

Syllabus template M.Sc. in Food Science and Nutrition SEMESTER II

Semester: II	
Course : Food Science and Nutrition	
Paper title: Research Methodology, Statistical applications and Nutrition Through Life Cycle	
Paper code: MFSN4201	Credits: 6
Hours/week : 6	
Category: Core/MDC/SEC/VAC : CORE (Major)	
Theory / Practical / Composite : Theory	
No of Modules : 2	

Course Overview: It introduces students to the systematic process of conducting research, including problem identification, study design, data collection, analysis, and ethical considerations. It covers the use of statistical tools to organize, analyze, and interpret data, enabling evidence-based decision-making in health and nutrition studies. The nutrition component focuses on dietary needs and challenges at different stages of life—infancy, childhood, adolescence, adulthood, pregnancy, and old age—emphasizing growth, development, and disease prevention. Together, the course equips learners with the skills to conduct scientific research, apply statistical reasoning, and understand nutritional requirements across the human life span.

Course Outcome:

1. **Remember** fundamental concepts, definitions, types of research, ethical principles, and basic nutritional requirements across the life cycle.
2. **Understand** research methodologies, statistical concepts, and the physiological and nutritional changes occurring at different stages of the life cycle.
3. **Apply** appropriate research methods and statistical tools for data collection, organization, presentation, and analysis in nutrition-related studies.
4. **Analyze** research data using statistical techniques and examine nutritional problems and dietary patterns across various population groups.
5. **Evaluate** research findings, ethical considerations, and nutrition interventions to assess their validity, reliability, and effectiveness.
6. **Create** and develop research proposals, reports, and evidence-based nutritional strategies addressing life cycle nutritional needs and health issues.

Prerequisites: *Basic knowledge about any prior course*

SYLLABUS

UNIT/Module	CONTENT	HOURS or NUMBER OF CLASSES	CO Mapping	COGNITIVE LEVEL
I/I Module 1 – Research Methodology & Statistical applications	Introduction Concept, definition, meaning, nature, scope, and objectives of research.	2	CO1,CO2,CO3, CO4,CO5	K1,K2,K3,K4 ,K5
II/I	Research Ethics and Methods	5	CO1,CO2,CO3, CO4,CO5	K1,K2,K3,K4 ,K5

	<p>Ethical principles governing research involving human participants and researchers, including rights, dignity, privacy, and safety. Informed consent, confidentiality, anonymity, voluntary participation, avoidance of harm, conflicts of interest, and research bias. Ethical guidelines, research integrity, plagiarism, data falsification and fabrication, duplication, scientific misconduct, and ethical review and approval of research proposals.</p>			
III/I	<p>Types of Research</p> <p>Basic and applied research</p> <p>Qualitative & quantitative research: overview and key differences</p> <p>Historical research, Descriptive research methods: survey, case study, correlational studies, content analysis, and causal-comparative research</p> <p>Analytical studies: pre-experimental, experimental, and quasi-experimental designs</p> <p>Qualitative research approaches, including ethnography</p> <p>Evaluative research: characteristics and the use of qualitative methods in evaluation studies</p>	5	CO1,CO3,CO4, CO5,CO6	K1,K3,K4,K5 ,K6
IV/I	Research Report Writing	3	CO1,CO3,CO4, CO5	K1,K3,K4,K5

	<p>Concept and purpose of research reporting. Synopsis preparation, types of research reports, characteristics of effective reports, structure and components of a research report, and guidelines for writing, formatting, and presenting research findings.</p>			
V/I	<p>Introduction to Statistics</p> <p>Fundamental principles and concepts of statistics. Orientation to qualitative and quantitative research procedures. Descriptive statistics and their applications in research.</p>	3	CO1,CO3,CO5, CO6	K1,K3,K5,K6
VI/I	<p>Organisation and Presentation of Data</p> <p>Nature of qualitative and quantitative data. Coding techniques and data reduction strategies. Data organisation through frequency distributions and thematic analysis. Use of percentages, percentiles, and frequency measures. Construction of univariate, bivariate, and multivariate tables. Graphical representation using diagrams, charts, and graphs.</p>	5	CO1,CO2,CO3, CO5,CO6	K1,K2,3,K5, K6
VII/I	<p>Statistical Measures and Data Analysis</p> <p>Classification and tabulation of data. Measures of central tendency and dispersion. Frequency distribution, histograms, frequency</p>	5	CO1,CO3,CO5, CO6	K1,K3,K5,K6

	<p>polygons, and ogives. Binomial and normal distributions and use of normal probability tables. Parametric and non-parametric tests. Hypothesis testing, Type I and Type II errors, and levels of significance. Application of Student's <i>t</i>-test for small samples, testing differences in means and proportions. Correlation analysis, including coefficient of correlation and rank correlation methods.</p>			
<p>I/II</p> <p>Module 2- Nutrition Through Life Cycle</p>	<p>Infant Nutrition</p> <p>Growth and physiological development during infancy. Nutritional requirements and Recommended Dietary Allowances (RDA). Infant feeding practices, including breastfeeding and formula feeding. Nutrition of low birth weight and premature infants. Introduction of complementary foods: importance of weaning, types of complementary foods, common feeding problems, growth patterns, developmental milestones, and appropriate feeding practices.</p>	4	CO1,CO3,CO5, CO6	K1,K3,K5,K6
<p>II/II</p>	<p>Nutrition for Toddlers and Pre-school Children</p> <p>Growth and developmental milestones. Nutritional requirements and RDA. Common nutritional problems in early childhood, with emphasis on Protein–Energy</p>	6	CO1,CO3,CO4, CO5	K1,K3,K4,K5

	Malnutrition (PEM), including SAM and MAM—clinical features, nutritional needs, and basic management strategies.			
III/II	<p>Nutrition for School-age Children and Adolescents</p> <p>Physical growth and pubertal development. Nutritional requirements and RDA. Major nutritional concerns including undernutrition, obesity, disordered eating behaviours, iron deficiency anaemia, and early risk factors for osteoporosis.</p>	6	CO1,CO3,CO4, CO5	K1,K3,K4,K5
IV/II	<p>Nutrition in Adulthood</p> <p>Nutritional requirements and RDA for adults. Factors influencing nutrient needs. Psychosocial stages of development. Physiological changes during perimenopause and menopause, and related dietary modifications.</p>	4	CO1,CO3,CO4, CO5	K1,K3,K4,K5
V/II	<p>Nutrition in Special Conditions</p> <p>Nutrition during pregnancy: foetal growth and development, maternal nutritional requirements, RDA, weight gain, and maternal–foetal nutrition relationship.</p> <p>Nutrition during lactation: physiology of lactation, nutritional requirements, RDA, breastfeeding practices including colostrum and mature milk,</p>	7	CO1,CO3,CO4, CO5	K1,K3,K4,K5

	<p>benefits and barriers to breastfeeding, and low milk supply. Nutrition in old age: physiological changes and theories of ageing, nutritional requirements, common nutrition-related problems, degenerative diseases including Alzheimer's disease, dietary guidelines for healthy ageing, and the role of physical activity.</p>			
Text Books				
<p>1. Bell, J. (2005): 4th Ed. Doing Your Research Project: A Guide for First-time Researchers in Education and Social Science, Viva Books, New Delhi</p>				
<p>2. Holloway, I. (1997): Basic Concepts of Qualitative Research, Blackwell Science, London.</p>				
<p>3. Kothari, C.R. (2004): 2nd Ed. Research Methodology: Methods and Techniques, Wishwa Prakashan, New Delhi.</p>				
<p>4. Nutrition Through the Life Cycle (8th Edition, 2024) by Judith E. Brown et al.</p>				
Suggested readings				
<p>1. Nutrition, Health and Disease: A Lifespan Approach (3rd Edition, 2021) by Simon Langley-Evans</p>				
<p>2. Introduction to Nutrition and Health Research (2012/2013) by Eunsook T. Koh & Willis L. Owen</p>				
<p>3.</p>				
Web Resources				
<p>1.</p>				
<p>2.</p>				
<p>Evaluation: Theory CIA: 20 Semester Exam:80</p>				
<p>Paper Structure for Theory Semester Exam Module : Theory: 100 Marks (80 End Sem + 20 CIA) Question Paper format: Theory end semester Module 1: 40 marks</p> <p>SHORT QUESTION: FROM 7 QTNS ANSWER 5 (EACH 2 MARKS) = $5 \times 2 = 10$ LONG QUESTION: FROM 8 QTNS ANSWER 6 (EACH 5 MARKS) = $6 \times 5 = 30$</p> <p>Module 2: 40 marks SHORT QUESTION: FROM 7 QTNS ANSWER 5 (EACH 2 MARKS) = $5 \times 2 = 10$ LONG QUESTION: FROM 8 QTNS ANSWER 6 (EACH 5 MARKS) = $6 \times 5 = 30$</p>				

Course outcomes (COs) and Cognitive Level Mapping

COs	CO Description	Cognitive levels
CO1	Remember fundamental concepts, definitions, types of research, ethical principles, and basic nutritional requirements across the life cycle.	K1
CO2	Understand research methodologies, statistical concepts, and the physiological and nutritional changes occurring at different stages of the life cycle.	K2
CO3	Apply appropriate research methods and statistical tools for data collection, organization, presentation, and analysis in nutrition-related studies.	K3
CO4	Analyze research data using statistical techniques and examine nutritional problems and dietary patterns across various population groups.	K4
CO5	Evaluate research findings, ethical considerations, and nutrition interventions to assess their validity, reliability, and effectiveness.	K5
CO6	Create and develop research proposals, reports, and evidence-based nutritional strategies addressing life cycle nutritional needs and health issues.	K6

Syllabus template M.Sc. in Food Science and Nutrition SEMESTER II

Semester: II				
Course : Food Science and Nutrition				
Paper title: Food Microbiology, Food Toxicology and Safety				
Paper code: MFSN4202				Credits: 6
Hours/week : 6				
Category: Core/MDC/SEC/VAC : CORE (Major)				
Theory / Practical / Composite : Theory				
No of Modules : 2				
Course Overview:				
Course Outcome:				
1. Remember fundamental concepts of basic microbiology and toxicology.				
2. Understand the nature of microorganisms involved in food spoilage, food infections and intoxications.				
3. Apply appropriate criteria for safety in various foods operations to avoid public health hazards due to food contamination.				
4. Analyze food adulteration and spoilage mechanisms and the common food adulterants used that are responsible for various diseases and disorders.				
5. Evaluate the knowledge of microbial toxins, food safety standards, and regulatory frameworks.				
6. Create and develop new approaches to diagnose the causes of food contamination and the strategies to overcome the threat of food borne infection.				
Prerequisites: Basic knowledge about any prior course				
SYLLABUS				
UNIT/Module	CONTENT	HOURS or NUMBER OF CLASSES	CO Mapping	COGNITIVE LEVEL
I/I Module 1 – Food Microbiology	Introduction to Food Microbiology Scope and significance of food microbiology. Overview of the microbial world including bacteria, fungi, yeasts, viruses, and bacteriophages. Classification of bacteria based on morphology (Gram-positive and Gram-negative, motility, spore-forming and non-spore-forming) and physiological growth requirements (temperature, pH, water activity, and	5	CO1,CO2,CO3, CO4,CO5	K1,K2,K3,K4 ,K5

	oxygen). General characteristics and role of fungi and yeasts in foods. Viruses and bacteriophages: characteristics and modes of multiplication. Factors influencing survival and growth of microorganisms in foods, including intrinsic factors and extrinsic factors.			
II/I	<p>Microbial Food Spoilage and Control</p> <p>Concept, characteristics, and significance of food spoilage. Spoilage patterns of major food groups such as cereals, fruits and vegetables, meat, poultry, seafood, milk and milk products, and packaged and canned foods. Methods for control of microorganisms in foods, including physical removal, thermal processing (thermal destruction, thermal death time, D, Z, and F values, thermal death time curves, and the 12D concept), low-temperature preservation, reduction of water activity, acidification, use of antimicrobial preservatives, and food irradiation.</p>	5	CO1,CO2,CO3, CO4,CO5	K1,K2,K3,K4 ,K5
III/I	<p>Foodborne Infections and Intoxications</p> <p>Foodborne diseases caused by bacteria, moulds, and viruses. Bacterial pathogens including <i>Salmonella typhi</i>, <i>Helicobacter pylori</i>, <i>Campylobacter jejuni</i>, <i>Yersinia enterocolitica</i>, <i>Bacillus cereus</i>,</p>	7	CO1,CO3,CO4, CO5,CO6	K1,K3,K4,K5 ,K6

	<p><i>Staphylococcus aureus</i>, <i>Listeria monocytogenes</i>, <i>Clostridium botulinum</i>, and <i>Escherichia coli</i>—with reference to disease symptoms, mechanisms of pathogenesis, food sources, prevention, and identification methods. Food intoxications and poisonings including mycotoxins, puffer fish poisoning, ciguatera fish poisoning, and paralytic shellfish poisoning. Viral foodborne illnesses caused by Norovirus, Norwalk virus, Rotavirus, Astrovirus, Adenovirus, Reovirus, Parvovirus, and Hepatitis A virus—symptoms, modes of transmission, prevention, and detection methods.</p>			
IV/I	<p>Microorganisms in Human Welfare and Food Biotechnology</p> <p>Role of microorganisms in human health and welfare, including normal microflora, prebiotics and probiotics. Single-cell protein production, fermented foods. Importance of microorganisms in food biotechnology, including genetically engineered microorganisms and their applications.</p>	3	CO1,CO3,CO4, CO5	K1,K3,K4,K5
I/II Module 2 - Food Toxicology and Food Safety	<p>Principles of Food Toxicology</p> <p>Basic concepts and definitions in toxicology, including toxicants, toxins, and dose–response</p>	4	CO1,CO3,CO5, CO6	K1,K3,K5,K6

	relationships. Types of toxicity—acute, sub-chronic, and chronic toxicity. Concepts of LD ₅₀ (lethal dose) and LC ₅₀ (lethal concentration). Factors influencing toxicity such as age, sex, genetic susceptibility, and environmental exposure. Risk assessment approaches used in food toxicology.			
II/II	<p>Food Toxins and Toxicants</p> <p>Microbial toxins including endotoxins, exotoxins, and mycotoxins, with examples such as aflatoxins and botulinum toxin. Naturally occurring food toxicants such as alkaloids, glycoalkaloids, and lectins. Chemical contaminants in foods including pesticides, heavy metals, and food additives. Toxic compounds formed during food processing, including acrylamide, heterocyclic amines, and polycyclic aromatic hydrocarbons.</p>	5	CO1,CO2,CO3, CO5,CO6	K1,K2,3,K5, K6
III/II	<p>Food Safety and Quality Assurance</p> <p>Microbiological quality standards for food and drinking water. Principles and application of Hazard Analysis and Critical Control Point (HACCP). Good Manufacturing Practices (GMP) and Good Hygienic Practices (GHP). Food standards, laws, and regulatory frameworks ensuring food safety,</p>	4	CO1,CO3,CO5, CO6	K1,K3,K5,K6

	including the Food Safety and Standards Act, 2006, relevant Bureau of Indian Standards (BIS), and establishment of food testing laboratories with reference to NABL and ISO/IEC 17025:2017 accreditation.			
IV/II	<p>Food Adulteration, Consumer Health, and Protection</p> <p>Common food adulterants, methods of adulteration, and laboratory tests for detection. Health hazards associated with food adulteration. Consumer rights and responsibilities related to food safety. Procedures for lodging complaints and seeking redressal. Role of consumer organizations and government agencies in safeguarding consumer interests.</p>	4	CO1,CO3,CO5, CO6	K1,K3,K5,K6
Text Books				
1. Banwart GJ.(1987) Basic Food Microbiology . CBS Publishers and Distributors				
2. Frazier WC Westoff DC.(1998)Food Microbiology. 4thed. Tata McGraw- Hill Publishing Co. Ltd.				
3. Garbutt John (1997) Essentials of Food Microbiology. Arnold London.				
4.				
Suggested readings				
1. JayJM, Loessner DA, Martin J.(2005) Modern Food Microbiology. 7th ed. Springer				
2. Pelczar MJ, Chan ECS, Krieg N. (1993) Microbiology. 5th ed. Tata McGraw-Hill Publishing Co. Ltd.				
3.				
Web Resources				
1.				
2.				
Evaluation: Theory CIA: 20 Semester Exam:80				
Paper Structure for Theory Semester Exam Module :				

Theory: 100 Marks (80 End Sem + 20 CIA)

Question Paper format: Theory end semester

Module 1: 40 marks

SHORT QUESTION: FROM 7 QTNS ANSWER 5 (EACH 2 MARKS) = $5 \times 2 = 10$

LONG QUESTION: FROM 8 QTNS ANSWER 6 (EACH 5 MARKS) = $6 \times 5 = 30$

Module 2: 40 marks

SHORT QUESTION: FROM 7 QTNS ANSWER 5 (EACH 2 MARKS) = $5 \times 2 = 10$

LONG QUESTION: FROM 8 QTNS ANSWER 6 (EACH 5 MARKS) = $6 \times 5 = 30$

Course outcomes (COs) and Cognitive Level Mapping

COs	CO Description	Cognitive levels
CO1	Remember fundamental concepts of basic microbiology and toxicology.	K1
CO2	Understand the nature of microorganisms involved in food spoilage, food infections and intoxications.	K2
CO3	Apply the knowledge for development of criteria for safety in various foods operations to avoid public health hazards due to food contamination.	K3
CO4	Analyze food adulteration and spoilage mechanisms and the common food adulterants used that are responsible for various diseases and disorders.	K4
CO5	Evaluate the knowledge of microbial toxins, food safety standards, and regulatory frameworks.	K5
CO6	Create and develop new approaches to diagnose the causes of food contamination and the strategies to overcome the threat of food borne infection.	K6

Syllabus template M.Sc. in Food Science and Nutrition SEMESTER II

Semester: II				
Course : Food Science and Nutrition				
Paper code: MFSN4203			Credits: 6	
Paper Title: Principles of Food Science and Food Processing				
Hours/week : 6				
Category: Core/MDC/SEC/VAC : CORE (Major)				
Theory / Practical / Composite : Theory				
No of Modules : 2				
<p>Course Overview: A foundational understanding of how raw agricultural materials are transformed into safe, nutritious, and appealing food products. It introduces the key concepts from Food Science, including the physical, chemical, and biological properties of food components such as carbohydrates, proteins, fats, vitamins, and minerals and how the role of components that behave during processing and storage, and how factors like temperature, moisture, pH, and microorganisms influence food quality and safety. The course also explores essential food processing techniques—such as preservation, drying, fermentation, pasteurization, and packaging—while emphasizing the application of Food Preservation and Food Safety principles. Overall, it equips learners with the scientific knowledge and practical insight needed for careers in food production, quality control, and product development within the food industry.</p>				
Course Outcome:				
<ol style="list-style-type: none"> Remember the fundamental concepts of food science, including functions of food, composition of food groups, food components, and basic principles of food processing and preservation. 				
<ol style="list-style-type: none"> Understand the effects of cooking, processing, water activity, pH, enzymes, and food additives on food quality, stability, and nutrient retention. 				
<ol style="list-style-type: none"> Apply principles of food science and processing techniques in the selection, preparation, preservation, and evaluation of different food products. 				
<ol style="list-style-type: none"> Analyze the physicochemical changes in food systems, including colloidal behavior, enzymatic reactions, browning, lipid oxidation, and the impact of processing on different food groups. 				
<ol style="list-style-type: none"> Evaluate food quality, safety, sensory characteristics, and the impact of additives, adulteration, contaminants, and processing methods using appropriate analytical and sensory techniques. 				
<ol style="list-style-type: none"> Design and develop food products or processing strategies incorporating functional properties, preservation methods, sensory evaluation, and nutritional improvement approaches. 				
Prerequisites: <i>Basic knowledge about any prior course</i>				
SYLLABUS				
UNIT/Module	CONTENT	HOURS or NUMBER OF CLASSES	CO Mapping	COGNITIVE LEVEL
I/I	Scope and importance of food	2	CO1,CO2,CO3,CO4,CO5	K1,K2,K3,K4,K5

Introduction to Food Science	science. Functions of food—physiological, psychological, and social.			
II/I Cooking Methods and Effects on Nutrients	Structure, composition, selection, storage, and cooking methods of major food groups and their effects on nutrient retention: cereals and pulses; fruits and vegetables; milk and milk products; eggs, meat, fish, and poultry; fats and oils. Food colloids—sols, gels, suspensions, foams, and emulsions.	3	CO1,CO2,CO3,CO4,CO5	K1,K2,K3,K4,K5
III/I Water, pH, and Enzymes in Food Systems	Role of water in foods, water activity, phase transitions, sorption isotherms, and food stability. Hydrogen ion concentration (pH) and oxidation–reduction potential in foods. Applications of enzymes and immobilized enzymes in food processing.	3	CO1,CO3,CO4,CO5,CO6	K1,K3,K4,K5,K6
IV/I Food Components and Their	Carbohydrates (sugars, sweeteners, starch and non-starch polysaccharides,	6	CO1,CO3,CO4,CO5	K1,K3,K4,K5

Functional Properties	gelatinization and retrogradation), proteins (nutritional and functional properties), lipids (functional roles, emulsions, oxidation, rancidity, antioxidants, interesterification), and browning reactions (Maillard reaction and caramelization).			
V/I Food Additives, Adulteration, and Fortification	Food additives: definition, classification, functions, chemistry, applications, and toxicological evaluation. Food adulteration: common adulterants and methods of detection. Methods for improving nutritional quality of foods—enrichment, restoration, and fortification.	4	CO1,CO3,CO5,CO6	K1,K3,K5,K6
VI/I Product Evaluation and Sensory Evaluation of Foods	Sampling techniques for product evaluation and sample preparation. Principles and applications of sensory evaluation in food quality and product	5	CO1,CO2,CO3,CO5,CO6	K1,K2,3,K5,K6

	<p>development. Sensory perception of appearance, flavour, texture, taste, and sound. Selection and training of sensory panelists. Classification of sensory tests:</p> <ul style="list-style-type: none"> • Difference tests (paired comparison, triangle, duo-trio, difference from control) • Descriptive tests • Affective and acceptance tests Consumer acceptability and preference measurement. 			
<p>VII/I Advanced Sensory Evaluation Technologies</p>	<p>Modern tools and techniques in sensory analysis including electronic nose (E-nose), electronic tongue (E-tongue), sensory mapping, texture analyzers, and emerging applications of virtual reality (VR) and augmented reality (AR).</p>	5	CO1,CO3,CO5,CO6	K1,K3,K5,K6

<p>I/II</p> <p>Introduction to Food Processing</p>	<p>Importance and scope of food processing in dietetics and nutrition. Impact of processing on food quality, safety, shelf life, and nutrient retention.</p>	<p>3</p>	<p>CO1,CO3,CO5,CO6</p>	<p>K1,K3,K5,K6</p>
<p>II/II</p> <p>Food Processing and Preservation Methods</p>	<p>Thermal Processing: Principles, mechanisms, and effects of blanching, pasteurization, sterilization, UHT processing, canning, extrusion cooking, and frying on food quality and nutrients.</p> <p>Low-temperature Processing: Principles and effects of refrigeration, chilling, freezing, freeze-drying (lyophilization), and freeze-concentration.</p> <p>Non-thermal Technologies: Principles and effects of irradiation, high-pressure processing, pulsed electric field, fermentation, and emerging preservation technologies.</p> <p>Other Preservation</p>	<p>9</p>	<p>CO1,CO3,CO4,CO5</p>	<p>K1,K3,K4,K5</p>

	<p>Methods: Drying, osmotic dehydration, concentration, evaporation, distillation, and hurdle technology.</p>			
<p>III/II</p> <p>Processing of Major Food Groups</p>	<p>Fruits and Vegetables: Processing of juices, jams, jellies, marmalades, purees, pastes, sauces, ketchup, pickles, preserves, and crystallized fruits; enzymatic browning and post-harvest handling.</p> <p>Cereals, Pulses, and Legumes: Milling, germination, extrusion, and fortification; effects on digestibility and glycaemic index.</p> <p>Beverages: Alcoholic and non-alcoholic beverages</p> <p>Confectionery Products: Candies, toffees, caramels, and chocolate products.</p> <p>Dairy and Meat Products: Pasteurization, homogenization, cheese and yoghurt manufacture; meat tenderization, curing, smoking,</p>	10	CO1,CO3,CO4,CO5	K1,K3,K4,K5

	freezing. Oils and Fats: Refining, hydrogenation, and interesterification; trans fats and health implications. Speciality and Functional Foods: Introduction, applications, organic foods, and superfoods.			
IV/II Contaminants and Adulteration in Processed Foods	Chemical and biological contaminants including heavy metals, pesticide residues, and microbial toxins. Common food adulterants and basic detection methods.	5	CO1,CO3,CO4,CO5	K1,K3,K4,K5
Text Books				
1. Textbook of Food Science and Nutrition by Sunita Roy Chowdhury and Bani Tamber Aeri.				
2. A Laboratory Manual of Food Analysis by Shalini Sehgal, Year – 2016 ISBN NO - 9789384588847				
3. Whitney. E.R. and S.R Kolfes (2002) Understanding Nutrition 9th edition .Wadsworth Thomson Learning.				
4. Gibson, G.R. and M.B. Roberfroil (1999) Coloric Mirobio, Nutrition and health, Kluwer Academic Publishers, Dordecht.				
Suggested readings				
1. Thompson, L.U. (1993) Potential Health Benefits and problems associated with antinutrients in foods. Food Research International. 26; 134 – 149.				
2.				
3.				

Web Resources
1.
2.
3.
4.
Evaluation Theory CIA: 20 Semester Exam:80
<p>Paper Structure for Theory Semester Exam Module : Theory: 100 Marks (80 End Sem + 20 CIA) Question Paper format: Theory end semester Module 1: 40 marks</p> <p>SHORT QUESTION: FROM 7 QTNS ANSWER 5 (EACH 2 MARKS) = $5 \times 2 = 10$ LONG QUESTION: FROM 8 QTNS ANSWER 6 (EACH 5 MARKS) = $6 \times 5 = 30$</p> <p>Module 2: 40 marks SHORT QUESTION: FROM 7 QTNS ANSWER 5 (EACH 2 MARKS) = $5 \times 2 = 10$ LONG QUESTION: FROM 8 QTNS ANSWER 6 (EACH 5 MARKS) = $6 \times 5 = 30$</p>

Course outcomes (COs) and Cognitive Level Mapping

COs	CO Description	Cognitive levels
CO1	Remember the fundamental concepts of food science, including functions of food, composition of food groups, food components, and basic principles of food processing and preservation.	K1
CO2	Understand the effects of cooking, processing, water activity, pH, enzymes, and food additives on food quality, stability, and nutrient retention.	K2
CO3	Apply principles of food science and processing techniques in the selection, preparation, preservation, and evaluation of different food products.	K3
CO4	Analyze the physicochemical changes in food systems, including colloidal behavior, enzymatic reactions, browning, lipid oxidation, and the impact of processing on different food groups.	K4
CO5	Evaluate food quality, safety, sensory characteristics, and the impact of additives, adulteration, contaminants, and processing methods using appropriate analytical and sensory techniques.	K5
CO6	Design and develop food products or processing strategies incorporating functional properties, preservation methods, sensory evaluation, and nutritional improvement approaches.	K6

Syllabus template M.Sc. FOOD SCIENCE & NUTRITION SEMESTER I

Semester: 2				
Course : Food Science & Nutrition				
Paper Title: Food Microbiology, Food Science & Processing				
Paper code: MFSN4251			Credits: 6	
Hours/week : 12				
Category: Core/MDC/SEC/VAC : CORE (Major)				
Theory / Practical / Composite : Practical				
No of Modules : No				
<p>Course Overview: This course make the students learn how to analyse presence of microorganisms in food samples. In addition italso helps to isolate and identify the biochemical characteristic features of microbes. IAnalysis the presence of adulterants in the food and to stay updated with the tests for food additives & fortifications.</p>				
Course Outcome:				
1. Remember the basic microbiological techniques for food and water analysis.				
2. Understand and learn preparation of different kinds of culture media.				
3. Apply the knowledge of composition of nutrients for balanced and nutrient rich healthy diet for population groups.				
4. Analyse the various food items and their implications.				
5. Evaluate critically analyse the planning and preparation of diets.				
6. Create new approaches & various measures for enhancing and analysing nutritional quality of diets.				
Prerequisites: Basic knowledge about any prior course				
SYLLABUS				
UNIT/Module	CONTENT	HOURS or NUMBER OF CLASSES	CO Mapping	COGNITIVE LEVEL
I.	<ol style="list-style-type: none"> 1. Study of various microbiological laboratory equipments. 2. Preparation of different culture medium. 3. Determination of bacteria and viable microbes by different techniques. 4. Simple staining, Gram staining, acid fast staining. 	12 /week	CO1,CO2,CO3, CO4,CO5,CO6	K1,K2,K3 K4,K5,K6

	<ol style="list-style-type: none"> 5. Microbiological analysis of Water, Milk, Canned product, Fruit juices and Street foods. 6. Phosphatase test for pasteurization of milk, Gradation of milk by methylene blue reduction test, Coliform bacteria isolation from different water sources; 7. MIC test for antibiotics against Gram-positive and Gram-negative bacteria. 8. Antibiotic susceptibility test by disc diffusion assay method. 9. Shelf life study of food items based on microbial safety 10. Study the effect of cooking on cereals, pulses, vegetables fruits, egg, meat and sugar. 11. Determination of physical characteristics and presence of any food additives. 12. Study the effect of various additives in processing of food. 13. Preparation of stable emulsions in food system. 14. Proximate analysis of food samples: moisture, ash, protein, fat, fibre and carbohydrate content. 15. Estimation of gluten content in food 16. Thermal Processing techniques 17. Food Dehydration and Freeze-Drying 18. Fermentation and Probiotic Food Preparation 19. Detection of Food Adulterants and Contaminants 			
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	<p>20. Sensory Evaluation and Shelf-Life Testing</p> <p>21. Sample meal formulation for various age groups</p> <p>Visit to food processing unit or any other organization dealing with advanced method in food microbiology and food processing.</p>			
Text Books				
1. A Laboratory Manual of Food Analysis by Shalini Sehgal, Year – 2016				
2. Nutritional Biochemistry by Homer Wells.				
3. Food Science: The Biochemistry of Food & Nutrition, Lab Manual (Glencoe/McGraw-Hill)				
4.				
Suggested readings				
1. A Laboratory Manual of Food Analysis by Shalini Sehgal, Year – 2016				
Web Resources				
1.				
2.				
Evaluation Theory CIA: 20 Semester Exam: 80				
Paper Structure for Practical Semester Exam Module : Practical : 100 Marks (20 End Sem + 80 CIA)				
Question Paper format: Practical end semester				
Viva voce – 20 marks (End Sem)				

Course outcomes (COs) and Cognitive Level Mapping

COs	CO Description	Cognitive levels
CO1	Remember the general biochemical and microbiological tests for analysis of food stuffs.	K1
CO2	Understand the preparation of culture media	K2
CO3	Apply the knowledge of chemistry on biochemical analysis.	K3
CO4	Analyse the various food items and their implications.	K4
CO5	Evaluate critically analyse the planning and preparation of diets.	K5
CO6	Create new approaches & various measures for enhancing and analysing nutritional quality of diets.	K6