M.Sc. in Food Science & Nutrition

SYLLABUS (2018-19)

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

Courses of Studies for the M. Sc Food Science & Nutrition Examination
(Under Course Credit Semester System)
Effective from First Semester Examination, 2018-19

1st Semester

Course No.	Title	Credit Hour
FSN. 411	Food Commodities	4 (Theory)
FSN. 412	Food Microbiology,Hygiene and Sanitation	4 (Theory)
FSN. 413	Nutritional Biochemistry	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)
NON-CREDIT/ADD-ON	ANYONE: 1. Soft and IT Skills 2. Leadership/Personality Development	00
	Total	**24**

IInd Semester

Course No.	Title	Credit Hour
FSN. 421	Food ingredients and Neutraceuticals	4 (Theory)
FSN. 422	Food Analysis	4 (Theory)
FSN. 423	Food Quality and Packaging	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
	Total	**22**

IIIrd Semester

Course No.	Title	Credit Hour
FSN. 511	Therapeutic Nutrition	4 (Theory)
FSN. 512	Genetics and Food Biotechnology	4 (Theory)
FSN. 513	Research Methodology and Biostatistics	4 (Theory)
FSN 514	Elective Paper (any one) a. Community Health Management b. Public Health Nutrition c. Institutional Food Management d. Food Processing and Preservation	4 (Theory)
FSN 515	Practical Diet Therapy	4 (Practical)
FSN. 516	Seminar-I	3
NON-CREDIT/ADD-ON	ANYONE: 1. Communicative English 2. Entrepreneurship and Development	00
	Total	**23**

IVth Semester

Course No.	Title	Credit Hour
FSN. 521	Term Paper/Review Paper	2
FSN 522	Final Dissertation & Viva-voice	12+2
FSN. 523	Seminar-II	3
FSN. 524	Industrial Tour Report	2
	Total	**21**

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

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DETAILED COURSES OF STUDIES
FIRST SEMESTER

Course No: FSN. 411 Food Commodities 4CH

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

Learning Outcome:

- Students will have a thorough understanding of various cereals, legumes and their value added products after processing.
- The students will know the specifications of various products, their variation in composition basis and nutritional details after certain processing.

UNIT-I

Cereals: Structure of cereal grains, composition, processing and storage of some common cereals (Rice, Wheat, Maize, Oats) ;Pulses: composition, nutritive value, processing and storage of some common pulses(Bengal gram, Black gram, Horse gram, Green gram); Nuts & plantation crop: processing, nutritional value of some common nuts(Coconut, Ground nut, Almond, Cashewnut), tea, coffee and cocoa.

UNIT-II

Fruits: Composition, Processing, nutritive value, fruit ripening and storage of fruits, processing of juices, candy, preserve, dried powder, ketch up, sauce, jam and jellies; Beverages: Composition, classification and Processing of Carbonated Beverages Vegetables: Classification, composition, processing of some common vegetables like pickles, potato chips; Spices: Composition, flavoring compounds, processing, nutritive value, adulteration of some common spices of India.

UNIT-III

Meat: Structure, composition, Slaughtering types, post-mortem changes and grading of meat, tenderization and curing of meat; Poultry: composition, classification, nutritive value and processing; Egg: Structure, composition, classification, nutritive value and processing; Fish: composition, classification, nutritive value and processing.

UNIT-IV

Milk and milk products: composition, physic-chemical properties of milk and nutritional importance of milk, processing of milk, Classification and study of milk products- Cream, Butter, Ghee, Khoa, Chhanna, Paneer, Cheese, Ice-cream, Fermented milk products. Various defects in milk products.

References:

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. Essentials of Food & Nutrition-M.Swaminathan-vol I &vol II.
4. Nutrition: An Integrated Approach- Pike & Brown
5. Principles of Nutrition E.D Wilson,K.H.Fisher&M.C.Faqua
6. Food Science- N.Potter&J.H.Hotchkiss- CBS Publishers & Distributors, New Delhi.
7. Encyclopedia of Food Science(1-3 volume) Anmol Publications.

Course No: FSN. 412 Food Microbiology, Hygiene and Sanitation 4CH

Objective: To develop the skills for structural variation of micro-organisms, various types of spoilage in food and its remedy.

Learning Outcome:

- Students will have a thorough understanding of various factors responsible for food spoilage.
- The students will know the specifications of various contamination sources and disease developed in certain processed products.
- Students will have a thorough understanding of importance of hygiene and sanitation in during food processing.

UNIT-I

Introduction to food Microbiology: Growth and survival of microorganisms in foods (Yeast, Mould, Bacteria); Factors affecting growth of microorganism: Intrinsic, Extrinsic; Physical and chemical methods to control microorganisms, General principles of spoilage, Biochemical changes caused by microorganisms; microbes in food fermentation, putrefaction, lipolysis; Antagonism

and synergism in microorganism; General concept of Prebiotics, probiotics and symbiotic; Principle of food preservation by controlling growth of microorganism (asepsis, high temp., low temp.,)

UNIT-II

Contamination, Preservation and Spoilage of different kind of foods-cereal, Pulses, Fruit and Vegetable, Meat, fish egg, poultry and their processed products, Milk and milk Products, Canned foods and Beverages.

UNIT-III

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

UNIT-IV

Microbial Food hygiene and sanitation: Method for microbial examination of food: indicator organisms, direct examination, cultural techniques, Rapid methods in detection of microorganisms. Contamination during handling, processing and its control.

References:

1. Food Microbiology – M.R.Adams&M.O.Moss, New Age International (P) Limited, New Delhi.
2. Food Facts and Principles -N. ShakuntalaManay& M. Shadaksharaswamy, New Age International (P) Limited, New Delhi.
3. Food Microbiology – William C.Frazier, Tata McGraw Hill publishing Company limited, New Delhi.
4. General Microbiology – Power &Daginawala, Himalaya Publishing House, Mumbai. (vol-II)
5. Basic Food Microbiology – G. Banwart, CBS Publishing & Distributors.
6. Modern Food Microbiology – Jay, James, Aspen publishers.
7. Microbiology- M.I.Pelezar&R.D.Reid McGraw Hill Book Company, New York.
8. Food Hygiene & Sanitation – S.Roday- Tata McGraw Hill, New Delhi.
9. Modern Food Microbiology: J.M.Hay, CBS Publications & Distributions..

Course No: FSN. 413 Nutritional Biochemistry 4CH

Objective: To develop the skills for structure, functions, metabolism of various components of food and their role in body.

Learning Outcome:

- ❖ Students will have a thorough understanding of structure and classification various components of food.
- ❖ The students will know the process of complete digestion and assimilation of food component.

UNIT-I

Carbohydrates: classification and chemical structure of carbohydrate; chemical properties, nutritive roles of carbohydrate, important carbohydrates in food (glucose, sucrose, starch, agar, glycogen, cellulose, pectin, Gums and resins); Carbohydrates: digestion, absorption, metabolism (glycolysis, citric acid cycle, glycogenesis, Glycogenolysis, Gluconeogenesis, hexose monophosphate pathway), Blood sugar level and equilibrium.& effect of deficiency.

UNIT-II

Amino acids and its classification, essential amino acids; Proteins: properties, classification, structure of proteins (primary, secondary, tertiary, quaternary), protein denaturation, 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.

UNIT-III

Lipid: role of lipid in body, structure, classification and physiochemical properties of Lipids, Chemical aspects of lipolysis-rancidity, Lipids: Digestion, absorption, transport and Metabolism of lipids, importance of lipo -protein, oxidation of fatty acids, fatty acid synthesis, metabolism of cholesterol, triacylglycerol and phospholipids- their role in health & diseases.

UNIT-IV

Water: physical properties, structure of water molecule, Role and types of water in Food, water activity and sorption isotherm, Importance of dietary fiber in body, Enzymes: properties, classification, kinetics and mechanism of enzyme inhibition. Terpenoids and alkaloids: Definition, Classification, Structure, Biosynthesis, Properties, Extraction, Biological Role.
Naturally occurring phenolic compounds: Definition, Classification, Structure, Biosynthesis, Properties and Biological Role.

References:

1. Aurand, L.W. and Woods, A.E. 1973. Food Chemistry. AVI, Westport.
2. Birch, G.G., Cameron, A.G. and Spencer, M. 1986. Food Science, 3rd Ed. PergamonPress, New York.
3. Fennema, O.R. Ed. 1976. Principles of Food Science: Part-I Food Chemistry. Marcel Dekker, New York.

4. Meyer, L.H. 1973. Food Chemistry. East-West Press Pvt. Ltd., New Delhi.Potter, N.N. 1978. Food Science. 3rd Ed. AVI, Westport.
5. Belitz HD.1999. *Food Chemistry*. Springer Verlag.DeMan JM. 1976. *Principles of Food Chemistry*. AVI.
6. Fennema OR.1996. *Food Chemistry*. Marcel Dekker.
7. Meyer LH. 1987. *Food Chemistry*. CBS.

Course No: FSN. 414 Basic Concepts of Nutrition 4CH

Objective: To develop the skills nutritional need during various stage of life and their assessment procedures.

Learning Outcome:

- Students will have a thorough understanding of structure and classification various minor components of food.
- The students will know the process of nutritional need during growth and ageing process in detail.
- The student will have thorough understanding of various procedures followed for nutritional status of and individual and role of certain agencies and NGO's in combating malnutrition.

UNIT-I

Food as a source of nutrients: classification of nutrients; functions, recommended dietary allowances, BMR, SDA. Vitamins: (A, B complex, C, D, E & K) & all major and minor mineral elements with their role in body , importance of Roughages in the diet. Water & electrolytes balance.

UNIT-II

Nutritional Needs: Nutrition during infancy, childhood, adolescence and adult, nutrition during pregnancy& lactation, nutrition in later maturity period, nutrition and infection, nutrition and immunity, nutrition & stress.

UNIT-III

Nutritional Assessment: Assessment of nutritional status by direct & indirect methods, use of various methods for the assessment of nutritional status, anthropometric assessment, clinical examination, bio-physical or radiological measurement, functional assessment, laboratory &biochemical assessment, dietary assessment, vital health statistics.

UNIT-IV

Nutritional problems: food intake and its regulation, food pattern, population and food production, malnutrition, background problem of malnutrition in India ecology of malnutrition, effect of malnutrition on vulnerable society, impact of malnutrition on national development, major to combat malnutrition, national nutrition policy and programmes, National and International agencies in combating malnutrition.

References:

1. Human Nutrition and Dietetics – S. Davidson & R. Passmars.
2. Essentials of Food and Nutrition – M. Swaminathan, vol. I & II, The Bangalore printing and Publishing Co. Ltd.
3. Human Nutrition and Dietetics – Davidson, Passmore, East wood, English Language Book Society (ELBS).
4. Dietetics – B.Srilakshmi; New age International (P) Limited, New Delhi.
5. Nutrient Requirements and Recommended Dietary Allowances for Indians – Indian Council of Medical Research, National Institute of Nutrition, Hyderabad.
6. Text Book of Human Nutrition – Mahtab. S. Bamji; N.Pralhadrao&Vinodini Reddy, Oxford & IBH Publishing Co. Pvt.Ltd
7. Principles of Nutrition – Fisher and Fuqua, wiley eastern Private Limited, New Delhi.

Course No: FSN. 415 Practical related to 411&412 4CH
Course No: FSN. 416 Practical related to 413&414 4CH

SECOND SEMESTER

Course No: FSN. 421 Food Ingredients and Nutraceuticals 4CH

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

Learning Outcome:

- Students will have a thorough understanding on properties of food.
- The students will know the important nutritional component for therapeutic aspect of food.
- The student will have thorough understanding of various types of additives to be added and their role in respective food items.

UNIT-I

Properties of foods: Physical properties(solutions, vapor pressure, boiling point, freezing point, osmotic pressure, viscosity, surface and interfacial tensions, specific gravity), Dispersion systems in of foods-Sol, Gel, Foam, Emulsion; Food preparation: Objective and method of cooking, cooking media, changes during cooking,

UNIT-II

Food pigments and colors: Some common pigments used in food industry (chlorophylls, myoglobin, anthocyanin, betalain, carotenoids, synthetic colors & lake /dye colors and other colourants); Flavors: types of flavor, flavor compounds, extraction principles of flavor, Sensation- smell sensation, texture sensation, visual appearance and sensation of taste.

UNIT-III

Food additives: definition, need and classification of food additives, preservatives-Natural and Artificial, antioxidants, chelating agents, coloring agents, curing agents, Emulsions, flavors and flavor enhancers, leavening agents, nutritional supplements, non-nutritive sweeteners, pH control agents, stabilizer and thickeners, humectants anti-caking agents, firming agent, clarifying agent, flour bleaching agents.

UNIT-IV

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; 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. Safety, adverse effect and interactions of neutraceuticals.

References:

1. Food Facts and Principles -N. ShakuntalaManay& M. Shadaksharaswamy, New Age International (P) Limited, New Delhi.
2. Branen AL, Davidson PM &Salminen S. 2001. *Food Additives*. 2nd Ed.Marcel Dekker.
3. Gerorge AB. 1996. *Encyclopedia of Food and Color Additives*. Vol. III.CRC Press.
4. Gerorge AB. 2004. *Fenaroli's Handbook of Flavor Ingredients*. 5th Ed.CRC Press.
5. Madhavi DL, Deshpande SS &Salunkhe DK. 1996. *Food Antioxidants:*
6. *Technological, Toxicological and Health Perspective*. MarcelDekker.
7. Morton ID & Macleod AJ .1990. *Food Flavours*. Part A, BC. Elsevier.
8. Nakai S &Modler HW. 2000. *Food Proteins. Processing Applications*.Wiley VCH.
9. Stephen AM. (Ed.). 2006. *Food Polysaccharides and Their Applications*.Marcel Dekker.

Course No: FSN. 422 Food Analysis 4CH

Objective: To develop the skills on the quantification technique of various components, allergens present in food products.

Learning Outcome:

- Students will have a thorough understanding on the working principle and instrumentation of various instruments used in food analysis.
- The students will know the importance of various methods to identify any malfunction aspect of food.

UNIT-I

Nature and Concept of Food analysis, Basic instrumentation: Principle for pH meter, Dialysis, ultra filtration, Reverse osmosis. Centrifugation: Principle, Theory (RCF, Sedimentation coefficient) and types of Rotors, Ultracentrifugation, Calorimetry: Bomb calorimeter, Principle of Rheological Analysis- Rheological parameters, rheological methods, instruments and application, Texture profile analysis, Densimetry, Refractometry,

UNIT-II

Spectroscopic analysis of food components, Principle, instrumentation & application of Colorimetric (colorimeter,colourflex), UV-Vis spectrophotometer, Spetroflurometer, IR, Atomic Absorption Spectroscopy, Mass spectroscopy, NMR and ESR.

UNIT-III

Chromatography: Theory & Principle, chromatographic parameter (partition coefficient, capacity factor, retention & dead time, Resolution& their calculation),components of chromatography & types (paper, thin layer, partition) Advance chromatography: GC,HPLC,HPTLC(principle, instrumentation &application). Separation technique & analysis: Electrophoresis: Paper & gel electrophoresis, PAGE, iso-electric focusing, 2D electrophoresis, Immuno electrophoresis.

UNIT-IV

Isotopic &immune techniques: Principle & theory of isotopic method, types, measurement &detection of radioactivity, Autoradigraphy, Immuno-techniques, Principle, antigen-antibody interaction, enzymatic immune assay- ELISA and its types. Different immuno techniques of antigen detection in food sample.

References:

1. Bioinstrumentation by .Veerakumari,
2. Biochemical & Molecular biology techniques. byWilson& Walker,
3. Food Chemistry, Aurand, L.W. and Woods, A.E. 1973.AVI, Westport.
4. Principles of Food Science: Part-I Food Chemistry. Fennema, O.R. Ed. 1976 Marcel Dekker, New York.
5. Methods in Food Analysis. Joslyn, M.A. Ed. 1970.Academic Press, New York.
6. Developments in Food Analysis Techniques-1. Applied Science King, R.D. Ed. 1978Publishers Ltd., London.
7. Separation Methods in Biochemistry 2nd Ed Morris, C.J. and Morris, P. 1976. PitmanPub., London.
8. An Introduction to Practical Biochemistry. Plummer, D.T. 1971Mc-Graw Hill Pub.Co., New York.
9. A Manualof Laboratory Techniques. Raghuramulu, N., Madhavan Nair, K., and Kalyanasundaram, S. Ed.1983.National Institute of Nutrition, ICMR, Hyderabad.

Course No: FSN. 423 **Food Quality and Packaging** **4CH**

Objective: To develop the skills on the standardization of food products with respect to quality and to preserve food by packaging.

Learning Outcome:

- Students will have a thorough understanding on the quality attributes, their measurement principle and instrumentation of various instruments used in food quality analysis.
- The students will know the importance of various methods to identify any adulteration aspect of food.
- Students will have a thorough understanding on various food laws with their amendments and regulation guidelines followed in national and international level.
- The students will know the importance of packaging in food preservation, shelf-life determination and deterioration of nutritional components with the use of various types of packaging materials.

UNIT-I

Concept of quality: quality attributes: physical, chemical, nutritional and microbial evaluation and measurement Sensory evaluation: Sensory characteristics of food, sensory requirements, Types of sensory evaluation. Objective evaluation: Tests used for objective evaluation, application and limit, Instruments used for quality assessment-color & gloss, size & shape, defects, texture, Viscosity & consistency,

UNIT-II

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. Food Toxins: Natural anti-nutritional factors, microbial toxins, Contaminations during handling and processing, Toxicity of some metals and chemicals in food and their permissible limits.

UNIT-III

Quality assurance, Quality Control, Total Quality Management; GMP, GHP; GLP, GAP; Sanitary and hygienic practices; HACCP; Quality manuals, documentation and audits;

Food laws and regulation: Mandatory and voluntary food laws, International quality systems and standards like ISO and Food Codex, BRC; Indian act-Food Safety and Standards Act, 2006, Various food acts- PFA,FPO,AGMARK, MMPO,MFPO, edible oil acts, standard weight acts.

UNIT-IV

Food packaging: Packaging material, packaging system and methods- vacuum packaging, gas flush packaging, aseptic packaging, modified atmosphere packaging (MAP), controlled atmosphere packaging (CAP), active packaging , bio-degradable packages, aseptic and edible package. Packaging Fresh and Processed Food: Packaging requirement for different foods and processing methods- Types, varieties, and trends; protective packaging of foods; packaging of food products sensitive to oxygen, light, moisture; packaging of convenience foods; packaging of food products.

References:

1. Lal G, Siddapa GS &Tandon GL.1986. *Preservation of Fruits and Vegetables*. ICAR.
2. Pantastico B. 1975. *Post Harvest Physiology, Handling and Utilization of Tropical and Subtropical Fruits and Vegetables*. AVI Publ.
3. Salunkhe DK, Bolia HR & Reddy NR. 1991. *Storage, Processing and Nutritional Quality of Fruits and Vegetables*. Vol. I. *Fruits and Vegetables*. CRC.
4. Thompson AK. 1995. *Post Harvest Technology of Fruits and Vegetables*. Blackwell Sci.
5. Verma LR. & Joshi VK. 2000. *Post Harvest Technology of Fruits and Vegetables*. Indus Publ.
6.Robertson, G.L. Food Packaging: Principles and Practice (2nd ed.), Taylor & Francis 2006
8. Food Packaging Technology Handbook. NIIR Board, National Institute of Industrial Research, 2003
9. Ahvenainen, R. (Ed.) Novel Food Packaging Techniques, CRC Press, 2003

10. Han, J.H. (Ed.) Innovations in Food Packaging, Elsevier Academic Press, 2005
11. Coles, R., McDowell, D. and Kirwan, M.J. (Eds.) Food Packaging Technology, CRC Press, 2003

Course No: FSN. 424 Advanced Human Physiology 4CH

Objective: To develop the skills on role of human body parts sustainable life.

Learning Outcome:

- Students will have a thorough understanding the normal function within living creatures.
- The students will know the importance of mechanical, physical, and biochemical function of humans and serves as the foundation of modern medicine.

UNIT-I: Reticulo-endothelial system: functions, classification. Lymphatic System: functions, circulation. 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.

UNIT-II: Respiratory system: anatomy, physiology and mechanism of respiration, regulation of respiration. Digestive System: anatomy of gastrointestinal tract and accessory organs. Digestion& absorption of foods, regulation of appetite Role of liver, pancreas, gall bladder

UNIT-III: Excretory system: anatomy, and function of kidney, formation, composition and excretion of urine. Role of kidney in water, electrolytes & acid base balance. Endocrine glands: structure & function, mode of action of hormones.

UNIT-IV: Reproductive system: Structure& function of male & female reproductive organs. Physiological changes in pregnancy. Lactation, Post parturition changes. Nervous System: anatomy and functions of brain, spinal cord, nerves, organization of central nervous system Musculoskeletal system: anatomy & function.

References:

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
5. Ross & Wilson Anatomy & Physiology in Health & illness-KJW.Wilson&JS.Ross 1987, Churhill Livingstone.
6. Text book of Physiology-volI & II-AK.Jain, Avichal Publishing Co. New Delhi.
7. 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

THIRD SEMESTER

Course No: FSN. 511 Therapeutic Nutrition 4CH

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

Learning Outcome:

- Students will have a thorough understanding that includes a general description of a clinical disorder, relevant data (laboratory, anthropometric and pharmacology)
- The students will know the importance of diet often recommended for clients who have a range of conditions from food allergies, to heart disease and cancer etc.
- Students will have a thorough understanding on recommended diet for optimal health and to maintain an appropriate level of nutrients in the body.

UNIT-I: Therapeutic Nutrition: Therapeutic adoption of normal diets (normal, soft & fluid diets) factors to be considered in planning therapeutic diets, drugs & diet inter-action, special feeding methods, pre& post operative diets, role of dietician, dietary calculation using food exchange lists, high & low calorie diet, high protein, high fat,& low carbohydrate diets.

UNIT-II: Therapeutic Diets: Etiology, physiological disturbances, biochemical & clinical manifestations & dietary management of: Fever & infection, Allergy & skin disturbances (bland & fiber restricted diet), Surgical conditions – Pre-Operative

and Post Operative conditions. Burns and Trauma – complications and dietary treatment. Peptic ulcer, gastritis, colitis (very low residue diet), Cancer, HIV and AIDS.

UNIT-III: Therapeutic Diets: Etiology, Physiological disturbances, biochemical & clinical manifestations & dietary management of Hepatitis & cirrhosis (High protein, high carbohydrate moderate fat or fat restricted diet) Diabetes mellitus (metabolic disorder) Diseases of kidney (Nephrosis, nephrosclerosis, glomerulonephiritis, uremia) (controlled protein, potassium & sodium diet)

UNIT-IV: Therapeutic Diets: Etiology, physiological disturbances, clinical & biochemical manifestation and dietary management of cardio vascular disorder. Hyper-lipidemia & Antherosclorosis (fat controlled diet) Heart disease (sodium restricted diet) Hypertension, Coma, Trauma, Stroke. Intestinal Tract disorder & Neurological disorder

References:

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. Normal and Therapeutic Nutrition- C.H.Robinson, Oxford & IBH publishing Co. Calcutta.
5. Text Book of Human Nutrition- Mahtab S. Bamji, N.Rao & V. Reddy, Oxford & IBH Publishing Co. Pvt Ltd.
6. Essentials of Food and nutrition – M.Swaminathan, Vol I & II, The Bangalore Printing & Publishing Co. Ltd (BAPPCO)
7. Normal and Therapeutic nutrition- C.H. Robinson & M.R Lawler – Macmillen Publishing Co. New York.
8. Food, Nutrition & Diet Therapy-L.K.Mahan & Escott.Stump- W.B. Saunders Ltd
9. Applied Nutrition & Diet Therapy for Nurses- J Davis, K.Sherer- W.B.Saunders.Co
10. Nutrition& Diet Therapy- S.R.Williams-Times mirror Mosby college Publishing. Co.
11. Human Nutrition & Dietetics- J.S.Garrow ,W.P.T.James, A. Ralph –Churhill Livingstone.

Course No: FSN. 512 Genetics and Food Biotechnology 4CH

Objective: To develop the skills on role of biotechnology in food, genetically modified food development with respect to genetic engineering, biochemical-technology and industrial microbiology.

Learning Outcome:

- Students will have a thorough understanding the biotechnological tools and techniques.
- The students will know the importance of various fermentation methods to design various fermented foods and food products.
- Students will have a thorough understanding third generation of gene therapy in disease prevention.

UNIT-I

Basic tools of r-DNA technology: Restriction endonuclease and DNA ligase, Cloning:- cloning vectors, cloning of foreign DNA, screening of recombinant clone, DNA Finger Print and its Application in Forensic Science, PCR technology, DNA sequencing technique, Cell/ tissue-culture, Hybridoma Technoogy, Monoclonal Antibodies, Enzyme Immobilization.

UNIT-II

Fermentation and Industrial Microbiology: Microbes in food process operations and production, microbes in food fermentation: lactic acid bacteria , yeast and mould. Fermentation as a method of processing and preserving foods; fermented foods and beverages; citric acid production, vinegar, Yoghurt, tofu, miso, tempeh, Soya sauce(shoyu); microbes used in pickling and sauerkraut, producing colors-*ang kak*, beta-carotene, production of microbial enzymes, baker's yeast, amino acids and anti-biotics; bacteriocins from lactic acid bacteria-production and application in food preservation, nisin, SCP.

UNIT-III

Basic concepts of Bioprocess Technology: Up stream processing, Bioreactor and its operation, optimization of process, scale-up; downstream processing, separation and purification.

Application of enzymes in food processing: enzyme catalyzed bioprocess, enzymatic bioconversions e.g- starch and sugar conversion processes, hydrolysed protein etc. and their downstream processing; baking by amylases; de-oxygenation and de-sugaring by glucose oxidase; beer mashing and chill proofing, Cheese production and processing.

UNIT-IV

Foodomics- Proteiomics, Genomics, Metabolomics and Nutrigenomics, Role of gene in Diet Therapy. Nutrients as Immunomodulators: General aspects of different types of immunity &their interrelationship, Nutrients on cellular & hormonal immunity, Immuno-Supression: Role of Nutrients.

Transgenic for food production: Development and current status of transgenic crops for crop improvement and enhanced agronomic performance; molecular farming, Transgenic Animal, GM foods: Ethical issues concerning GM foods; testing for GMOs; IPR.GMO Act 2004.

References:

1- Bains W.1993.Biotechnology from A to z. Oxford Univ.Press
2- Joshi VK and Pandey A.1999.Biotechnology: Food fermentation.vol.1,2.Eduction publ.
3- Knorr D.1982.Food Biotechnology. Marcel Dekker.
4- Lee BH.1996.Fundamentals of Food Biotechnology.VCH
5- Perlman D.1977-1979.Annual Reports of fermentation processes.
6- Percott SC and Dunn CG.1959.Industrial Microbiology.McGraw Hill.
7- Ward.OP.1989.Fermentaion Biotechnology.Prentice Hall.

Course No: FSN. 513 Research Methodology and Biostatistics 4CH

Objective: To develop the skills on statistical methods and to understand data analysis for writing up a dissertation/ thesis/research article.

Learning Outcome:

- Students will have a thorough understanding the arrangement of data to draw an analytical conclusion.
- The students will know the importance of various methods to design the research work.
- Students will have a thorough understanding on relation, deviation and accuracy of their experimental data..
- The students will know the importance of research work and have some contribution towards science.

UNIT-I

Research Methodology: Meaning, aim & objective of research, significance of research, Research types, Different types of research design. 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. Frequency distribution*:* Discrete and continuous frequency distribution, population & sample, sampling methods and its types, sampling errors.

UNIT-III

Descriptive statistics: Measure of central tendency: (Arithmetic mean, mean ,median, mode), relation between mean median and mode ;Measure of dispersion: Range, Mean deviation & Standard deviation; Skewness and Kurtosis .

UNIT-IV

Theoretical Probability Distribution: Binomial, Poisson and normal distribution; Testing of Hypothesis: Null and Alternative Hypothesis, level of significance, Student't' distribution and its application, Chi-square(x^2) test & its application, 'f' test and its application.

UNIT-V

Correlation, Regression and ANOVA analysis: Types of correlation; simple, partial and multiple correlation, Method of study & testing the significance of correlation coefficient, Rank Correlation, Regression analysis: regression equations and regression lines, Properties of regression lines, regression coefficient, testing the significance of regression coefficient. Analysis of variance (ANOVA): One way and two way classification and their applications.

References:

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
3. Elements of Statistics, Theory & Practice – M.Singhal. Lakshmi Narain Agarwal, Educational Publisher – Agra
4. An Introduction to Statistical Methods – C.B.Gupta & V.Gupta- Vikas Publishing House PVT Ltd. New Delhi.
5. Research Methods & Measurements in Behavioural & Social Sciences – G.L.Bhatnagar – Agri. Cole. Publishing Academy, New Delhi.
6. Statistical Methods – S.P.Gupta, Sultan Chand & Sons Publisher- New Delhi
7. Research Methodology, Methods and Techniques – C.R. Kothari Wiley Eastern Limited – New Delhi
8. An Introduction to Statistical Methods – C.B.Gupta&V.Gupta- Vikas Publishing House PVT Ltd. New Delhi.

Course No: FSN. 514 Elective Paper 4CH

FSN-514a. Community Health Management

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

Learning Outcome:

- ❖ Students will have a thorough understanding to the organization and management of services that are planned with and provided in the community, not in health facilities.
- ❖ The students will know the importance of Overall management of community health services, needs of their assessment and situation analysis.

UNIT-I: Health: concept, definition, dimension & determinant of health, positive health, health situation in India, concept of disease, causation (Agent, host, environmental factors) concept and control & prevention, modes of intervention, Health Indices: fertility, indicator, vital statistics, mortality, morbidity & demographic indicator, Human development Index, Reproductive health index.

UNIT-II: Health Care: Concept of health care, level of health care, changing concept, elements & principles of health care, health for all, national strategies, health care delivery system (primary health care) health care services & system, agencies (Govt. and Private) in delivery health care services, health programmes in India.

UNIT-III: Health needs & problem: Health needs & problems related to sanitation & environment, personal hygiene, pollution, health needs of special groups-women, infants, children, adolescents, geriatric health needs & problems, problems related to communicable (malaria, cholera, typhoid, chicken pox, measles, mumps, influenza, hepatitis, poliomyelitis, tuberculosis) & non communicable (heart disease, hypertension, cancer, diabetes, obesity) diseases. Newer diseases.

UNIT-IV: Health planning &Management: Health planning, health needs & demands, objectives, targets & goals, planning cycle, Health management: methods & techniques, health planning in India, Five year plans & health system in India. Health information: requirements, components, sources of health information, health regulation & acts, health legislation. Health Education: adoption of new ideas & practices, content & principles of health education, audio-visual aids in health education.

References:

1. Primary Health Care Vol I –III, P.R.Dutt, Gandhigram Institute of Rural Health & Family Welfare Trust, Ambathurai.
2. A Text Book of Community Health for Nurses, R.K.Manelkar, Vora Medical Publications, Mumbai.
3. Essentials of Community Health Nursing- K.Park M/S Banarasidas Bharat Jabalpur.
4. Text Book of Preventive & social Medicine- K. Park . M/S Banarasidas Bharat, Jabalpur.
5. Text Book of Public Health and Social Medicine- A.N.Ghei Lakshmi Book Store, New Delhi.
6. A Hand Book of Social & preventive Medicine- Y.P.Bedi, Atmaram & Sons, New Delhi.
7. Community Health in the United States- John D. Porterfield- Voice of American Forum-Lectures.
8. The Concept of Health- Donald A.read- Hobrook Press Inc, Boston.
9. Principles of Health Science- K.L.Jones, L.W. Shainberg & C.O. Byer- Harper & Row Publishers, New York.
10. Encyclopedia of Health & Nutrition- Anmol Publications New Delhi.
11. Health Promotion in Public- A. Bhatia, Anmol Publications, New Delhi

Course No: FSN. 514(Elective) b. Public Health Nutrition 4CH

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.

Learning Outcome:

- ❖ Students will have a thorough understanding to quantitative and qualitative methods, program development and evaluation, health disparities, health behavior change and health policy.
- ❖ The students will know the importance to support the careers of aspiring public health researchers and actively encourage applications for further NGO survey.

UNIT-I: Community nutrition: Definition, aims, basic measurements and applications. Factors influencing community nutrition: Environmental, social and economic factors, food habits, food faddism, ignorance and food losses.

UNIT-II: Community Health Centre: Organisation and functions of community health centres and primary health centres, Primary health care and concept. Types of services- services in primary, secondary and tertiary health care setup, patients in different critical care centers, post-natal, pediatric and geriatric patients. Role of nutrition support team- dietetic interns, dietitians (therapeutic, administrative and consultant dietitian). Team approach in patient care.

UNIT-III: Food security in the community: Assessment of nutritional status of individual and community. Role of New food, Food fortification and enrichment, Food labeling in the community. Food Service: Style of Service & Types of Service

UNIT-IV: Nutrition Education and individual behavior change: Meaning, nature and importance of nutrition education to the community, training of workers in nutrition education programme. Principles of planning, executing and evaluation

nutrition education programme. Methods and Techniques of organizing nutrition programmes using audio, video aids and exhibition, Problems of nutrition.

Books Recommended

1. Preventive and Social Medicine- Park and Park, Banarasidas Bhanot Publishers, Prem nagar, Nagpur Road, Jabalpur.
2. Normal and Therapeutic nutrition - C.H.Robinson, Oxford &IBH Publishing Co.Calcutta.
3. Public Health and Hygiene- Y.P.Bedi, Atma ram & sons, Kashmere gate, Delhi.
4. Text Book of Public Health and Social Medicine- A.N.Ghei, Lakshmi Book Store, New Delhi.

Course No: FSN. 514(Elective) c. Institutional Food Management 4CH

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.

Learning Outcome:

- Students will have a thorough understanding to study the history of hospitality, career opportunities and the different areas of hospitality.
- The students will know the importance to support practical management skills, such as scheduling, hiring, wage and salary regulations, safety in the workplace and job performance evaluation.

UNIT-I: Introduction to Food Service Systems: Evolution of the food service industry. Broad categories of catering services; commercial and Institutional. 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.

UNIT-II: Principles of Institutional food Management: Management functions. Management tools: Tangible, Intangible tools. Management Process: Tools of Management**,** Management of resources, (money, space, materials' equipments, staff, time and procedures).

UNIT-III: Personnel Management: Manpower planning. Space Planning & Organizing, Recruitment, selection and orientation-Training and motivation, employee facilities & benefits, Types of employee welfare Schemes, training and development of employees. Labour Laws. Welfare policies and schemes for employees.

UNIT-IV: Energy and Finance Management: Importance of time and energy management, Types of energy – Human and fuel energy, Measures for utilization and conservation. Management of Finance: Sources of finance and Budgets, Cost accounting/analysis: Food cost analysis, Labour cost analysis and Cost Control Techniques.

Books Recommended

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.
5. Hotel House Keeping Training Manual- Andrews Snoher-Tata McGraw Hill Publication-New Delhi.
6. 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. Hospitality & Catering- Ursula Jones & Newtons.
7. Handbook of Food Preparations – A.M. Home Economics Association.
8. Food Selection and Preparations – Sweetman, M.D., 4, Mackeller.
9. Food service Planning: layout Equipment – Lender H. Ketshevar and Marget E. Terrel.

Course No: FSN.514 d. Food Processing and Preservation 4CH

Objective: To develop the skills for processing of food after postharvest and use of various preservation techniques in food processing industries.

Learning Outcome:

- Students will have a thorough understanding of various food processing techniques.
- The students will know the importance of various preservation techniques.

UNIT-I

Basic concept of food processing and preservation: Reason of food Spoilage and Scope of food processing preservation; principles of food processing and preservation. Principle and preservation by low temperature: (refrigeration, freezing, and

dehydro freezing; cold storage, frozen food), changes during freezing-physical and chemical changes. Processing and preservation by drying: factors affecting drying rate, types of dryer – (kiln, tray, drum, spray, tunnel, fluidized bed drying), types of drying technique (freeze drying, vaccum drying),

UNIT-II

Processing and preservation by heat: (blanching, pasteurization, sterilization, UHT processing, heating, dehydration, canning, Microwave cooking-(principle, changes during microwave cooking, advantages),difference between microwave and conventional heating, Use of Nano technology in food. Concentration and evaporation-(flash evaporator, falling film evaporator and multiple effect evaporators), changes during Concentration

UNIT-III

Processing and preservation by non-thermal method: irradiation, high pressure, pulsed electric field, high hydrostatic pressure, Hurdle technology: concept of hurdle technology and its application, Ultrasonic processing: Properties of ultrasonic, application of ultrasonic as processing techniques, ohmic heating, IR heating;

UNIT-IV

Food processing equipments: material handling, cleaning and grading, conveyors, size reduction, food grain storage, milling, Separation Technique: filtration, agitation and mixing. Baking, Roasting, Frying. Extrusion Technology-(principle, types of extruders).

References

1. Arsdel WB, Copley MJ & Morgan AI. 1973. *Food Dehydration*. 2nd Ed. Vols. I, II.AVI Publ.
2. Desrosier NW & James N.1977. *Technology of Food Preservation*. 4th Ed. AVI. Publ.
3. Fellows PJ. 2005. *Food Processing Technology: Principle and Practice*. 2nd Ed. CRC.
4. Jelen P. 1985. *Introduction to Food Processing*. Prentice Hall.

Course No: FSN. 515	**Practical related to Diet Therapy**	**4CH**
Course No: FSN. 516	**Seminar-I**	**3CH**

FOURTH SEMESTER

Course No: FSN. 521	**Term paper**	**2CH**
Course No: FSN. 522	**Final Dissertation & Viva Voce**	**12+2CH**
Course No: FSN. 523	**Seminar-II**	**3CH**
Course No: FSN. 524	**Industrial Tour Report**	**2CH**

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M.Sc.INFOODSCIENCE and NUTRITION
P.G. DEPARTMENTOF FOODSCIENCETECHNOLOGY & NUTRITION

Name of the HOD: The Chairman, P.G. Council, Sambalpur University

Name of the Course Coordinator: Dr. BinataNayak **Mob. No.** 9439896178, 7978477327

Email id: cordcfst@suniv.ac.in

1.MINIMUM ELIGIBILITY: Any Science Graduate or any Technical/Professional Graduate (B.Tech.,B.Sc.Agriculture,B.Pharma,B.Sc.Home Science and other related subjects of four years study after+2 Science) of Sambalpur University or of any other University recognized by Sambalpur University as equivalent there to with a minimum of 45% marks is eligible. Graduates with Home Science Honours/ Pass along with P.G Diploma, Diploma, or Certificate Course in any of the subjects like Food & Nutrition/ Nutrition &Health Education/ Nutrition & Dietetics/ Hospital &Health Management and other related subjects with a minimum of 45% marks at Graduation level are also eligible for admission to M.Sc in Food Science and Nutrition.

2.SELECTION CRITERIA: Career-30marks,writtentest-70marks(Total-100Marks).When the number of applications is less than the sanctioned strength, merit list will be prepared on the basis of career marks only.

For students who have passed Technical/professional Graduates

Degree	FirstDivision	SecondDivision	ThirdDivision/Pass
HighSchool	6	4.5	3.0
+2	9	7	5

B.E./B.Tech./B.Sc. HomeSc./B.Pharm(4yearsstudyafter+2)	
First Class Hons. Or equivalent grade-75% marks or above	15
First Class or equivalent grade – above 60% marks and below 75%	13
Second Class or equivalent grade –above 50% marks and below60%	10
Pass or equivalent grade with below50%marks	07

+3(Honours): Marks secured in Honours Subject X15
Maximum Marks in Honours Subject

+3(Pass): Agreegate Marks secured X12
Maximum Marks

3.DURATION OF THE COURSE: 2Years

4.NUMBER OF SEATS: 20 with reservation as per rule.

5. COURSE FEE: Rs. 15,000/- per Semester per Student.
*****This is in addition to the fee prescribedatclause11oftheprospectus.
*** Course Fee once deposited shall not be refunded in any circumstances.**

6. SPECIAL FEATURE OF THE COURSE: M. Sc. in Food Science and Nutrition programme focuses on the Nutrition, Dietetics and Food Science, an area of increasing importance to Consumers, Government and the Food Industry. This M.Sc programme is interdisciplinary in nature and is a challenging and practical course which demands a good grasp of knowledge in science for human welfare. The aim of the course is to provide knowledge and understanding of Fundamentals of food and food products that interact with human metabolism, basic concepts of Nutrition, Nutritional requirement at various stages of life, Chemistry of Food Components & Techniques in Food Analysis etc.

This programme will enable to develop:

- An understanding of the subjects at the interface between human nutrition and food science.
- An understanding of food constituents in the context of their manufacture and storage, particularly from the standpoints of safety and nutritional attributes.
- One's capacity to undertake research in food science/ nutrition.
- Skills in critical appraisal of data, presentational and interpersonal skills.

7. CAREER PROSPECT: This M.Sc. programme is for those wishing to develop a career in hospitals, NGO's, food-related research or the food industry. It is designed to meet the increasing demand for nutrition scientists experienced in human nutritional trials and in the evaluation of physiological, biochemical and molecular basis for effects of diet on human health. As a food nutritionist, one is endowed with the skills and knowledge to improve another's quality of life. Right from providing assistance in planning meals in times of old age, sickness or extreme stress, to advising them with regards to healthy eating-selection. Demand for food nutritionists is prevalent in hospitals that require their services for fixing nutritional regimens. Even athletes in physical training camps or mountaineers rely heavily on the instructions of a well qualified nutritionist. Moreover, even restaurants employ candidates with degrees in Food & Nutrition, Food Technology, Nutrition or Food Services Management. Thus nowadays, Food Science & Nutrition is one of the vital and growing fields where one can get endless opportunities if looking to build up a career. Dieticians /Nutritionists/ Food Technologists are required everywhere like hospitals, nursing homes, canteens, health clubs, catering unit of star hotels, government's health departments, food manufacturing companies and even in recreation clubs. Other noble options are to teach the subject in colleges or universities and to work as specialists to practice privately. Food service, Institutional Catering even requires dietetics professionals to plan, administer and arrange nutritious balanced diets for cafeterias of schools, colleges, offices, factories etc. Apart from that, their work might include evaluation and acquisition of food materials and equipment, checking and receiving inventories of supplies etc. Professionals carrying on such work are recognized as Administrative or Management Nutritionists. Nutritionists involved in Social Welfare activities, often called as Community dietitian or Public Health Nutritionists are mostly attached to government-aided public health divisions to improve the mass food habits and public health. Our post graduates can therefore expect to find themselves in demand from employers and often have to choose from several excellent job offers.

8. **TRAINING AND PLACEMENT:** Till now department has recommended students for hands on training in on-campus. 16 no's of students have already completed their M.Sc. Research Projects from Sambalpur University. About

50%ofthestudentspassedfromthedepartment got placed in different organizations like hospitals, AMWAY, VLCC dietician. The Department is expecting to excel in training **for last 6months in hospitals, CSIR-ICMR Labs and NRC-organizations**. The Department is expecting to excel in training and placement in future.

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