OUTCOMES (POs):**

<b>PO1:</b>	Acquaint with production and consumption trends, structure, composition, quality evaluation, and processing technologies for product development and value addition of various Food commodities.
<b>PO2:</b>	Gain an understanding of the chemical bases of food component reactivity and functionality which will provide them an opportunity to test various approaches for manipulating the chemical and/or functional properties of foods.
<b>PO3:</b>	Acquaint with different groups of micro-organisms associated with food, their activities, destruction and detection in food.
<b>PO4:</b>	Understand the role of food and nutrition for the welfare of the community.
<b>PO5:</b>	Acquaint with different Micronutrient constituents in different foods and its role in health benefits.
<b>PO6:</b>	Use concepts, tools and techniques related to Chemistry and biological science and its application in Family and Community Science (Food Science)
<b>PO7:</b>	Apply the acquired conceptual knowledge of food quality assurance and sustainable waste management for holistic living
<b>PO8:</b>	Familiarize the students about the processing and preservation techniques of pulses, oilseeds, spices, fruits and vegetables, meat, fish, poultry, milk & milk products
<b>PO9:</b>	To understand the concepts of physiological characteristics of different food commodities and to provide an insight about losses during storage and ways to prevent it.
<b>PO10:</b>	Identify and discuss the complex issues inherent in selecting a research problem, selecting an appropriate research design, and implementing a research project thus the role and importance of research in the social sciences
<b>PO11:</b>	Solve complex problems and acquire analytical skills using latest industrial techniques and tools to find out the solution for food & environmental safety
<b>PO12:</b>	To discover the biotechnological approaches in the field of Food Science and communicate common processes which allow the different food processing waste to be converted into valuable products.
<b>PO13:</b>	Established ethical entrepreneur through projects field, industrial visit and other programmes.
<b>PO14:</b>	Explore research interest with creativity, updated technology and sensitivity towards various social issues which make an interest to pursue higher education and research.

**FIRST SEMESTER**

<b>Course Code: FSN-411 (4CH)</b>	<b>Course Name: FOOD COMMODITIES</b>
<b>Pre-requisite: None</b>	<b>Co-requisite: FSN-413</b>

**Objective:** To develop the skills for structural, compositional and nutritional importance of various foods and their processed products.

<b>UNIT</b>	<b>TOPICS</b>	<b>NO. OF LECTURES</b>
<b>1</b>	Cereals: Structure of cereal grains, composition, processing and storage of some common cereals (Rice, Wheat, Maize, Oats), Green Revolution.	<b>3</b>
	Pulses and oilseeds: composition, nutritive value, processing and storage of some common pulses.	<b>3</b>
	Nuts & plantation crop: processing, nutritional value of some common nuts (Coconut, Ground nut, Almond, Cashew nut), tea, coffee and cocoa.	<b>3</b>
<b>2</b>	Fruits and Vegetables: Composition, nutritive value and classification	<b>1</b>
	Canning: Definition, processing steps, and equipment, cans and containers, quality assurance and defects in canned products.	<b>2</b>
	Preparation and preservation of juices, squashes, syrups, sherbets, nectars, cordials, etc; FSSAI specification Preparation, preservation by jam, jelly and marmalades and various problems with remedies.	<b>3</b>
	Preparation and preservation for manufacture of preserve, candies, concentrate, chutney, sauce, puree, paste, ketchup; toffee, cheese, leather, dehydrated, potato wafers and pickles, soup powders; FSSAI specification.	<b>2</b>
	Spices: Composition, flavoring compounds, processing, nutritive value, adulteration of some common spices of India.	<b>2</b>
<b>3</b>	Meat: classification and Muscle structure	<b>1</b>
	Chemical composition and physico-chemical properties of meat muscle, Abattoir design and layout, Pre-slaughter transport, care and ante-mortem inspection.	<b>2</b>
	Stunning types, Slaughtering of animals and poultry, post-mortem inspection and grading of meat, Factors affecting post-mortem changes, quality characteristics of meat.	<b>2</b>
	Processing and preservation of meat- tenderization of meat, curing of meat- role of ingredients and types of curing, smoking of meat, different cooking methods and Restructured Meat- sausages, salami, Chicken wings, chunks (IQF)	<b>2</b>
	Egg structure: Composition, quality characteristics, processing and preservation of eggs.	<b>2</b>
	Fish: composition, classification, nutritive value and processing: surimi; Fish protein concentrates (FPC); Fish protein extracts (FPE), fish protein hydrolysates (FPH), Fish oils.	<b>2</b>
<b>4</b>	Milk and milk products: Operation Flood, composition, physico-chemical properties of milk and nutritional importance of milk, processing of milk.	<b>2</b>
	Dairy plant operations viz. receiving, separation, clarification, pasteurization, standardization, homogenization, sterilization, storage, transport and distribution of milk. Dairy plant sanitation and waste disposal.	<b>3</b>
	Classification and study of milk products (with specifications)- Cream, Butter, Ghee, condensed milk, Khoa, Milk powder, Chhanna, Paneer, Cheese, Ice-cream, Fermented milk products. Various defects in milk products.	<b>5</b>
<b>TOTAL LECTURES =</b>		<b>40</b>

**COURSE OUTCOMES:**

Upon completion of the subject the students will be able to:

CO1	Develops awareness of basic structure of grains and role of revolutions for food productions.
CO2	Introduces professional ethics among various fruit based products.
CO3	Elaborates the role of muscle food types and their preparations.
CO4	Analyzes the importance of milk products processing and handling.

**TEXT BOOKS:**

1	Food Facts and Principles -N. ShakuntalaManay& M. Shadaksharaswamy, New Age International (P) Limited, New Delhi.
2	Food Science – B.Srilakshmi, New Age international (P) Limited, New Delhi.
3	Post harvest technology of cereals: pulses and oilseeds, Chakraverty A., Oxford & ibh publishing company, 1988
4	Fruit and Vegetable Preservation ,Principles and Practices, Srivastava R.P. and Sanjeev Kumar, International Book Distributing Company, New Delhi 2005
5	Principles of Meat Technology, Singh V. P. , New India Publishing Agency, Delhi
6	Outline of Dairy Technology, Sukumar De, Oxford University Press, 2008

**REFERENCE BOOKS:**

1	Handbook of Seed Science and Technology, Basra A.,CRC Press, 2006
2	Handbook of Fruit and Vegetable Processing Sinha and Hui, John Wiley and Sons, 2010
3	Handbook of Meat, Poultry and Seafood Quality, Kerth Wiley Backwell, 2012
4	Technology of Milk Processing, Khan QA and Padmanabhan, ICAR, New Delhi
5	Food Science- N.Potter & J.H.Hotchkiss- CBS Publishers & Distributors, New Delhi.

**Course Code: FSN-412 (4CH)****Course Name: BIOCHEMISTRY OF FOODS****Pre-requisite: None****Co-requisite: None**

**Objective:** To develop the skills for structural, compositional and nutritional importance of various foods and their processed products.

UNIT	TOPICS	NO. OF LECTURES
<b>1</b>	Carbohydrates: classification and chemical structure of different carbohydrate; chemical properties.	<b>2</b>
	Nutritive roles of carbohydrate, important carbohydrates in food (glucose, sucrose, starch, agar, glycogen, cellulose, pectin, Gums and resins);	<b>2</b>
	Carbohydrates: digestion, absorption, metabolism (glycolysis, citric acid cycle, glycogenesis, Glycogenolysis, Gluconeogenesis, hexose monophosphate pathway),	<b>5</b>
	Blood sugar level and equilibrium.& effect of deficiency, Glycemic index based foods	<b>1</b>
<b>2</b>	Amino acids and its classification, Structure of different amino acids; Role of essential amino acids in body.	<b>2</b>
	Proteins: properties, classification and denaturation factors	<b>2</b>
	Structure of proteins (primary, secondary, tertiary, quaternary),	<b>2</b>
	Protein: Digestion, absorption, transportation and metabolism of Protein (Nitrogen balance, transamination & deamination of protein, urea cycle and biosynthesis of protein), Functional properties of protein & effect of deficiency.	<b>3</b>
	Functional properties of protein & effect of deficiency.	<b>1</b>
<b>3</b>	Lipid: role of lipids in body, structure and classification, Importance of omega-3 and omega-6 fatty acids and their sources.	<b>2</b>

	Physio-chemical properties of fats/oils: acid value, saponification value, iodine value, smoke point, flash point, fire point, specific gravity	1
	Enzymatic and chemical reactions of fats; Rancidity and its types, detection techniques chemical aspects of lipids(Baudouin test, Halphens test, hexabromide test)	1
	Lipids: Digestion, absorption and transport	2
	Metabolism of lipids- oxidation of fatty acids, fatty acid synthesis.	2
	Importance of lipo –protein in human body- metabolism of cholesterol, triacylglycerol and phospholipids- their role in health & diseases.	2
4	Water: physical properties, structure of water molecule, Role and types of water in Food, water activity and sorption isotherm.	1
	Importance of dietary fiber in body,	1
	Enzymes: properties, classification, kinetics and mechanism of enzyme inhibition, Enzymes in food industry: Carbohydrases ( Amylases, cellulases, pectinases, vertases)	5
	Proteasase, Lipases and oxidases in food processing..	
	Terpenoids and alkaloids: Definition, Classification, Structure, Biosynthesis, Properties, Extraction, Biological Role.	2
	Naturally occurring phenolic compounds: Definition, Classification, Structure, Biosynthesis, Properties and Biological Role.	1
	<b>TOTAL LECTURES =</b>	<b>40</b>

#### COURSE OUTCOMES:

Upon completion of the subject the students will be able to:

CO1	Demonstrates awareness of basic structure of carbohydrates and their role.
CO2	Expresses importance of protein and its requirement for growth.
CO3	Elaborates the quality of cooking oils to be chosen during food preparations.
CO4	Analyzes the importance of natural components stability during processing and handling.

#### TEXT BOOKS:

1	Fennema, O.R. Ed. 1976. Principles of Food Science: Part-I Food Chemistry. Marcel Dekker, New York.
2	Meyer, L.H. 1973. Food Chemistry. East-West Press Pvt. Ltd., New Delhi.
3	Belitz HD.1999. Food Chemistry. Springer, Verlag
4	Lehninger Principles of Biochemistry, David L. Nelson and Michael M. Cox, 6th Ed. Macmillan Learning, NY, USA. 2012

#### REFERENCE BOOKS:

1	Swaminathan M. 1974. Essentials of Foods and Nutrition. Vol. II. Ganesh& Co.
2	J.L.JAIN, Fundamentals of Biochemistry. S. Chand publication
3	Satyanarayan and Chakrapani, Biochemistry, 5 <sup>th</sup> edition., Elsevier, 2013

<b>Course Code: FS/FSN-413</b>	<b>Course Name: FOOD MICROBIOLOGY</b>
<b>Pre-requisite: None</b>	<b>Co-requisite: None</b>

**Objective:** This course acquaints students with various industrial and food products, their production techniques and prevention of spoilage.

UNIT	TOPICS	NO. OF LECTURES
1	Introduction to food Microbiology: Growth and survival of microorganisms in foods (Yeast, Mould, Bacteria)	2
	Factors affecting growth of microorganism: Intrinsic, Extrinsic; Physical and chemical methods to control microorganisms,	3

	Biochemical changes caused by microorganisms; microbes in food fermentation, putrefaction, lipolysis; Antagonism and synergism in microorganism;	2
2	Contamination, General principles of spoilage, Preservation and Spoilage of different kind of foods-cereal,	2
	Preservation and Spoilage of different kind of Pulses,.	2
	Preservation and Spoilage of different kind of Fruit and Vegetable,	2
	Preservation and Spoilage of Meat, fish egg, poultry and their processed products	2
	Preservation and Spoilage of milk and different milk products	2
	Preservation and Spoilage of Canned foods and Beverages	2
3	Food toxicology & food borne illness: Food hazards- microbiological, nutritional, environmental, natural toxicants, pesticides, food additives, preservatives food borne illness: (Clostridium, botulinum, Escherichia coli, Brucella, Bacillus, Salmonella, Staphylococcus) Non bacterial agent & food borne illness, (Helminths & Nematodes, protozoa, toxic algae, fungi & food borne viruses	5
	Method for microbial examination of food: indicator organisms, direct examination, cultural techniques, Rapid methods in detection of microorganisms.	3
4.	Microbial Food hygiene and sanitation: Contamination during handling, processing and its control	3
	Food fermentation products and beneficial microbes: Youghurt, Cheese, Saurkraut, Tofu etc	5
	Characteristics feature of LAB, General fermentation idea, General concept of Prebiotics, probiotics and symbiotic anti-biotics; bacteriocins from lactic acid bacteria-production and application in food preservation	5
<b>TOTAL LECTURES =</b>		<b>40</b>

#### **COURSE OUTCOMES:**

Upon successful completion of the course, students should be able to:

CO1	Explain the interactions between microorganisms and the food environment, and factors influencing their growth and survival.
CO2	Acquaints with various types of food contamination and spoilage by different microorganisms and their preservation techniques.
CO3	Describe the characteristics of food borne microorganisms, and methods for their isolation, detection and identification
CO4	Explain why microbiological sanitizations are necessary during the time of industrial food products with the help of microorganism.

#### **TEXT BOOKS:**

1	Frazier W C . Food Microbiology, McGraw Hill
2	Modern Food Microbiology. James M Jay, Martin J Lossner, David A Golden
3	Food Microbiology Adams M R & Moss. The Royal Society of Chemistry, Cambridge.

#### **REFERENCE BOOKS:**

1	Modern Industrial Microbiology & Biotechnology by N. Okafor. 1st edition. CRC Press, USA. 2007.
2	Industrial Microbiology Samuel C Presscott

<b>Course Code: FSN-414 (4CH)</b>	<b>Course Name: BASIC CONCEPTS OF NUTRITION</b>
<b>Pre-requisite: None</b>	<b>Co-requisite: FSN-412</b>

#### **Objective:**

- To apprehend the candidate with understand the mechanisms adopted by the human body for regulation of metabolic pathways



- To develop an insight into interrelationships between agencies/ Govt. organization/ NGO etc.

UNIT	TOPICS	NO. OF LECTURES
<b>1</b>	Food as a source of nutrients: classification of nutrients; functions, recommended dietary allowances (RDA), Nutrition and Life style-BMR, SDA.	<b>1</b>
	Vitamins: (A, B complex, C, D, E & K) – functions, types, metabolism, sources, deficiency disease and RDA	<b>6</b>
	Major and minor mineral elements with their role in body- Ca, P, Mg, Fe, I, u, Zn, F, Chr and Se.	<b>5</b>
	Importance of Roughages in the diet.	<b>1</b>
	Water & electrolytes balance.	<b>1</b>
<b>2</b>	Nutritional Needs: Nutrition during infancy – Physiological changes, nutritional requirements, food requirements as per RDA, Human milk composition, weaning foods.	<b>2</b>
	Nutritional Needs: Nutrition during pre-school children,– Physiological changes, nutritional requirements, food requirements as per RDA,	<b>2</b>
	Nutritional Needs: Nutrition during school children – Physiological changes, nutritional requirements, food requirements as per RDA,	<b>2</b>
	Nutritional Needs: Nutrition during adolescence – Physiological changes, nutritional requirements, food requirements as per RDA,	<b>2</b>
	Nutrition and infection, nutrition and immunity, nutrition & stress.	<b>1</b>
<b>3</b>	Nutritional Needs: Nutrition during young adults - Physiological changes, nutritional requirements, food requirements as per RDA.	<b>2</b>
	Nutritional Needs: Nutrition during pregnancy - Physiological changes, nutritional requirements, food requirements as per RDA, problems in breast feeding.	<b>2</b>
	Nutritional Needs: Nutrition during lactation - Physiological changes, nutritional requirements, food requirements as per RDA.	<b>2</b>
	Nutritional Needs: Nutrition during old age- Physiological changes, nutritional requirements, food requirements as per RDA.	<b>2</b>
	Nutritional Needs: Nutrition in athletes/sports persons- Physiological changes, nutritional requirements, food requirements as per RDA.	
<b>4</b>	Nutritional Assessment: Assessment of nutritional status by direct & indirect methods,	<b>1</b>
	Anthropometric assessment, clinical examination, bio-physical or radiological measurement, functional assessment,	<b>3</b>
	Laboratory & biochemical assessment, dietary assessment, vital health statistics.	<b>1</b>
	Nutritional problems: Protein energy malnutrition- biochemical and metabolic changes,	<b>2</b>
	National nutrition policy and programmes, Role of National and International agencies in combating malnutrition	<b>2</b>
	<b>TOTAL LECTURES =</b>	<b>40</b>

#### COURSE OUTCOMES:

Upon completion of the subject the students will be able to:

CO1	Demonstrates integration of cellular level metabolic events to nutritional disorders and imbalances.
CO2	Expresses importance of nutrients during various beginning stage of life.
CO3	Elaborates the nutritional requirements during various older stages of life.
CO4	Analyzes the importance of nutritional assessment procedures and role of certain agencies / NGO's in combating malnutrition.

<b>TEXT BOOKS:</b>	
1	Dietetics – B.Srilakshmi; New age International (P) Limited, New Delhi.
2	Nutrition Science – B.Srilakshmi; New age International (P) Limited, New Delhi.
3	Human Nutrition and Dietetics – Davidson, Passmore, East wood, English Language Book Society (ELBS).
4	Text Book of Human Nutrition – Mahtab. S. Bamji; N.Pralhadrao&Vinodini Reddy, Oxford & IBH Publishing Co. Pvt.Ltd

<b>REFERENCE BOOKS:</b>	
1	Swaminathan M. 1974. Essentials of Foods and Nutrition. Vol. II. Ganesh& Co.
2	Principles of Nutrition – Fisher and Fuqua, wiley eastern Private Limited, New Delhi.
3	Nutrient Requirements and Recommended Dietary Allowances for Indians – Indian Council of Medical Research, National Institute of Nutrition, Hyderabad.
4	ABC of Nutrition (4thedition), Stewart Truswell, BMJ Publishing Group, 2003

**Course No: FSN. 415**

**Practical related to 411&412**

**4CH**

**Course No: FSN. 416**

**Practical related to 413&414**

**4CH**

## **SECOND SEMESTER**

<b>Course Code: FSN-421 (4CH)</b>	<b>Course Name: FOOD INGREDIENTS</b>
<b>Pre-requisite: FSN-411</b>	<b>Co-requisite: None</b>

**Objective:** To develop the skills on the properties of food and various ingredients and their role in food products.

<b>UNIT</b>	<b>TOPICS</b>	<b>NO. OF LECTURES</b>
<b>1</b>	Properties of foods: Physical properties of solid and liquid foods(solutions, vapor pressure, boiling point, freezing point, osmotic pressure, viscosity, surface and interfacial tensions, specific gravity),	<b>2</b>
	Textural properties, Thermal properties, optical properties, electrical properties, flow properties, Visco-elastic properties	<b>3</b>
	Dispersion systems in of foods-Sol, Gel, Foam, Emulsion; Rheology of diphase systems.	<b>3</b>
	Food preparation: Objective and method of cooking, cooking media, changes during cooking.	<b>2</b>
<b>2</b>	Food pigments and colors: Some common pigments used in food industry (chlorophylls, myoglobin, anthocyanin, betalain, carotenoids, annatto, synthetic colors & lake /dye colors and other colourants)- structure and stability;	<b>4</b>
	Flavors: types of flavor, flavor compounds, extraction principles of flavor, flavor potentiator / enhancers.	<b>2</b>
	Sensation- smell sensation and sensation of taste.	<b>1</b>
	Sensation - texture sensation, visual appearance	<b>2</b>
	Sensation by trigeminal nerve, sensory thresholds	<b>1</b>
<b>3</b>	Food additives: definition, need and classification of food additives, Food Additives generally recognized as safe (GRAS);	<b>1</b>
	Preservatives-Natural and Artificial	<b>2</b>
	Antioxidants and pH control agents in food	<b>1</b>
	Chelating agents, coloring agents, curing agents,	<b>1</b>
	Nutritional supplements, Artificial and non-nutritive sweeteners,	<b>2</b>
	Leavening agents, firming agent, clarifying agent, flour bleaching and maturing agents,	<b>2</b>
	Stabilizer and thickeners, humectants, anti-caking agents, anti-foaming agents, packaging gases	<b>1</b>
	Fat mimetics and replacers	<b>1</b>

4	Nutraceuticals and phytochemicals: definition, Classification. Dietary supplements, Functional foods- their legislation and health claims, Natural occurrence of certain photo-chemicals. Antioxidants and flavonoids: omega – 3 fatty acids, carotenoids, dietary fiber, phytoestrogens.	2
	Neutraceuticals for effective control of disease or health benefit with adequate safety. Role of neutraceuticals against- skin health/ageing, bone health, eye health, mental health, cardiovascular health, cancer prevention etc	4
	Safety, adverse effect and interactions of neutraceuticals, Foodomics- Proteiomics, Genomics, Metabolomics and Nutrigenomics, Role of gene in Diet Therapy. Nutrients as Immunomodulators.	4
<b>TOTAL LECTURES =</b>		<b>40</b>

#### **COURSE OUTCOMES:**

Upon completion of the subject the students will be able to:

CO1	Define food behavior before any food formulations/preparations.
CO2	Demonstrates the role of senses during eating foods.
CO3	Implementation of suitable additive for different food preparations.
CO4	Design foods against certain diseases.

#### **TEXT BOOKS:**

1	Physical properties of foods, Ignacio Arana, CRC Press, Taylor and Francis Group, 2012
2	Food Biochemistry and Food Processing, Benjamin K. S., Wiley-Blackwell, London, 1983
3	Fennema, O.R. Ed. 1976. Principles of Food Science: Part-I Food Chemistry. Marcel Dekker, New York.
4	Functional foods and Nutraceuticals, Egbuna C. & Tupas G.D., Springer, 2020

#### **REFERENCE BOOKS:**

1	Food Chemistry, David Newton, Facts on File, Inc. New York, 2004
2	Belitz HD. 1999. Food Chemistry. Springer, Verlag
3	Handbook of Nutraceuticals and Functional foods, 3 <sup>rd</sup> ED, CRC Press, Taylor and Francis Group,

<b>Course Code: FSN-422 (4CH)</b>	<b>Course Name: TECHNIQUES IN FOOD ANALYSIS</b>
<b>Pre-requisite: FSN-412</b>	<b>Co-requisite: None</b>

**Objective:** To develop the skills for structural, compositional quantification techniques and tools used for various components, allergens present in food products.

UNIT	TOPICS	NO. OF LECTURES
1	Nature and Concept of Food analysis, Basic instrumentation: Principle for pH meter, Dialysis	2
	Filtration and types, ultra filtration, Reverse osmosis	2
	Centrifugation: Principle, Theory (RCF, Sedimentation coefficient) and types of Rotors, Ultracentrifugation	2
	Calorimetry: Bomb calorimeter, Densimetry	1
	Refractometry	1
	Viscometers used in food industry.	1
2	Spectroscopic analysis of food components, Principle, instrumentation & application of Colorimetric (Hunter Lab colorimeter/ Munsell colorimeter/CIE-colour system).	2
	Principle, instrumentation & application of UV-Vis spectrophotometer & Spectrofluorometer,	2
	Principle, instrumentation & application of IR & Atomic Absorption Spectroscopy	2
	Principle, instrumentation & application of Mass spectroscopy	2
	Principle, instrumentation & application of NMR and ESR.	2

3	Chromatography: Theory & Principle, chromatographic parameter (partition coefficient, capacity factor, retention & dead time, Resolution & their calculation), components of chromatography & types (paper, thin layer, partition)	3
	Advance chromatography: GC, HPLC, HPTLC (principle, instrumentation & application). Separation technique & analysis	4
	Electrophoresis: Paper & gel electrophoresis, PAGE, iso-electric focusing, 2D electrophoresis, Immuno electrophoresis.	3
4	Isotopic & immune techniques: Principle & theory of isotopic method, types, measurement	2
	Detection of radioactivity, RIA, Autoradiography	3
	Immuno-techniques, Principle, antigen-antibody interaction, enzymatic immune assay- ELISA and its types.	3
	Different immuno techniques of antigen detection in food sample.	2
<b>TOTAL LECTURES =</b>		<b>40</b>

### COURSE OUTCOMES:

Upon completion of the subject the students will be able to:

CO1	Demonstrates awareness of basic separation techniques for food analysis.
CO2	Expresses importance of amino acids and sugars estimation.
CO3	Elaborates the molecular weight, ionic characteristics and pure extraction food components .
CO4	Analyzes the importance of quick detection techniques to identify adulterations.

### TEXT BOOKS:

1	Food Analysis -Theory and Practice, Pomrenz Y & Meloan CE, 3rd Ed. CBS. 1996
2	Food Analysis, S. Suzanne Nielsen, 3rd Ed. Kluwer Academic, New York, USA., 2003
3	Wilson and Walker's Principles and Techniques of Biochemistry and molecular Biology, 8 <sup>th</sup> edition, Hoffmann A. & Clokie S., Cambridge University Press, 2018
4	Handbook of Food Analysis Instruments, Semih Ötles, CRC Press, Boca Raton, FL, USA. 2009.

### REFERENCE BOOKS:

1	Instrumental Methods of Food Analysis, Macleod AJ, Elek Sci. Marcel Dekker. 1973
2	Modern Techniques for Food Authentication, Da-Wen Sun, Elsevier Inc., Burlington, MA, USA. 2008
3	An Introduction to Practical Biochemistry. Plummer, D.T. 1971 Mc-Graw Hill Pub.Co., New York.

<b>Course Code: FSN-423 (4CH)</b>	<b>Course Name: FOOD QUALITY CONTROL</b>
<b>Pre-requisite: None</b>	<b>Co-requisite: None</b>

**Objective:** To develop the skills on the standardization of food products with respect to quality assessment.

UNIT	TOPICS	NO. OF LECTURES
1	Concept of quality: quality attributes: physical, chemical, nutritional and microbial evaluation.	2
	Objective evaluation: Tests used for objective evaluation, application and limit, Instruments used for quality assessment-color & gloss, size & shape, defects, texture, Viscosity & consistency	5
	Sensory evaluation: Sensory characteristics of food, sensory requirements, Types of sensory evaluation..	2
2	Food adulteration and food toxins: common adulterant in food (milk and milk products, edible oils, cereals & pulses, prepared foods, spices, beverages); simple screening, control of food adulteration	2
	Food Toxins: Terms in toxicology; Safety evaluation using traditional and modern approach;	2

	Natural anti-nutritional factors, toxic phytochemicals, microbial toxins, toxins from fungi,	2
	Contaminations during handling and processing(PAHs), contaminants from industrial wastes, pesticide residues	2
	Toxicity of heavy metals and chemicals in food and their permissible limits,	2
	Food allergens.	1
3	Quality assurance, Quality Control, Total Quality Management;	1
	GMP, GHP;	2
	GLP, GAP;	1
	Sanitary and hygienic practices;	1
	physical, chemical and biological hazards in foods,	1
	HACCP- Principles of HACCP, application of HACCP system, implementation steps for HAACP system ;	2
	HACCP-systems for food safety,	1
	Quality manuals, documentation and audits.	1
4	Food laws and regulation: Mandatory and voluntary food laws,	1
	International quality systems and standards like ISO (9000 & 22000) series, Codex, BRC;	3
	Indian Food acts-Food Safety and Standards Act, 2006, FSS Regulations: Regulations on Licensing and Registration, Regulations on Contaminants, toxins and residues, Food product standards, food additives, Laboratory and sampling analysis; Packaging and Labelling; Prohibition and Restriction on sales.	3
	Various food acts- Environment (Protection) Act, 1986, Standards of Weights and Measures Act, 1976, Essential Commodities Act, 1955, The Export (Quality Control and Inspection) Act, 1963, The Insecticides Act, 1968, Consumer Protection Act, 1986. Introduction to various food laws (Voluntary) -Agmark Standards (AGMARK), BIS Standards and Specifications.	3
<b>TOTAL LECTURES =</b>		<b>40</b>

#### COURSE OUTCOMES:

Upon completion of the subject the students will be able to:

CO1	Define food behavior appropriate quality characteristics for food formulations/preparations.
CO2	Demonstrates the role of toxins that contaminates food nutritions.
CO3	Implementation of hygiene and sanitation conditions for different foods.
CO4	Implementation of suitable specifications for different foods formulations/ industries.

#### TEXT BOOKS:

1	Fundamentals of Quality Control for Food Industry, Krammer and Twigg, Avi Publishing Company, 1966
2	Handbook of Food Toxicology, S.S Deshpande, Marcel Dekker , 2002
3	Food Quality Assurance –Principles and Practices, Inteaz Alli, CRC Press Boca Raton
4	Food Hygiene and Sanitation, Roday S. McGraw Hill Education, 2011
5	An Introduction to Food Science Technology and Quality Management, Bhatt D.K. & Tomar P., Kalyani publishers.

#### REFERENCE BOOKS:

1	Sensory Evaluation Techniques, Civillie and Carr, CRC Press, 2015
2	Food Industry Quality Control System, Clute M., CRC Press, 2008
3	Food Safety Management and ISO 22000 –Food Industry Briefing, Early Ralph, Food Industry Briefing Publication
4	Food Safety and Standards Act, Rules & Regulations., Vidhi Jain & Akalank Kumar Jain

**Course Code: FSN-424 (4CH)**

**Course Name: ADVANCED HUMAN PHYSIOLOGY**

**Pre-requisite: None**

**Co-requisite: None**

**Objective:** The basic physiology of various system in human body and functions of various organs with their regulation.

UNIT	TOPICS	NO. OF LECTURES
1	Respiratory system: anatomy, physiology and mechanism of respiration, regulation of respiration.	4
	Circulatory system: blood, composition of blood cells, development & function of blood cells, blood clotting, blood grouping and hemoglobin, Heart: anatomy, cardiac cycle, blood pressure and factors affecting blood pressure.	6
2	Digestive System: anatomy of gastrointestinal tract and accessory organs. Digestion & absorption of foods, regulation of appetite Role of liver, pancreas, gall bladder	5
	Reticulo-endothelial system: functions, classification. Lymphatic System: functions, circulation.	5
3	Excretory system: anatomy and function of kidney, formation, composition and excretion of urine. Role of kidney in water, electrolytes & acid base balance.	4
	Endocrine glands: structure & function, mode of action of hormones.	6
4	Reproductive system: Structure & function of male & female reproductive organs. Physiological changes in pregnancy. Lactation, Post parturition changes.	4
	Nervous System: anatomy and functions of brain, spinal cord, nerves, organization of central nervous system Musculoskeletal system: anatomy & function.	6
<b>TOTAL LECTURES =</b>		<b>40</b>

#### COURSE OUTCOMES:

Upon completion of the subject the students will be able to:

CO1	Develops awareness of different organ system.
CO2	Introduces process of food digestion and assimilation in human body.
CO3	Elaborates the role of various organs of human body.
CO4	Analyzes the importance of nerve system in human body.

#### TEXT BOOKS:

1	Human Physiology. VolI &II -C.C.Chatterjee, Medical Allied agencies.
2	The Human Body-CH.best&NB. Taylor.1989, ASI publication House
3	Text book of Medical Physiology-AC.Guyton, WB sounders
4	Medical laboratory technology-KL. Mukherjee. Tata Mcgrawhill

#### REFERENCE BOOKS:

1	Ross & Wilson Anatomy & Physiology in Health & illness-KJW.Wilson&JS.Ross 1987, Churhill Livingstone
2	Text book of Physiology-volI & II-AK.Jain, Avichal Publishing Co. New Delhi.
3	Review of Medical Physiology-WF. Ganong, Lange medical Publication

**COURSE NO: FSN.425 PRACTICAL RELATED TO ALL THEORY PAPERS 4CH**

**COURSE NO: FSN. 426 SUMMER INTERNSHIP 2CH**

1. The students of first year shall do the survey /visit to local district hospitals for patients suffering from various diseases and shall plan appropriate diet for them.
2. They shall maintain logbook of patients and their diets.
3. At the end of academic year their logbooks will be evaluated by the faculty concerned.
4. Certificate by the hospital authority need to be presented.

#### COURSE OUTCOME:

The student will be adapted to hospital administration for better practical aspects.

### THIRD SEMESTER

<b>Course Code: FSN-511 (4CH)</b>	<b>Course Name: THERAPEUTIC NUTRITION</b>
<b>Pre-requisite: None</b>	<b>Co-requisite: FSN-414</b>

**Objective:** To develop the skills for human health science, to learn about diets and eating that is complimentary to different health conditions or illnesses.

UNIT	TOPICS	NO. OF LECTURES
<b>1</b>	Therapeutic Nutrition: Therapeutic adoption of normal diets (normal, soft & fluid diets) factors to be considered in planning therapeutic diets, role of dietician, dietary calculation using food exchange lists, high & low calorie diet, high protein, high fat, & low carbohydrate diets..	<b>3</b>
	Menu Planning, Over-view of special diets.	<b>2</b>
	Drugs & Diet Inter-Action, Food sensitivity	<b>2</b>
	Special feeding methods, pre & post operative diets,	<b>2</b>
<b>2</b>	Therapeutic Diets: Etiology, physiological disturbances, biochemical & clinical manifestations & dietary management of: Fever & infection	<b>2</b>
	Therapeutic Diets: Etiology, physiological disturbances, biochemical & clinical manifestations & dietary management of: Anaemia,	<b>1</b>
	Therapeutic Diets: Etiology, physiological disturbances, biochemical & clinical manifestations & dietary management of: Critical care and stress	<b>2</b>
	Therapeutic Diets: Etiology, physiological disturbances, biochemical & clinical manifestations & dietary management of: Allergy & food intolerance	<b>2</b>
	Therapeutic Diets: Etiology, physiological disturbances, biochemical & clinical manifestations & dietary management of: Surgical conditions in Burns and Trauma – complications and dietary treatment.	<b>2</b>
	Therapeutic Diets: Etiology, physiological disturbances, biochemical & clinical manifestations & dietary management of: HIV and AIDS.	<b>1</b>
<b>3</b>	Therapeutic Diets: Etiology, physiological disturbances, biochemical & clinical manifestations & dietary management of: Obesity and underweight	<b>2</b>
	Therapeutic Diets: Etiology, physiological disturbances, biochemical & clinical manifestations & dietary management of: Eating disorder	<b>1</b>
	Therapeutic Diets: Etiology, physiological disturbances, biochemical & clinical manifestations & dietary management of: diabetes mellitus	<b>2</b>
	Therapeutic Diets: Etiology, physiological disturbances, biochemical & clinical manifestations & dietary management of: gout and inborn errors of metabolism	<b>2</b>
	Therapeutic Diets: Etiology, physiological disturbances, biochemical & clinical manifestations & dietary management of: GI Disease and disorders	<b>2</b>
	Therapeutic Diets: Etiology, physiological disturbances, biochemical & clinical manifestations & dietary management of: Cancer	<b>2</b>
<b>4</b>	Therapeutic Diets: Etiology, physiological disturbances, clinical & biochemical manifestation and dietary management of cardio vascular disorder. Hyper-lipidemia & Antherosclerosis (fat controlled diet) Heart disease (sodium restricted diet) Hypertension, Coma, Trauma, Stroke.	<b>2</b>
	Therapeutic Diets: Etiology, Physiological disturbances, biochemical & clinical manifestations & dietary management of : Liver and Pancreas, Hepatitis & cirrhosis (High protein, high carbohydrate moderate fat or fat restricted diet)	<b>3</b>
	Therapeutic Diets: Etiology, physiological disturbances, biochemical & clinical manifestations & dietary management of: Diseases of kidney (Nephrosis, nephrosclerosis, glomerulonephritis, uremia) (controlled protein, potassium & sodium diet)	<b>4</b>
	Therapeutic Diets: Etiology, Physiological disturbances, biochemical & clinical manifestations & dietary management of : Neurological disorder	<b>1</b>
	<b>TOTAL LECTURES =</b>	<b>40</b>



**COURSE OUTCOMES:**

Upon completion of the subject the students will be able to:

CO1	Develops awareness of basic structure of grains and role of revolutions for food productions.
CO2	Introduces professional ethics among various fruit based products.
CO3	Elaborates the role of muscle food types and their preparations.
CO4	Analyzes the importance of milk products processing and handling.

**TEXT BOOKS:**

1	Nutrition and Dietetics – Subhangini A.Joshi – Tata McGraw-Hill Publishing Company Limited, New Delhi
2	Dietetics – B.Srilakshmi – New age international (P) limited New Delhi.
3	Clinical Dietetics and Nutrition – F.A. Antia, Oxford University Press, London.
4	Text Book of Human Nutrition- Mahtab S. Bamji, N.Rao & V. Reddy, Oxford & IBH Publishing Co. Pvt Ltd.

**REFERENCE BOOKS:**

1	Normal and Therapeutic nutrition- C.H. Robinson & M.R Lawler – Macmillen Publishing Co. New York.
2	Essentials of Food and nutrition – M.Swaminathan, Vol I & II, The Bangalore Printing & Publishing Co. Ltd (BAPPCO)
3	Food, Nutrition & Diet Therapy-L.K.Mahan & Escott.Stump- W.B. Saunders Ltd
4	Nutrition& Diet Therapy- S.R.Williams-Times mirror Mosby college Publishing. Co.
5	Human Nutrition & Dietetics- J.S.Garrow ,W.P.T.James, A. Ralph –Churhill Livingstone.

<b>Course Code: FSN-512 (4CH)</b>	<b>Course Name: RESEARCH METHODOLOGY AND BIOSTATISTICS</b>
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<b>Pre-requisite: None</b>	<b>Co-requisite: None</b>
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**Objective:** The course is intended to give an overview of research and statistical models commonly used in medical and biological sciences. The goal is to impart an intuitive understanding and working knowledge of research designs and statistical analysis. The strategy would be to simplify, analyze the treatment of statistical inference and to focus primarily on how to specify and interpret the outcome of research.

UNIT	TOPICS	NO. OF LECTURES
<b>1</b>	Research Methodology: Meaning, aim & objective of research, significance of research, Research types, Research methods vs methodology, Different types of research design. Different Steps in Writing Report, Technique of Interpretation, Precaution in interpretation, Significance of Report Writing, Layout of the Research Report.	<b>3</b>
	Fundamentals of statistics: Research process, Population, Variables, Primary and secondary data, Collection of data, Classification and tabulation of data, Need and usefulness of Diagrams & Graphs, Different types of diagrams and graphs (Bar charts, Histograms, Frequency polygons, one way scatter plots, Box plots, two way scatter plots, line graphs)	<b>2</b>
	Frequency distribution: Discrete and continuous frequency distribution, population & sample, Sample Size and its Determination	<b>2</b>
	Sampling Designs: Census and Sample Survey, Implications of a Sample Design, Steps in Sampling Design, Criteria of Selecting a Sampling Procedure, Characteristics of a Good Sample Design, Different Types of Sample Designs, sampling errors.	<b>2</b>
<b>2</b>	Descriptive statistics: Measure of central tendency: (Arithmetic mean, harmonic mean, geometric mean, median, mode), relation between mean, median and mode ;	<b>2</b>
	Measure of dispersion: Range, Mean deviation & Standard deviation;	<b>4</b>
	Skewness and Kurtosis,	<b>2</b>
	Probability.	<b>2</b>



<b>3</b>	Testing of Hypotheses: Definition, Basic Concepts, Procedure for Hypothesis Testing, Measuring the Power of a Hypothesis Test, Normal distribution, data transformation, Null and Alternative Hypothesis, level of significance.	<b>3</b>
	Chi-square Test: Chi-square as a Non-parametric Test, Conditions for the Application Chi-square test, Steps Involved in Applying Chi-square Test	<b>2</b>
	Student 't' distribution and its application, 'f' test and its application,	<b>2</b>
	Analysis of Variance and Covariance: Analysis of Variance (ANOVA): Concept and technique of One-way ANOVA, Concept of Two-way ANOVA & Analysis of Covariance (ANOCOVA)	<b>4</b>
<b>4</b>	Measures of Relationship: Need and meaning, Correlation and Simple Regression Analysis, Types of correlation; simple, partial and multiple correlation, Method of study & testing the significance of correlation coefficient.	<b>4</b>
	Regression analysis: regression equations and regression lines, Properties of regression lines, regression coefficient, testing the significance of regression coefficient.	<b>4</b>
	Concept of cluster Analysis and Principal component Analysis.	<b>2</b>
	Computer Application: Use of Computer in data analysis and research, Use of Software and Statistical package. Introduction to SPSS. Importing data from excel, access, entering data, labeling a variable, coding and recoding a categorical and continuous variable. Converting data from string to numeric variables, sorting & filtering, merging, appending data sets.	<b>10</b>
<b>TOTAL LECTURES =</b>		<b>40</b>

#### COURSE OUTCOMES:

CO1	Student will be able to understand design statistical models, research designs with the understating of background theory of various commonly used statistical techniques as well as analysis interpretation, reporting of results and use of statistical software.
CO2	
CO3	
CO4	

#### TEXT BOOKS:

1	Zar, Jerrold H.(1998). Biostatistical Analysis, Prentice Hall, NJ
2	Statistics for Management, Levin and Rubin, Owls Books, Toledo, USA
3	Business Mathematics and Statistics, N.K.Nag & S.K.Nag, Kalyani publishers.
4	Handbook on Data Envelopment Analysis, Cooper, Seiford, Lawrence & Zhu, Springer

#### REFERENCE BOOKS:

1	Statistical Methods – S.P.Gupta, Sultan Chand & Sons Publisher- New Delhi
2	Research Methodology, Methods and Techniques – C.R. Kothari Wiley Eastern Limited – New Delhi

<b>Course Code: FSN-513</b>	<b>Course Name: INDUSTRIAL FOOD BIOTECHNOLOGY</b>
<b>Pre-requisite: FSN-413</b>	<b>Co-requisite: None</b>

**Objective:** This course acquaints students with various industrial food products, production techniques by modifying the genetic material or using beneficial microbes .

UNIT	TOPICS	NO. OF LECTURES
<b>1</b>	Definition, Scope, and Application of Biotechnology - Application in Food Industries,	<b>1</b>
	Basic tools of r-DNA technology: Restriction endonuclease and DNA ligase, Cloning:- cloning vectors, cloning of foreign DNA, screening of recombinant clone, PCR technology, DNA sequencing technique, Blotting techniques.	<b>4</b>
	Role of DNA in Cell Metabolism; Cell and Tissue Culture; Cloning and Micromanipulation	<b>3</b>

2	Transgenic for food production: Development and current status of transgenic crops (insect resistant and herbicide tolerant crops) for crop improvement and enhanced agronomic performance; molecular farming, Transgenic Animal, Hybridoma Technology	4
	GM foods: Ethical issues concerning GM foods; testing for GMOs; IPR .GMO Act 2004. Concept of genomics and proteomics.	3
3	Fermentation and Industrial Microbiology: Upstream processing: media for industrial fermentation-submerged and solid state fermentation. sterilization, development of inoculum for fermentation. Screening techniques-primary and secondary, strain improvement of industrially important microorganisms.	4
	Introduction to fermentation processes- Bioreactor design, types and components of fermenter- agitation, aeration, pH, temperature, dissolved oxygen- control and monitoring. Different types of fermenter	3
	Techniques of Downstream processes - recovery and purification- filtration, centrifugation. Purification of intracellular and extra cellular products- Chromatography and Distillation.	4
4.	Brief account of industrial production of beer, bread, industrial alcohol, vinegar and acetic acid, Cheese by microorganisms. Production of aminoacids, Production of antibiotics, Production of food colourants, Production of beta carotene, Production of baker's yeast,	6
	Production of microbial enzymes and its importance- protease, alpha- amylase, Immobilization of enzymes.	2
	Effluent Treatment Plants and Solid Waste Utilization and Management – SCP, Biogas and vermi- composting	3
	Utilization of-agricultural waste (cereal, legume and oil seed based waste), dairy waste, fruit and vegetable waste, meat, poultry, egg and fish wastes, by-products of fermentation industries, Sugar and bakery industry.	3
<b>TOTAL LECTURES =</b>		<b>40</b>

#### **COURSE OUTCOMES:**

Upon successful completion of the course, students should be able to:

CO1	Explain the basics and molecular techniques involved in recombinant DNA technology and the role of microbes in rDNA technology. Describe the applications of transgenic plants and animals
CO2	Describe the production and applications of transgenic plants and animals
CO3	Explain various industrial relevant microbial products and their production process
CO4	Develop processes for utilization of food waste with the help of biotechnology.

#### **TEXT BOOKS:**

1	Genetics. Strickberger M W. Prentice, Hall of India, Pvt Limited, New Delhi.
2	Industrial Microbiology, Casida LE, Wiley, 1968
3	Microbial Biotechnology: Fundamentals of Applied microbiology - Hiroshi Nikaido, Alexander N Glazer
4	Biotechnology -Expanding Horizons, B.D. Singh, Kalyani Publishers, New Delhi. 2014

#### **REFERENCE BOOKS:**

1	Introduction to Plant Biotechnology. Second Edition. Science Publishers. Chawla HS.
2	Utilization of By-Products and Treatment of Waste in the Food Industry. Oreopoulou V and Russ W. Springer, 2007.
3	Principles of Gene Manipulation and Genomics, S.B. Primrose and R.M. Twyman, 7thEd. , Blackwell Publishing, Victoria, Australia, 2006

<b>Course Code: FSN-424 (4CH)</b>	<b>Course Name: ELECTIVE PAPERS</b>
<b>Pre-requisite: None</b>	<b>Co-requisite: None</b>

<b>Course Code: FSN-424 (A)</b>	<b>Course Name: CLINICAL DIETETICS</b>
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**Objective:**

To develop the skills on the medical and clinical sciences which focus on the maintenance, protection and improvement of the health status of population groups and communities as opposed to the health of individual patients.

UNIT	TOPICS	NO. OF LECTURES
1	Health: concept, definition, dimension & determinant of health, positive health, health situation in India,	3
	Concept of disease, causation (Agent, host, environmental factors) concept and control & prevention, modes of intervention,	2
	Immunity and health,	3
	Health Indices: fertility, indicator, vital statistics, mortality, morbidity & demographic indicator, Human development Index, Reproductive health index.	3
2	Health Care: Concept of health care, level of health care, changing concept, elements & principles of health care,	3
	Health for all, national strategies, health care delivery system (primary health care) health care services & system,	3
	Agencies (Govt. and Private) in delivery health care services, health programmes in India.	3
3	Health needs & problem: Health needs & problems related to sanitation & environment, personal hygiene.	2
	Health Economics and Economics of Malnutrition: indicators of nutrition Interventions in malnutrition,	2
	Food security	2
	Health assessment by biochemical tests: CDC, lipid profile, urine culture, electrolytes etc	4
4	Health planning & Management: Health planning, health needs & demands, objectives, targets & goals, planning cycle,	2
	Health management: methods & techniques, health planning in India, Five year plans & health system in India.	2
	Health information: requirements, components, sources of health information, health regulation & acts, health legislation.	2
	Health Education: adoption of new ideas & practices, content & principles of health education, audio-visual aids in health education,	2
	Nutrition education Programme evaluation	2
<b>TOTAL LECTURES =</b>		<b>40</b>

**COURSE OUTCOMES:**

Upon completion of the subject the students will be able to:

CO1	Demonstrates integration of population dynamics.
CO2	Expresses importance of health care systems for healthy life.
CO3	Analyzes the importance of nutritional assessment procedures.
CO4	Elaborates the nutritional education programmes for creating health awareness.

**TEXT BOOKS:**

1	Dietetics – B.Srilakshmi; New age International (P) Limited, New Delhi.
2	Nutrition Science – B.Srilakshmi; New age International (P) Limited, New Delhi.
3	Text Book of Preventive & social Medicine- K. Park . M/S Banarasidas Bharat, Jabalpur.
4	Text Book of Public Health and Social Medicine- A.N.Ghei Lakshmi Book Store, New Delhi.

<b>REFERENCE BOOKS:</b>	
1	The Concept of Health- Donald A.read- Hobbrook Press Inc, Boston.
2	Principles of Health Science- K.L.Jones, L.W. Shainberg & C.O. Byer- Harper & Row Publishers, New York.
3	Health Promotion in Public- A. Bhatia, Anmol Publications, New Delhi
4	A Hand Book of Social & preventive Medicine- Y.P.Bedi, Atmaram & Sons, New Delhi.

<b>Course Code: FSN-424 (B)</b>	<b>Course Name: PUBLIC HEALTH NUTRITION</b>
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**Objective:**

To develop the skills on the complex and changing exposure to nutrition throughout the life cycle as a critical determinant of health and a key field of study for those committing themselves to public health both internationally and nationally.

<b>UNIT</b>	<b>TOPICS</b>	<b>NO. OF LECTURES</b>
<b>1</b>	Community nutrition: Definition, aims, basic measurements and applications. Factors influencing community nutrition.	<b>5</b>
	Environmental, social and economic factors, food habits, food faddism, ignorance and food losses.	<b>2</b>
<b>2</b>	Community Centres: Organisation and functions of community health centres and primary health centres, Primary health care and concept.	<b>3</b>
	Types of services- services in primary, secondary and tertiary health care setup, patients in different critical care centers, post-natal, pediatric and geriatric patients.	<b>3</b>
	Role of nutrition support team- dietetic interns, dietitians (therapeutic, administrative and consultant dietitian). Team approach in patient care.	<b>3</b>
<b>3</b>	Food security in the community: Assessment of nutritional status of individual and community.	<b>3</b>
	Role of New food, Food fortification and enrichment, Food labeling in the community.	<b>3</b>
	Food Service: Style of Service & Types of Service	<b>4</b>
<b>4</b>	Nutrition Education and individual behavior change	<b>2</b>
	Meaning, nature and importance of nutrition education to the community,v	<b>2</b>
	Training of workers in nutrition education programme.	<b>3</b>
	Principles of planning, executing and evaluation: Methods and Techniques of organizing nutrition programmes using audio, video aids and exhibition, Problems of nutrition.	<b>3</b>
<b>TOTAL LECTURES =</b>		<b>40</b>

**COURSE OUTCOMES:**

Upon completion of the subject the students will be able to:

CO1	Demonstrate quantitative and qualitative methods, program development and evaluation,
CO2	Expresses importance of health care systems for healthy life.
CO3	Analyze the importance of health disparities, health behavior change and health policy.
CO4	Elaborate the importance to support the careers of aspiring public health researchers and actively encourage applications for further NGO survey.

**TEXT BOOKS:**

1	Public Health and Hygiene- Y.P.Bedi, Atma ram & sons, Kashmere gate, Delhi.
2	Nutrition Science – B.Srilakshmi; New age International (P) Limited, New Delhi.
3	Text Book of Preventive & social Medicine- K. Park . M/S Banarasidas Bharat, Jabalpur.
4	Text Book of Public Health and Social Medicine- A.N.Ghei Lakshmi Book Store, New Delhi.

**REFERENCE BOOKS:**

1	The Concept of Health- Donald A.read- Hobbrook Press Inc, Boston.
2	Principles of Health Science- K.L.Jones, L.W. Shainberg & C.O. Byer- Harper & Row Publishers, New York.
3	Health Promotion in Public- A. Bhatia, Anmol Publications, New Delhi

**Objective:**

To develop the skills on the principles of catering management, be aware of the differing methods of food service and implications for the nutritional quality and safety of food.

UNIT	TOPICS	NO. OF LECTURES
1	Introduction to Food Service Systems: Evolution of the food service industry. Broad categories of catering services; commercial and Institutional.	4
	Characteristics of the various types of food service units – Canteens, Hostels, Hospitals and Restaurants. Scope for food and nutrition services in hospitals-importance of nutritional care and foods service in hospitals.	4
2	Principles of Institutional food Management: Management functions. Management tools: Tangible, Intangible tools.	4
	Management Process: Tools of Management, Management of resources, (money, space, materials' equipments, staff, time and procedures).	4
3	Personnel Management: Manpower planning. Space Planning & Organizing, Recruitment, selection and orientation-Training and motivation, employee facilities & benefits.	4
	Types of employee welfare Schemes, training and development of employees	3
	Labour Laws.	3
4	Energy and Finance Management: Importance of time and energy management,	2
	Types of energy – Human and fuel energy, Measures for utilization and conservation.	2
	Management of Finance: Sources of finance and Budgets, Cost accounting/analysis: Food cost analysis,	3
	Labour cost analysis and Cost Control Techniques.	3
<b>TOTAL LECTURES =</b>		<b>40</b>

**COURSE OUTCOMES:**

Upon completion of the subject the students will be able to:

CO1	Demonstrate study the history of hospitality, career opportunities and the different areas of hospitality.
CO2	Expresses importance of importance to support practical management skills
CO3	Analyze the importance of scheduling, hiring, wage and salary regulations, safety in the workplace and.
CO4	Elaborate the importance of job performance evaluation.

**TEXT BOOKS:**

1	Catering Management – an integrated approach- M.Sethi & S.Malhon, Wiley Eastern Limited.
2	Institutional food Management- MohiniSethi, New Age International Publishers, New delhi
3	Catering Management in the Technological age-Fuller Barrievd- Rock hiff Publications.
4	Personal Management in the Hotel& Catering Industries- Boella- Hutchinson Publications.

**REFERENCE BOOKS:**

1	Hotel House Keeping Training Manual- Andrews Snoher-Tata McGraw Hill Publication-New Delhi.
2	The Practice of Hospitality Management _vol I and II –R.Lewis, T.Begg's M.Shaw & S.Croffot-AVI Publishing Co.DC.West Port Connecticut.
3	Food service Planning: layout Equipment – Lender H. Ketshevar and Marget E. Terrel.

**Objective:** To develop the skills for postharvest processing of food and use them as preservation techniques in food processing industries

UNIT	TOPICS	NO. OF LECTURES
1	Basic concept of food processing and preservation: Reason of food Spoilage and Scope of food processing preservation; principles of food processing and preservation	2
	Principle and preservation by low temperature: (refrigeration, freezing, and dehydro freezing; cold storage, frozen food), changes during freezing-physical and chemical changes	2
	Processing and preservation by drying: factors affecting drying rate, types of dryer – (kiln, tray, drum, spray, tunnel, fluidized bed drying),	2
	Types of drying technique (freeze drying, vacuum drying)	2
	Microwave cooking-(principle, changes during microwave cooking, advantages), difference between microwave and conventional heating	2
2	Processing and preservation by heat: (blanching, pasteurization, sterilization, UHT processing, heating, smoking, pickling, canning)	3
	Concentration and evaporation-(flash evaporator, falling film evaporator and multiple effect evaporators), changes during Concentration	2
	Ohmic heating	1
	Food processing equipments: material handling, cleaning and grading, conveyors, size reduction	2
	Separation Technique: filtration (MF, UF, NF, RO), agitation and mixing, frying, baking	2
3	Irradiation	1
	High pressure processing	2
	pulsed electric field	1
	Ultrasonic processing: Properties of ultrasonic, application of ultrasonic as processing techniques	2
	IR heating	1
	Hurdle technology: concept of hurdle technology and its application	2
	Extrusion Technology-(principle, types of extruders).	1
4.	Food packaging: Packaging material, Mass transfer in packing material	3
	packaging system and methods- vacuum packaging, gas flush packaging, aseptic packaging	2
	Modified atmosphere packaging (MAP), controlled atmosphere packaging (CAP), active packaging	2
	Bio-degradable packages, aseptic and edible package.	2
	Package testing, CA & M, quality changes during storage of foods	1
<b>TOTAL LECTURES =</b>		<b>40</b>

#### COURSE OUTCOMES:

Upon successful completion of the course, students should be able to:

CO1	Create a basis knowledge of food processing and preservation methods
CO2	Demonstrate some basis knowledge of thermal processing methods for food preservation
CO3	Develop the fundamental ideas of non-thermal food preservation techniques
CO4	Implement the advancement of packaging material in food processing industries

<b>TEXT BOOKS:</b>	
1	Fellows PJ. 2005. <i>Food Processing Technology: Principle and Practice</i> . 4 <sup>th</sup> Ed. CRC.
2	Potter NN & Hotchkiss 1997. <i>Food Science</i> . 5th Ed. CBS
3	Sahay KM & Singh KK. 1994. <i>Unit Operation of Agricultural Processing</i> . Vikas Publ. House.
4	Robertson, G.L. <i>Food Packaging: Principles and Practice</i> (2nd ed.), Taylor & Francis 2006

<b>REFERENCE BOOKS:</b>	
1	Ramaswamy H & Marcotte M. 2006. <i>Food Processing: Principles and Applications</i> . Taylor & Francis
2	Wills, R.B.H., McGlasson, W.B., graham, D., Lee, T.H. and Hall, E.G. 1989.
3	Food Packaging Technology Handbook. NIIR Board, National Institute of Industrial Research, 2003
4	Robertson, G.L. <i>Food Packaging: Principles and Practice</i> (2nd ed.), Taylor & Francis 2006

<b>Course Code: FSN-515(4CH)</b>	<b>Course Name: PRACTICALS ON DIET THERAPY</b>
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<b>Course Code: FSN-516(3CH)</b>	<b>Course Name: SEMINAR-I</b>
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**Objective:** To develop the skills for improving the verbal and non-verbal communication skills and acquire leadership skill and team work capabilities through participation.

Evaluation shall be done by members. Students should be assigned marks for presentation skill based on following Criteria:

Sl.No.	Topics	%Marks
1	Report Evaluation	50
2	Recent / innovative/ unique idea/ topics	10
3	Technical knowledge related to product/process/ technique	20
4	PPT Presentation	20

<b>COURSE OUTCOMES:</b>
The student utilizes the knowledge in detail to build self-confidence.

### **FOURTH SEMESTER**

<b>Course Code: FSN-521 (2CH)</b>	<b>Course Name: NUTRITIONAL STATUS SURVEY</b>
<b>Pre-requisite: None</b>	<b>Co-requisite: None</b>

**Objective:** To develop the skills for any pandemic/ epidemic situation, their cause, learn about diets and drug that is complimentary to different health conditions or illnesses.

Evaluation shall be done by members. Students should be assigned marks for presentation skill based on following Criteria:

Sl.No.	Topics	%Marks
1	Report Writing	60
	-subject knowledge	(20)
	-disease management	(20)
	-cause and diet requirements	(20)
2	PPT presentation	40



**COURSE OUTCOMES:**

It is for building (or reinforcing) skills in project development and execution, decision-making, individual and team coordination, approach to problem solving, etc. The programme has end to end approach. Carefully calibrated activities help the participants to explore and discover their own potential and both activities and facilitation play a critical role in enhancing team performance. It helps the student to develop competence, capability, capacity building, acquiring skills, expertise, and confidence to current health trends. This is a step forward for high quality professional competence and practical work experience in real life situation.

<b>Course Code: FSN-522 (14 CH)</b>	<b>Course Name: FINAL PROJECT REPORT</b>
<b>Pre-requisite: None</b>	<b>Co-requisite: None</b>

**Objective:** To develop the skills for research.

1. Basic concepts of project planning

a) Defining objectives- Need, problem, project, feasibility, planning, formulation. - . Identifying resources b) Methods/approaches, Project Appraisal- Project Format

2. Guideline for project writing – Title of the project - Name of the person - Duration of the project, type of project. – Aims and objectives - summary of the proposed project - Project information, location, people and personnel involved. - Working/methodology – Evaluation - Writing and reporting

3. Internship Tenure– 6months-

After successful completion of the course the candidate is eligible to undergo 6months internship in the following departments (Hospital posting)

4. Working hours/day – 8hours.

Inspect and study for each speciality in Hospital:

General Medicine, Surgery, Obstetrics & Gynaecology, Geriatric, Oncology, Cardiology, Gastroenterology, Hepatology, Neurology, Pediatrics, Endocrinology, Nephrology, ICU-Cardio, Medical, Surgical, Pediatric, Food Service Area (Dietary/Diet Kitchen), store keeping (receiving and holding of provision, stock levels in the stores),supervision of the kitchen area, pre-preparation area and preparation of patient diet and hospital made enteral feeds, quality Control, kitchen hygiene and patient tray service.

A Good Project should have:

- i) Originality, Innovation and creativity and should commensurate with understanding the problem and finding solution.
- ii) Relevance of the project to the community and impact of the project on society.
- iii) Proper understanding of the subject, quality and quantity of the work and efforts to validate the data collected.

Project Report Writing:

The structure of the project report shall be in the format is as follows:

- i) The Cover Page-
  - It should have
    - Title of the project
    - Name and address of department
    - Name and address of Supervisor/Guide/ teacher
- ii) Abstract -500 words
- iii) Contents:
  - List of tables/figures
  - Abbreviations



- iv) Introduction-Description on background of the study
- v) Aims and Objectives
- vi) Relevance of the project work
- vii) Methodology
- viii) Observations: This shall include the observations during the experiment. Observation can be both qualitative as well as quantitative.
- ix) Data analysis and interpretation: The data generated/ obtained from the experiments/observations should be processed for better understanding in a more structured manner. Tools and methods (e.g. statistical methods) may be used for analysing data to understand the patterns that emerges from it to form results and conclusions.
- x) Results: Results are the output of compilation of the data into meaningful outcomes/ interpretations and sometimes, there is a need to redo the experiments to get consistent results. In case it is not possible to “repeat the experiments”, there should be adequate replicates so that adequate data is available for interpretation, and arriving at results.
- xi) Conclusions: This is the logical end of the project to arrive at specific conclusions from the observed phenomena. In a way, the whole objective of the project is to arrive at some conclusion, either positive or negative which would lead to a better understanding of the problem.
- xii) Acknowledgement
- xiii) References

Evaluation shall be done by external members. Students should be assigned marks for project report based on following Criteria:

Sl.No.	Topics	%Marks
1	Originality of Idea and Concept	5
2	Relevance of the project to the theme/problem	5
3	Data collection and analysis	10
4	Research Plan and Methodology	10
5	Experimentation/ execution of research work	10
6	Research Report Writing	30
7	Oral Presentation	20
8	Clarification of queries raised	20
	<b>Total=</b>	<b>100</b>

#### **COURSE OUTCOMES:**

The word ‘Project’ essentially means that learning and development are achieved through personally determined experience and involvement, rather than on received teaching or training, typically in group, by observation, study of theory or hypothesis, bring in innovation or transfer of skills or knowledge. Experiential learning during project work is a business curriculum-related endeavour which is interactive.

**Course Code: FSN-523(3CH)**

**Course Name: SEMINAR-II**

**Pre-requisite: FSN-516**

**Co-requisite: None**

**Objective:** To develop the skills for improving the verbal and non-verbal communication skills and acquire leadership skill and team work capabilities through participation.

Evaluation shall be done by members. Students should be assigned marks for presentation skill based on following Criteria:

Sl.No.	Topics	%Marks
1	Report Evaluation	50
2	Recent / innovative/ unique idea/ topics	10
3	Technical knowledge related to product/process/ technique	20
4	PPT Presentation	20

**COURSE OUTCOMES:**

The student utilizes the knowledge in detail to build self-confidence.

**Course Code: FSN-524 (2CH)**

**Course Name: INDUSTRIAL TOUR REPORT**

**Pre-requisite: None**

**Co-requisite: None**

**Objective:** To develop the skills for industrial processing and application of knowledge approach.

Industrial Tour should be compulsorily carried out by students at least for 1 week. The Industrial Tour should be planned to make students acquaint with different sectors of Food Processing Industries (viz. Bakery, fruits and vegetables, snacks, meat processing, etc). The students should be shared with the details of industries being visited to and given an assignment to collect the basic details of the types of products and technicalities related to it.

**Formats for Study Tour or Educational Tour Report and For Its Evaluation:**

1. Name of the student:
2. Reg. No and Roll No. :
3. Name of the plant (address):
4. Period of Tour:

Place	Date and Time	Organization	Learning Outcomes

Evaluation shall be done by members. Students should be assigned marks for Industrial Tour based on following Criteria:

Sl.No.	Topics	%Marks
1	Tour report Evaluation	50
2	Technical knowledge related to products	20
3	Presentation of Tour Report with Pictures in PPT	30

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