FOUR YEAR SYLLABUS

BACHELOR'S PROGRAMME

In

FOOD AND NUTRITION (MAJOR & MINOR)

Based on the guidelines of NEP 2020

UNIVERSITY OF KALYANI
KALYANI – 741235
NADIA,
WEST BENGAL, INDIA
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SEMESTER-I

Course Structure

SEMESTER I

Course Code	Course Title	Nature of Course	Credit of Course	Evaluation		Total
				Internal	Semester End	
FNT-M-1	Concept of Nutritional Physiology & Food Science	Major	6	15	60	75
FNT-MI-1	Nutritional Chemistry and Food Science (Part-I)	Minor	4	10	40	50
FNT-MDC-1	Basics of Food and Nutrition	Multi-disciplinary Course	3	10	35	45
FNT-SEC- 1 (Any one)	A. Nutritional Assessment and Diet Survey	Skill Enhancement Course	3	10	35	45
	B. Computer Application in Nutrition					
FNT-VA-1	Environmental Education	Value Added Course	4	10	40	50
05			**20**	**55**	**210**	**265**

MAJOR COURSE

Course Code: FNT-M-T-1

Course Name: CONCEPT OF NUTRITIONAL PHYSIOLOGY & FOOD SCIENCE (THEORY)

Total Credit: 6 [Theory: 4 + Practical: 2]

FM: 75 [Theory: 40 (Term End) + 10 (Internal)], [Practical: 20 (Term End) + 5 (Internal)]

No. of Lectures: 60

- **Basic Concept of Cell Biology:**

1. Structure and Functions of Cell with special reference to Plasma membrane (Fluid Mosaic Model), Mitochondria, Ribosome, Endoplasmic reticulum, Nucleus.

- **Brief Overview of Different Physiological Systems**:

1. Blood- Composition and Functions, Blood groups
2. Circulatory System: Structure of Heart and Heart Valves, Cardiac Cycle
3. Digestive System: Structure and Functions of G.I. Tract, Liver, Gallbladder and Pancreas. Process of Digestion and Absorption of food**.**

- **Food Science: Elementary concept**

1. Basic concepts of nutritional science: Food, Nutrition, Health, Primary Health Care and Nutritional Status (Definition, Interrelationship in maintaining good health and well-being),
2. Food (Functions and Constituents of food and Food Groups: Basic concepts), Food Pyramid
3. Nutrients (Macro & Micro Nutraceutical): Functions, Sources and Requirements
4. Recommended Dietary allowances (RDA), RDA for Indians (ICMR 2010 & 2020) and their uses in planning diets.
5. Nutrient and Nutritive value, Concept of Balanced Diet
6. Uses and Nutritional Aspects of Cereals & Pulses, Milk & Milk Products, Meat & Meat Products, Vegetables & Fruits, Fats & Oils.

- **Nutritional Chemistry: Elementary Concept**

1. Classification, Properties & Functions of Carbohydrates (Monosaccharides, Disaccharides, Oligosaccharides and Polysaccharides), Protein (Primary, Secondary, Tertiary and Quaternary), and Lipids, Fatty Acid (PUFA, MUFA, SFA, Ω-3 Fatty Acid, and TFA).
2. Enzyme: Concept, Classifications, Mechanism of Action, Kinetics (Michaelis-Menten Equation and Hill Equation), Enzyme Inhibition
3. Elementary Concept of Metabolism: Glycolysis, TCA Cycle, HMP Shunt, Glycogenesis, Gluconeogenesis, Electron Transport Chain and Oxidative Phosphorylation.

4. Deamination, Transamination, Urea Cycle, β-Oxidation (Process Outlines and Name of Enzymes, ATP Production Only).

- **Reference Books (All Latest Edition):**

1. Essentials of Medical Physiology by A B S Mahapatra And G S Mahapatra (Current Books International, New Delhi, India)
2. Essentials of Medical Physiology by K Sembulingam, P Sembulingam (Jaypee Brothers Medical Publishers, New Delhi, India)
3. C.C.Chatterjee's Human Physiology by Chatterjee C.C (CBS Publishers, New Delhi, India)
4. Guyton and Hall Textbook of Medical Physiology (Guyton Physiology) by John E. Hall (Elsevier Health Science, Philadelphia, PA, USA)
5. Ganong's Review of Medical Physiology by Kim E. Barrett (McGraw Hill/India, New Delhi, India)
6. The Cell: A Molecular Approach by Geoffrey M. Cooper, Robert E. Hausman (Sinauer Associates Inc, Sunderland, MA, USA)
7. Karp's Cell Biology by Gerald Karp, Janet Iwasa, Wallace Marshall (Wiley, Hoboken, NJ, USA)
8. Food Science by B Srilakshmi (New Age International Publishers, New Delhi, India)
9. Food Science and Nutrition by Sunetra Roday (Oxford University Press, Oxford, UK)
10. Textbook of Food Science and Technology by Sharma A (CBS Publishers, New Delhi, India)
11. Biochemistry by Debajyoti Das (Academic Publishers, Kolkata, India)
12. Harper's Illustrated Biochemistry By Victor W. Rodwell, David Bender, Kathleen M. Botham, Peter J. Kennelly, P. Anthony Weil (McGraw-Hill Education, New York, NY, USA)
13. Lehninger Principles of Biochemistry By David L. Nelson, Michael Cox (W.H.Freeman & Co Ltd, New York, NY, USA)

Course Code: FNT-M-P-1

Course Name: CONCEPT OF NUTRITIONAL PHYSIOLOGY & FOOD SCIENCE (PRACTICAL)

Total Credit: 2

FM: 25 [20 (Term End) + 5 (Internal)]

No. of Lectures: 60

1. Estimation of Hemoglobin, TC, DC, ESR, Determination of Blood Group, Determination of Bleeding Time & Clotting Time
2. Determination of Pulse Rate (30 Beats/10 Beats Method) and Measurement of Blood Pressure During Rest and in Exercise Conditions
3. Qualitative Detection of Carbohydrate (Molisch Test, Benedict's Test, Iodine Test, Fehling's Test, Tollen's Test, Bial's Test, Seliwanoff's Test, Barfoed's Test, Phenylhydrazine Test), Non-Reducing Sugar (Hydrolysis Test or Inversion Test).

4. Quantitative Measurement of Carbohydrate (Benedict's Test, Glucose-Oxidase Test)
5. Qualitative Detection of Protein (Biuret, Ninhydrin, Xanthoproteic Test, Millon's Test).
6. Qualitative Detection of Fat (Solubility Test, Translucent Spot, Acrolein Test, Baudouin Test, Huble's Test)

- **Reference Books (Latest Edition):**

1. Ghai's A Textbook of Practical Physiology by V.P. Varshney, Mona Bedi (Jaypee Brothers Medical Publishers, New Delhi, India)
2. Practical Textbook of Biochemistry for Medical Students by DM Vasudevan, Subir Kumar Das (Jaypee Brothers Medical Publishers, New Delhi, India)

MINOR COURSE

Course Code: FNT-MI-1

Course Name: NUTRITIONAL CHEMISTRY AND FOOD SCIENCE (PART-I) (THEORY)

Total Credit: 4

FM: 50 [Theory: 40 (Term End) + 10 (Internal)]

No. of Lectures: 60

- **Basic Concept of Nutritional Chemistry:**

1. Role of Carbohydrates, Protein, Lipids, Vitamins and Minerals in Nutrition

- **Basic Concept of Enzyme and Metabolism:**

1. Enzyme: Concept, Classifications, Mechanism of Action
2. Elementary Concept of Metabolism: Glycolysis, TCA Cycle, Deamination, Transamination, Beta Oxidation (Process Outlines and Name of Enzymes, ATP Production Only)

- **Basic Concept of Food Science:**

1. Basic Concepts of Nutritional Science: Food, Nutrition, Health, Primary Health Care And Nutritional Status (Definition, Interrelationship In Maintaining Good Health and Well-Being),
2. Food Groups, Food Pyramid, Functions of Food.
3. Recommended Dietary Allowances and RDA for Indians (ICMR 2010 & 2020) and Their Uses
4. Energy in Human Nutrition: Energy and Its Unit, Energy Assessment and Balance, Factors of Energy Requirement, BMR and Its Regulation, SDA of Food
5. Nutrient And Nutritive Value, Concept Of Balanced Diet
6. Uses and Nutritional Aspects of Cereals & Pulses, Milk & Milk Products, Meat & Meat Products, Vegetables & Fruits, Fats & Oils.

- **Reference Book (Latest Edition):**

1. Food Science by B Srilakshmi (New Age International Publishers)
2. Food Science and Nutrition by Sunetra Roday (Oxford University Press)
3. Textbook of Food Science and Technology by Sharma A (CBS Publishers)
4. Biochemistry by Debajyoti Das (Academic Publishers)
5. Harper's Illustrated Biochemistry By Victor W. Rodwell, David Bender, Kathleen M. Botham, Peter J. Kennelly, P. Anthony Weil (McGraw-Hill Education)
6. Lehninger Principles of Biochemistry By David L. Nelson, Michael Cox (W.H.Freeman & Co Ltd)

MULTI-DISCIPLINARY COURSE

Course Code: FNT-MDC-1

Course Name: CONCEPTS OF FOOD SCIENCE AND NUTRITION (THEORY)

Total Credit: 3

FM: 45 [Theory: 35 (Term End) + 10 (Internal)]

No. of Lectures: 45

- **Basic Concept Of Cell & Tissues:**

1. Structure and Functions of Cell with Special Reference to Different Cellular Organelles (Outline of Pro and Eukaryotic Cell and Elementary Idea of Different Organelles, Detail Structure and Functions are Not Required)

- **Brief Overview of Different Physiological Systems**:

1. Blood-Composition and Functions, Circulatory System: Structure of Heart and Heart Valves,
2. Digestive System: Structure and Functions of G.I. Tract, Process of Digestion and Absorption of Food**,** Functions of Liver, Gallbladder and Pancreas.

- **Basics of Nutrition:**

1. Growth, Development, Nutrition, Malnutrition and Health, Scope of Nutrition, Elementary Concept of Nutrients-Macro, Micro Nutrients and Their Functions, Dietary Fibres. Elementary Concept of Carbohydrate, Protein and Fat and Their Sources, Concept of Digestion and Metabolism.

- **Basics of Food Science**:

1. Food, Food Groups, Food Pyramid, Functions of food. Nutrient and Nutritive value, Concept of Balanced Diet.

- **Reference Books (Latest Edition):**

1. Essentials of Medical Physiology by A B S Mahapatra And G S Mahapatra (Current Books International)
2. Essentials of Medical Physiology by K Sembulingam, P Sembulingam (Jaypee Brothers Medical Publishers)
3. C.C.Chatterjees Human Physiology by Chatterjee C.C (CBS Publishers)
4. Guyton and Hall Textbook of Medical Physiology (Guyton Physiology) by John E. Hall (Elsevier Health Science)
5. Ganong's Review of Medical Physiology by Kim E. Barrett (McGraw Hill/India)
6. The Cell: A Molecular Approach by Geoffrey M. Cooper, Robert E. Hausman (Sinauer Associates Inc)
7. Karp's Cell Biology by Gerald Karp, Janet Iwasa, Wallace Marshall (Wiley)
8. Food Science by B Srilakshmi (New Age International Publishers)
9. Food Science and Nutrition by Sunetra Roday (Oxford University Press)
10. Textbook of Food Science and Technology by Sharma A (CBS Publishers)

SKILL ENHANCEMENT COURSE

Course Code: FNT-SEC-1A

Course Name: NUTRITIONAL ASSESSMENT AND DIET SURVEY

Total Credit: 3

FM: 45 [35 (Term End) +10 (Internal)]

No. of Lectures: 45

- **Theoretical Background:**

1. Growth, Development, Nutrition, Malnutrition and Health, Scope Of Nutrition
2. Nutritional Aspect in Different Occupation: Manual Workers, Shift Workers, Sedentary Workers, Dietary Guidelines for Indians.
3. Formulation of RDA, Dietary Guidelines with Reference to Man and Woman
4. Concept of BMR and SDA and their Implications in Nutrition
5. Concept of Diet Survey and Diet Chart Preparation (ICMR Method)

- **Practical Assessment:**

1. Nutritional Anthropometry
   A. Anthropometric assessment of adults (Weight, Height, Circumferences, Breadths, Skinfold thickness, Derived formulas)
   B. Anthropometric assessment of infants and children (Introduction of Growth charts, Anthropometric measurements of children, Age calculation, Interpretation of growth charts)
2. Visit to old age home / ICDS Centre / Nutrition Rehabilitation Centre (NRC) / Slum area / Any public place and Report Preparation on nutritional status and health concern (In any area at least 8-10 case studies to be done).
3. Visit to a Rural Technology Centre/Community Welfare Centre and Field Report Preparation
4. Dietary Survey and Report Presentation of a Family and Community

- **Reference Books (Latest Edition):**

1. Anthropometric and Nutritional Assessment by Mohammad Nasir Ahmad (LAP Lambert Academic Publishing)
2. Assessment of Nutritional Status by Anupama Rani (Sonali Publications)
3. Nutrition Assessment: Basics of Nutritional Assessment by Spencer Garrett
4. Nutritional Assessment by Robert Lee, David Nieman (McGraw-Hill Higher Education)
5. Principles of Nutritional Assessment by Rosalind S. Gibson (OUP USA)
6. Community Medicine: Practical Manua by Rajkumar Patil (Elsevier India)

7. Nutrient Requirements for Indians Recommended Dietary Allowances Estimated Average Requirements - A Report of the Expert Group by Ministry of Health and Family Welfare, ICMR, NIN (ICMR)
8. Dietary Guidelines For Indians A Manual by NIN (ICMR)
9. Nutritive Value of Indian Foods (2021) with Fruits by ICMR and C Gopalan (ICMR)

OR

Course Code: FNT-SEC-1B

Course Name: COMPUTER APPLICATION IN NUTRITION

Total Credit: 3

FM: 45 [35 (Term End) +10 (Internal)]

No. of Lectures: 45

- **Theoretical Background:**

1. Basic Structure of Computer–Hardware and Software Its Types, Concepts and Applications, Input-Output Storage Devices
2. Computer Memory Concept & Types (ROM-BIOS,RAM) And Its Functions
3. Concept. Types & Functions of Computer Networks Internet And Its Applications Web Browsers & Search Engines
4. Concept of Viruses. Malware, Spyware Legal & Ethical Issues of Uses of Aforesaid Programme
5. MS Word. Main Features and Applications In Food and Nutritions
6. MS Excel Main Features & Its Applications In Food and Nutrition (Making of Chart, Bar, Graphs and Mathematical Calculation)
7. MS Power Point: Preparation and Presentation of Slides and Salient Features.

- **Practical Assessment:**

1. Data Entry, Formatting, Mathematical Calculations, Idea of Different Operations In Excel
2. Introduction of MS Word: Formatting, Paragraph Alignment, Font Size, Article Writing and Report Preparation.
3. Making of a PowerPoint Slide and Presentation, Introduction of Different Features of PowerPoint Slide.

- **Reference Books (Latest Edition):**

1. Basic Computer Course by Soumya Ranjan Behera (Vasan Publications)
2. Computer Basics by G. Manjunath B.E (Vasan Publications)
3. Computer Fundamentals by Priti Sinha, Pradeep K., Sinha (BPB Publications)
4. Microsoft Office 365 2022 Beginners Manual: The All-In-One Microsoft Office Guide To Mastering Word, Excel, Powerpoint, Outlook, Sharepoint by Eddie S. Erhart

SEMESTER-II

Course Structure

SEMESTER II

Course Code	Course title	Nature of Course	Credit of Course	Evaluation		Total
				Internal	Semester End	
FNT-M-2	Therapeutic Nutrition-I	Major	6	15	60	75
FNT-MI-1	Nutritional Chemistry and Food Science (Part-I)	Minor	4	10	40	50
FNT-MDC-2	Concept of Digestion & Nutrient Utilization	Multi-disciplinary Course	3	10	35	45
AECC-1	Communicative English	Ability Enhancement Course	4	10	40	50
FNT-SEC-2 (Any One)	A. Quality management & Food Laws	Skill Enhan-cement Course	3	10	35	45
	B. Food Analysis & Laboratory Technology					
FNT-SI-1	Summer Internship (Additional for Certificate/Diploma)	Summer Internship	4			
05			**24**	**55**	**210**	**265**

MAJOR COURSE

Course Code: FNT-M-T-2

Course Name: THERAPEUTIC NUTRITION-I (THEORY)

Total Credit: 6 [Theory: 4 + Practical: 2]

FM: 75 [Theory: 40 (Term End) + 10 (Internal)], [Practical: 20 (Term End) + 5 (Internal)]

No. of Lectures: 60

1. Nutritional Assessment in Clinical Care- Goals and Methods (SGA). Modification of Normal Diets (Normal, Soft and Fluid Diets), Types and Factors to be considered in Planning Therapeutic Diets, General Principles of Dietary Calculation.
2. Enteral Nutrition vs. Parenteral Nutrition. Clinical Parameter to Monitor During Nutrition Support, Complications Associated with Parenteral Nutrition, Enteral Tube Feeding in Clinical Nutrition, Enteral Tube Feeding Formulas, Enteral Tube Feeding Delivery System, Monitoring the Tube-Fed Patients, Indication and Contradictions for Parenteral Nutrition, Parenteral Feeding in Clinical Nutrition, Parenteral Nutrition Delivery System.
3. Therapeutic Adaptations of Normal Diet, Classification of Therapeutic Diets, Types of Dietitians and Role of Dietitian.
4. Pathophysiology, Risk Factors, Sign and Symptom, Diagnosis and Dietary Management: Underweight, Overweight and Obesity, Ischemic Heart Disease, Diabetes, Diarrhea. Dysphagia, GERD, IBS, IBD, Peptic Ulcer, Colorectal Cancer

- **Reference Books (Latest Edition):**

1. Dietetics by B Srilakshmi (New Age International Publishers)
2. Fundamentals of Foods, Nutrition and Diet Therapy by Sumati R (New Age International Publishers)
3. Advances In Diet Therapy: Practical Manual by V. Vimala (New Age International Publishers)
4. Williams' Basic Nutrition and Diet Therapy by Staci Nix (Elsevier)
5. Diet Planning Through the Life Cycle-Diet Therapy A Practical Manual by Veenu Seth. Kalyani Singh. Pulkit Mathur (Elite Publishing)
6. Nutrition and Diet Therapy by Linda Debruyne, Kathryn Pinna, Eleanor Whitney (Wadsworth Publishing Co Inc)

Course Code: FNT-M-P-2

Course Name: THERAPEUTIC NUTRITION-I (PRACTICAL)

Total Credit: 2

FM: 25 [20 (Term End) + 5 (Internal)]

No. of Lectures: 60

1. Therapeutic Diet Chart Preparation for Diabetes Mellitus, Peptic Ulcer, IBD, GERD, IBS, Colorectal Cancer, Obesity, Ischemic Heart Disease, Diarrhea and Constipation patients (Case Specific).
2. Training/Workshop/Short-Term Course From Nutrition and Dietetics/Nutrition and Public Health Department of any University/Research Institute/Community Science Centre/Rural Technology Department/Hospital Visit and Documentation of the work followed by Report Preparation.

- **Reference Books (Latest Edition):**

1. Advances In Diet Therapy: Practical Manual by V. Vimala (New Age International Publishers)
2. Diet Planning Through the Life Cycle Part 2- Diet Therapy A Practical Manual by Veenu Seth. Kalyani Singh. Pulkit Mathur (Elite Publishing)

MINOR COURSE

Course Code: FNT-MI-1

Course Name: NUTRITIONAL CHEMISTRY AND FOOD SCIENCE (PART-I) (THEORY)

Total Credit: 4

FM: 50 [Theory: 40 (Term End) + 10 (Internal)]

No. of Lectures: 60

- **Basic Concept of Nutritional Chemistry:**

1. Role of Carbohydrates, Protein, Lipids, Vitamins and Minerals in Nutrition

- **Basic Concept of Enzyme and Metabolism:**

1. Enzyme: Concept, Classifications, Mechanism of Action
2. Elementary Concept of Metabolism: Glycolysis, TCA Cycle, Deamination, Transamination, Beta Oxidation (Process Outlines and Name of Enzymes, ATP Production Only)

- **Basic Concept of Food Science:**

1. Basic Concepts of Nutritional Science: Food, Nutrition, Health, Primary Health Care And Nutritional Status (Definition, Interrelationship In Maintaining Good Health and Well-Being),
2. Food Groups, Food Pyramid, Functions of Food.
3. Recommended Dietary Allowances and RDA for Indians (ICMR 2010 & 2020) and Their Uses
4. Energy in Human Nutrition: Energy and Its Unit, Energy Assessment and Balance, Factors of Energy Requirement, BMR and Its Regulation, SDA of Food
5. Nutrient And Nutritive Value, Concept Of Balanced Diet
6. Uses and Nutritional Aspects of Cereals & Pulses, Milk & Milk Products, Meat & Meat Products, Vegetables & Fruits, Fats & Oils.

- **Reference Book (Latest Edition):**

1. Food Science by B Srilakshmi (New Age International Publishers)
2. Food Science and Nutrition by Sunetra Roday (Oxford University Press)
3. Textbook of Food Science and Technology by Sharma A (CBS Publishers)
4. Biochemistry by Debajyoti Das (Academic Publishers)
5. Harper's Illustrated Biochemistry By Victor W. Rodwell, David Bender, Kathleen M. Botham, Peter J. Kennelly, P. Anthony Weil (McGraw-Hill Education)
6. Lehninger Principles of Biochemistry By David L. Nelson, Michael Cox (W.H.Freeman & Co Ltd)

MULTI-DISCIPLINARY COURSE

Course Code: FNT-MDC-2

Course Name: CONCEPT OF DIGESTION & NUTRIENT UTILIZATION

Total Credit: 3

FM: 45 [Theory: 35 (Term End) + 10 (Internal)]

No. of Lectures: 45

1. Classification of Carbohydrates, Proteins and Fats
2. Enzymes-Classifications and Functions, Brief Concept of Mechanism of Action
3. Vitamins and Minerals- Different Types, Food Sources and Functions
4. Digestion and Absorption of Carbohydrates
5. Digestion and Absorption of Proteins
6. Digestion and Absorption of Fats
7. Metabolism of Carbohydrate, Protein and Fat: Outline and elementary concept of Glycolysis, TCA cycle, Deamination, Transamination, β-oxidation.

- **Reference Books (Latest Edition):**

1. Biochemistry by Debajyoti Das (Academic Publishers)
2. Harper's Illustrated Biochemistry By Victor W. Rodwell, David Bender, Kathleen M. Botham, Peter J. Kennelly, P. Anthony Weil (McGraw-Hill Education)
3. Lehninger Principles of Biochemistry By David L. Nelson, Michael Cox (W.H.Freeman & Co Ltd)

SKILL ENHANCEMENT COURSE

Course Code: FNT-SEC-2A

Course Name: QUALITY MANAGEMENT AND FOOD LAWS

Total Credit: 3

FM: 45 [35 (Term End) +10 (Internal)]

No. of Lectures: 45

- **Theoretical Background:**

1. Microbiological Criteria and Food Safety, Food Safety Objectives (FSO), Indicators of Food Microbial Quality and Safety, Some Indicators of Product Quality- Coliforms, Enterococci, Bifidobacterium, Coliphages.
2. Microbiological Quality Standards of Food, Control and Inspection, Enforcement and Govt. Regulatory Practices and Policies. FDA, EPA, HACCP, ISI; Handling of Recombinant Product; Detection of Various Methods of Food Toxicity, Hazard Analysis Criteria Control Points (HACCP) System For Food Safety: Principles, and Application
3. Food Quality Protection Act (FQPA); FQPA Requirement, Impact; Food Safety Standards Act (FSSA)-The Prevention of Food Adulteration Act, 1954, the Fruit Products Order, 1955, Edible Flour (Control) Order, 1967, the Milk and Milk Products Order, 1992 (In Relation To Food); Different Regulations, Codex, Food Export Control and Certification.
4. Good Practices in Food Quality Management, Introduction of Good Laboratory Practices (GLP) and Its Applications, Elements of GLP, OECD Guidelines for GLP, National Accreditation Board For Testing and Calibration Laboratories (NABL).

- **Practical Assessment:**

1. Procedures of Different Types of Food safety AUDITS
2. Practical demonstration of Standard Operating Procedure (SOP)
3. General Procedures for data evaluation
4. Instrumentation Validation (Demonstration)
5. Analyst Certification
6. Laboratories Facility Certification
7. Specimen/Sample Tracking Procedures (Overview)

- **Reference Books:**

1. Food Safety and Standards Act, 2006 by Virag Gupta (Commercial Law Publishers (India) Pvt. Ltd)
2. Principles of Good Laboratory Practice by Pradeep Deshmukh (Adhyyan Books)
3. Good Laboratory Practices and Compliance Monitoring by Trupti Patil-Dongare (PharmaMed Press/BSP Books)

4. Auditing in the Food Industry: From Safety and Quality to Environmental and Other Audits by M Dillon, C Griffith (Woodhead Publishing)

OR

Course Code: FNT-SEC-2B

Course Name: FOOD ANALYSIS & LABORATORY TECHNOLOGY

Total Credit: 3

FM: 45 [35 (Term End) +10 (Internal)]

No. of Lectures: 45

- **Theoretical Background:**

1. Definitions of Standards of Quality, Assessment of Quality Using Routine and Official Methods of Analysis and Interpretation of Analytical Results: General Methods and Principles for The Determination of Components: Carbohydrates, Proteins, Amino Acids, Fats, Mineral Matter, Moisture, Ash, Crude Fibre, Synthetic Dyes.
2. Methods for the Determination of Water-Soluble Vitamins: (B1, B2, B3, B6, B12, C and Folic Acid) (Visible Spectrophotometric Technique Only). Methods of Determination of Fat-Soluble Vitamins: (A, D, E and K), Principles and Methods for Estimation of Minerals: Titrimetric and Gravimetric Methods.
3. Inorganic Components (Minerals): Arsenic, Cadmium, Copper, Lead, Mercury, Zinc, Fluorine, Sodium, Potassium, Calcium, Phosphorous. Pesticides: Thin Layer Chromatography and Gas Liquid Chromatography as Tools for Organophosphorus and Organo Chlorine Pesticides.

- **Practical Assessment:**

1. Determination of Carbohydrate, Protein, and Fat Content from Different Food Samples
2. Measurement of Proximate Analysis (Moisture, Ash, Crude Fat, Crude Fibre) of Different Food Samples.
3. Measurement of Vitamin Contents (Water Soluble/Fat Soluble) of Different Food Product.
4. Determination of Minerals of Food Samples
5. Practical Demonstration of Thin Layer Chromatography (TLC)

- **Reference Books:**

1. Food Analysis Laboratory Manual by S. Suzanne Nielsen (Springer)
2. Introduction to the Chemical Analysis of Foods by Nielsen S. S (CBSPD)
3. Food Analysis: Theory and Practice by Pomeranz Y (CBS Publishers & Distributors Pvt Ltd)
4. A First Course in Food Analysis by A.Y. Sathe (New Age International Pvt Ltd)
5. Laboratory Manual For Food Canners And Processors: Analysis Sanitation And Statistics by NCA (Medtech)
6. General Laboratory Manual: Food, Water, Drug, Flour, Oil And Fruit Juice Analysis by Dutse Irimiya (Glit Publishing)

SEMESTER-III

Course Structure

SEMESTER III

Course Code	Course Title	Nature of Course	Credit of Course	Evaluation		Total
				Internal	Semester End	
FNT-M-3	Therapeutic Nutrition-II	Major	6	15	60	75
FNT-MI-2	Nutritional Chemistry & Food Science (Part-II)	Minor	4	10	40	50
FNT-MDC-3	Life Style Diseases & Nutrition Intervention	Multidisciplinary Course	3	10	35	45
FNT-SEC-3 (Any one)	A. Entrepreneur & Small Catering Unit B. Culinary Sciences	Skill Enhancement Course	3	10	35	45
FNT-VA-2		Value Added Course	4	10	40	50
05			**20**	**55**	**210**	**265**

MAJOR COURSE

Course Code: FNT-M-T-3

Course Name: THERAPEUTIC NUTRITION-II (THEORY)

Total Credit: 6 [Theory: 4 + Practical: 2]

FM: 75 [Theory: 40 (Term End) + 10 (Internal)], [Practical: 20 (Term End) + 5 (Internal)]

No. of Lectures: 60

1. Pathophysiology, Risk Factors, Signs, Symptoms, Syndromes, Diagnosis, and Dietary Management of different renal disorders: Chronic Kidney Disease (CKD), Acute Kidney Injury (AKI), Polycystic Kidney Disease (PKD), Glomerulonephritis, Diabetic Nephropathy, and Hypertensive Nephropathy; Concept of Dialysis
2. Overview of cardiovascular disease: types, risk factors, and prevalence; Pathophysiology of common cardiovascular conditions (e.g., coronary artery disease, hypertension); Nutritional Approaches for Cardiovascular Disease Prevention; Dietary Management of Specific Cardiovascular Conditions.
3. Introduction to Inborn Errors of Metabolism (IEM); Nutritional Assessment in IEM; Dietary Management Principles; Specific Nutritional Interventions; Nutritional considerations during infancy, childhood, and adulthood in individuals with IEM
4. Pathophysiology, Risk Factors, Signs and Symptoms, Diagnosis, and Dietary Management: Different Anemia; Hypothermia; Hyperthermia; Pancreatitis; Gout

- **Reference Books (Latest Edition):**

1. Dietetics by B Srilakshmi (New Age International Publishers)
2. Fundamentals of Foods, Nutrition and Diet Therapy by Sumati R (New Age International Publishers)
3. Advances In Diet Therapy: Practical Manual by V. Vimala (New Age International Publishers)
4. Williams' Basic Nutrition and Diet Therapy by Staci Nix (Elsevier)
5. Diet Planning Through the Life Cycle-Diet Therapy A Practical Manual by Veenu Seth. Kalyani Singh. Pulkit Mathur (Elite Publishing)
6. Nutrition and Diet Therapy by Linda Debruyne, Kathryn Pinna, Eleanor Whitney (Wadsworth Publishing Co Inc)

Course Code: FNT-M-P-3

Course Name: THERAPEUTIC NUTRITION-II (PRACTICAL)

Total Credit: 2

FM: 25 [20 (Term End) + 5 (Internal)]

No. of Lectures: 60

1. Menu planning and meal preparation for different cardiovascular disease; Label reading and grocery shopping tips for cardiovascular health; Behavior change strategies to promote dietary adherence and lifestyle modification.
2. Therapeutic Diet Chart Preparation for CKD, AKI, PKD, Glomerulonephritis, Diabetic Nephropathy, Nutritional Anemia, Hyperthermia, Gout, Diabetes Mellitus (Case Specific).
3. Training/Workshop/Short-Term Course from Nutrition and Dietetics/Nutrition and Public Health Department of any University/Research Institute/Community Science Centre/Rural Technology Department/Hospital Visit and Documentation of the work followed by Report Preparation.

- **Reference Books (Latest Edition):**

1. Advances In Diet Therapy: Practical Manual by V. Vimala (New Age International Publishers)
2. Diet Planning Through the Life Cycle Part 2- Diet Therapy A Practical Manual by Veenu Seth. Kalyani Singh. Pulkit Mathur (Elite Publishing),

MINOR COURSE

Course Code: FNT-MI-2

Course Name: NUTRITIONAL CHEMISTRY AND FOOD SCIENCE (PART-II) (THEORY)

Total Credit: 4

FM: 50 [Theory: 40 (Term End) + 10 (Internal)]

No. of Lectures: 60

1. Fat-soluble vitamin: Physiological role, dietary sources and deficiency disorders.
2. Water-soluble vitamin: Physiological role, dietary sources and deficiency disorders.
3. Role of Minerals (Ca, Fe, Na, K, I, Zn, Mn, Mg, Co) and micronutrients: Physiological role, dietary sources and deficiency disorders.
4. Minimum nutritional requirement and RDA: Formulation of RDA, dietary guidelines with reference to man and woman.
5. Energy in human nutrition: Energy and its unit, Energy assessment and balance, Factors of energy requirement, BMR and its regulation, SDA of food.
6. Clinical assessment and sign of nutrient deficiency disorders: Protein energy malnutrition (PEM), Anemia, Rickets, Goiter, Vitamin A, Vitamin C and Vitamin B-complex.

- **Reference Book (Latest Edition):**

1. Food Science by B Srilakshmi (New Age International Publishers)
2. Food Science and Nutrition by Sunetra Roday (Oxford University Press)
3. Textbook of Food Science and Technology by Sharma A (CBS Publishers)
4. Biochemistry by Debajyoti Das (Academic Publishers)
5. Harper's Illustrated Biochemistry By Victor W. Rodwell, David Bender, Kathleen M. Botham, Peter J. Kennelly, P. Anthony Weil (McGraw-Hill Education)
6. Lehninger Principles of Biochemistry By David L. Nelson, Michael Cox (W.H.Freeman & Co Ltd)

MULTI-DISCIPLINARY COURSE

Course Code: FNT-MDC-3

Course Name: LIFE STYLE DISEASES & NUTRITION INTERVENTION

Total Credit: 3

FM: 45 [Theory: 35 (Term End) + 10 (Internal)]

No. of Lectures: 45

1. Overview of lifestyle diseases: Definition, classification, and prevalence; Epidemiology and risk factors associated with lifestyle-related diseases; Role of nutrition in the prevention and management of chronic diseases; Dietary patterns and their impact on health outcomes.
2. Etiology and health consequences of obesity and metabolic syndrome; Nutrition interventions for weight management and metabolic health; Types of diabetes mellitus: Type I, Type II, and gestational diabetes; Medical nutrition therapy for diabetes prevention and management.
3. Risk factors and pathophysiology of cardiovascular diseases; Coronary artery disease (CAD), Hypertension (high blood pressure), Rheumatic heart disease, Cardiomyopathy; Dietary strategies for promoting healthy cardiovascular system and reducing cardiovascular risk.
4. Designing nutrition interventions for lifestyle disease, prevention and management; Evaluation methods for assessing the effectiveness of nutrition interventions; Case studies and research analysis: Application of nutrition interventions in real-world settings.

- **Reference Books (Latest Edition):**

1. Cardiovascular Nutrition: Disease Management and Prevention by Jo Ann S. Carson, Taylor C. Wallace (CRC Press)
2. Nutrition and Heart Disease: Causation and Prevention by Ronald Ross Watson, Victor R. Preedy (CRC Press)
3. Nutrition and Cardiovascular Disease by Willett, Walter C. (Oxford University Press)
4. Cardiovascular Disease: Diet, Nutrition and Emerging Risk Factors by Ronald Ross Watson, Victor R. Preedy (Wiley-Blackwell)
5. Nutrition in the Prevention and Treatment of Disease by Ann M. Coulston, Carol J. Boushey, Mario Ferruzzi (Academic Press)

SKILL ENHANCEMENT COURSE

Course Code: FNT-SEC-3A

Course Name: ENTREPRENEUR & SMALL CATERING UNIT

Total Credit: 3

FM: 45 [35 (Term End) +10 (Internal)]

No. of Lectures: 45

- **Theoretical Background:**

1. Definition and characteristics of entrepreneurship; Importance of entrepreneurship in the food service industry; Entrepreneurial mindset and skills development; Business planning process: Vision, mission, goals, and objectives; Legal aspects of starting a small catering unit; Organizational structure and management functions
2. Market analysis and segmentation; Branding and positioning strategies; Promotional tactics: Advertising, social media, and customer engagement; Basics of financial accounting and record keeping; Budgeting and financial forecasting; Pricing strategies and cost control measures.
3. Principles of menu planning: Seasonality, theme, dietary considerations; Cost analysis and pricing strategies for catering menus; Menu customization and client consultation
4. Kitchen layout and equipment selection for catering operations; Production scheduling and workflow optimization; Inventory control and supplier management; Understanding client needs and expectations; Communication skills for catering staff; Handling customer complaints and feedback

- **Practical Assessment:**

1. Form groups of 3-4 students per group. Each group will be responsible for planning and executing a catering event. Choose a theme for the catering event (e.g., wedding reception, corporate luncheon, cocktail party, birthday celebration). Develop a detailed catering plan that includes the following components: Menu, Budget, Timeline, Logistics, Marketing, and Customer Service. After the event, each group will submit a comprehensive report that includes the following: Evaluation, Financial Analysis, and Lessons Learned. Each group will deliver a presentation summarizing their catering event experience, highlighting key findings, and sharing insights with the class.
2. Market survey for food items both raw and processed.
3. Survey of food service units.
4. Planning menus for the following: Packed meals for office employees; Nutritious tiffin's for school children; School/college canteen
5. Develop a checklist for good hygiene practices

- **Reference Books (Latest Edition):**

1. Foodservice Management: Principles and Practices by June Payne-Palacio and Monica Theis (Pearson)

2. Introduction to Foodservice by June Payne-Palacio and Monica Theis (Pearson)
3. Foodservice Organizations: A Managerial and Systems Approach by Mary Gregoire and Laurie K. Kennedy (Pearson)
4. Food and Beverage Service: A Training Manual by Sudhir Andrews (Tata McGraw-Hill Education)
5. Food Service Management: Principles and Practices by Anita Tull and Dennis Lillicrap (Hodder Education)

OR

Course Code: FNT-SEC-3B

Course Name: CULINARY SCIENCES

Total Credit: 3

FM: 45 [35 (Term End) +10 (Internal)]

No. of Lectures: 45

- **Theoretical Background:**

1. Introduction to Culinary Sciences; Introduction to the scientific method in culinary research; Historical perspectives on the intersection of science and cooking.
2. Food Physics; Principles of heat transfer in cooking: Conduction, convection, and radiation; Physical properties of food: Texture, viscosity, and elasticity; Experimentation with heat transfer methods and their effects on food texture and quality.
3. Introduction to molecular gastronomy: Techniques and applications; Molecular gastronomy experiments: Spherification, foams, gels, and emulsions; Hands-on lab: Creating molecular gastronomy dishes and exploring culinary innovation.
4. Application of scientific principles in recipe development and menu planning; Culinary demonstration: Applying scientific techniques to classic and contemporary dishes; Group cooking project: Designing and preparing a themed menu incorporating scientific concepts; Exploration of current trends and innovations in the culinary industry.

- **Practical Assessment:**

1. Knife Skills and Basic Cooking Techniques; Cutting techniques: Chop, dice, slice, and julienne; Basic cooking methods: Sautéing, roasting, grilling, and boiling
2. Sauce Making and Flavor Development; Foundations of sauce making: Roux, béchamel, velouté, and tomato sauce; Flavor balancing and seasoning techniques; Practical exercises: Preparing and pairing sauces with dishes.
3. Baking Essentials: Doughs and Batters; Introduction to baking ingredients and their functions; Dough preparation techniques: Yeast dough, pastry dough, and quick breads; Batters: Pancake batter, cake batter, and muffin batter

4. Pastry Making and Dessert Basics; Pastry doughs: Shortcrust pastry, puff pastry, and choux pastry; Introduction to dessert components: Custards, creams, and fruit fillings; Practical sessions: Making pies, tarts, and éclairs
5. Culinary Showcase and Final Assessment; Culinary showcase: Presentation of signature dishes and baked goods; Final assessment: Practical cooking and baking exam; Course reflections and feedback

- **Reference Books (Latest Edition):**

1. On Cooking: A Textbook of Culinary Fundamentals by Sarah R. Labensky, Alan M. Hause, and Priscilla A. Martel (Pearson)
2. The Professional Chef by The Culinary Institute of America (CIA) (Wiley)
3. Culinary Arts Principles and Applications by Michael J. McGreal (Pearson)
4. Baking and Pastry: Mastering the Art and Craft by The Culinary Institute of America (CIA) (Wiley)
5. Professional Baking by Wayne Gisslen (Wiley)
6. Culinary Fundamentals by American Culinary Federation (Pearson)

SEMESTER-IV

Course Structure

SEMESTER IV

Course Code	Course Title	Nature of Course	Credit of Course	Evaluation		Total
				Internal	Semester End	
FNT-M-4.1	Food Microbiology	Major	6	15	60	75
FNT-M-4.2	Community Nutrition & Epidemiology	Major	6	15	60	75
FNT-MI-2	Nutritional Chemistry & Food Science (Part-II)	Minor	4	10	40	50
AECC-2	Modern Indian Language	Ability Enhancement Course	4	10	40	50
FNT-SI-2	Summer Internship (Additional for Certificate/Diploma)	Summer Internship	4			
04			**20**	**50**	**200**	**250**

MAJOR COURSE

Course Code: FNT-M-T-4.1

Course Name: FOOD MICROBIOLOGY (THEORY)

Total Credit: 6 [Theory: 4 + Practical: 2]

FM: 75 [Theory: 40 (Term End) + 10 (Internal)], [Practical: 20 (Term End) + 5 (Internal)]

No. of Lectures: 60

1. Basic concepts in microbiology; Microbial cell structure and function; Classification and taxonomy of microorganisms; Growth and reproduction of microorganisms; Laboratory techniques in microbiology; Overview of common foodborne bacteria (e.g., Salmonella, *Escherichia coli*, *Listeria monocytogenes*, *Staphylococcus aureus*, *Campylobacter jejuni*, *Clostridium botulinum*, *Clostridium perfringens*, *Bacillus cereus*, *Vibrio cholerae*, Shigella spp.); Mechanisms of pathogenicity and infection; Sources and transmission of foodborne bacteria; Epidemiology of foodborne bacterial diseases; Detection and enumeration of foodborne bacteria.
2. Definition and significance of food spoilage; Differences between spoilage and pathogenic microorganisms; Types of Spoilage Microorganisms: Bacteria (Pseudomonas spp., Lactobacillus, Acetobacter, etc.), Molds (Penicillium, Aspergillus, Fusarium, etc.), Yeasts (Saccharomyces, Candida, etc.); Factors Affecting Microbial Growth in Food; Common Spoilage Processes in Different Food Products: Dairy spoilage, Meat spoilage, Poultry spoilage, Seafood spoilage, Fruits and vegetables, Bakery products, Canned foods; Prevention and control of Food Spoilage; Gut Microbes; Symbiosis.
3. The importance of controlling microorganisms in food; Overview of different methods used for microbial control in the food industry; Physical Methods of Microbial Control: Pasteurization, Sterilization, Refrigeration and Freezing, Drying and Dehydration, Filtration, and Irradiation
4. Introduction to Microbial Culturing; Types of Culture Media; Aseptic Technique and Inoculation Methods; Isolation and Enumeration of Microorganisms; Subculturing and Maintenance of Microbial Cultures; Characterization and Identification of Microorganisms; Applications of Microbial Cultures in Food Industry.

- **Reference Books (Latest Edition):**

1. Microbiology: Principles and Explorations by Jacquelyn G. Black (John Wiley & Sons).
2. Prescott's Microbiology by Joanne Willey, Linda Sherwood, and Christopher J. Woolverton (McGraw-Hill Education).
3. Microbiology: An Introduction by Gerard J. Tortora, Berdell R. Funke, and Christine L. Case (Pearson).
4. Medical Microbiology by Patrick R. Murray, Ken S. Rosenthal, and Michael A. Pfaller (Elsevier).
5. Microbiology: Principles and Explorations by Jacquelyn G. Black (John Wiley & Sons).
6. Food Microbiology: Fundamentals and Frontiers by Michael P. Doyle, Robert L. Buchanan, and Adrianus W. F. Debont (ASM Press).

7. Microbiology: An Introduction by Gerard J. Tortora, Berdell R. Funke, and Christine L. Case (Pearson)
8. Food Microbiology: Principles into Practice by M.R. Adams and M.O. Moss (John Wiley & Sons)
9. Fundamentals of Food Microbiology by Bibek Ray (CRC Press)
10. Brock Biology of Microorganisms by Michael T. Madigan, Kelly S. Bender, Daniel H. Buckley, and W. Matthew Sattley (Pearson).

Course Code: FNT-M-P-4.1

Course Name: FOOD MICROBIOLOGY (PRACTICAL)

Total Credit: 2

FM: 25 [20 (Term End) + 5 (Internal)]

No. of Lectures: 60

1. Preparation of liquid (broth) and solid media Slant and Stab.
2. Microbiological techniques: Pure culture technique-Spread plate, Pour plate and Streak plate; Staining-Simple stain, Differential stain (Gram stain).
3. Biochemical tests for characterization: (catalase, nitrate-reduction, indole production, methyl red and voges-Proskauer test), Sugar fermentation test, IMViC reaction.
4. Microbiological examination of milk and milk product (Methylene blue reduction test).
5. Daily record of laboratory practical book

- **Reference Books (Latest Edition):**

1. Food Microbiology: Laboratory Manual by Karen Davis, Mary A. Oyarzabal, and Lindy Miller (CRC Press)
2. Experiments in Microbiology, Plant Pathology and Biotechnology by K.R. Aneja (New Age International Publishers)
3. Microbiology: Laboratory Theory & Application by Michael J. Leboffe and Burton E. Pierce (Morton Publishing Company)
4. A Laboratory Textbook of Microbiology by S.K. Rai (Rastogi Publications)
5. Experiments in Microbiology, Immunology, and Biotechnology by Ramesh Maheshwari (Wiley-Blackwell)

MAJOR COURSE

Course Code: FNT-M-T-4.2

Course Name: COMMUNITY NUTRITION & EPIDEMIOLOGY (THEORY)

Total Credit: 6 [Theory: 4 + Practical: 2]

FM: 75 [Theory: 40 (Term End) + 10 (Internal)], [Practical: 20 (Term End) + 5 (Internal)]

No. of Lectures: 60

1. Introduction to epidemiological concepts and methods; Principles of public health nutrition; Historical perspective and evolution of community nutrition; Concept of population and Community: Definition and characteristic features of population, Concept of community and community health, types of community; Factors affecting health of community: Environmental, social, political, cultural and economic.
2. Strategies for promoting healthy eating habits; Community-based nutrition education programs; Policy approaches to improve food environments; Community water and waste management: Source of water, safe drinking water,
3. Nutritional problems in community: Etiology, Clinical signs and management-Kwashiorkor, Marasmus, Goiter, Nutritional anemia, and Diarrhea; Concept of Disease: Endemic, Epidemic, Pandemic, Acute and Chronic, Incubation period and Quarantine period; Communicable and Non-communicable diseases; Zoonosis, Epizootic and Enzootic; Seasonal Diseases; Types and causes of malnutrition (undernutrition, overnutrition); Global and national trends in malnutrition; Social determinants of malnutrition.
4. Principles of Epidemiology: Epidemiological study-Descriptive and Analytical; Factors that Influence the Epidemiology of Disease; Study designs in nutritional epidemiology (cross-sectional, case-control, cohort); Measures of association (odds ratio, relative risk); Causal inference in nutrition research; Rate of Disease-associated in a Population: Attack rate, Mortality and Morbidity rate, Co-morbidity; Prevalence and Incidence of a disease.

- **Reference Books (Latest Edition):**

1. Community Nutrition in Action: An Entrepreneurial Approach by Marie A. Boyle and David H. Holben (Cengage Learning)
2. Nutritional Epidemiology by Walter Willett (Oxford University Press)
3. Epidemiology: Beyond the Basics by Moyses Szklo and Javier Nieto (Jones & Bartlett Learning)
4. Public Health Nutrition: Principles and Practice by Mark Lawrence and Tony Worsley (Allen & Unwin)
5. Community Nutrition for Developing Countries by Norman J. Temple, Shiriki Kumanyika, and Tracey Ledoux (CRC Press)
6. Textbook of Community Medicine: Preventive and Social Medicine by K. Park (Banarsidas Bhanot Publishers)

7. Community Nutrition: Planning Health Promotion and Disease Prevention by Sanjiv Kumar (Jaypee Brothers Medical Publishers)
8. Nutritional Epidemiology: Practical Guidelines for Healthy Eating and Disease Prevention by S.N. Singh (New Age International Publishers)
9. Public Health Nutrition in Developing Countries by Shilpa Shrivastava and Sunita Mittal (Jaypee Brothers Medical Publishers)
10. Epidemiology for Public Health by Sunil Kumar Raina and Raman Chauhan (Jaypee Brothers Medical Publishers)

Course Code: FNT-M-P-4.2

Course Name: COMMUNITY NUTRITION & EPIDEMIOLOGY (PRACTICAL)

Total Credit: 2

FM: 25 [20 (Term End) + 5 (Internal)]

No. of Lectures: 60

1. Microbiological examination of water (drinking water, supply water & pond water):

a) Presumptive test

b) Confirmatory test

c) Completed test for coliform

d) Determination of MPN index.

2. Visit to old age home / ICDS Centre / Nutrition Rehabilitation Centre (NRC) / Slum area / Any public place and Report Preparation on nutritional status and health concern (In any area at least 8-10 case studies to be done).

Or

Visit to a Rural Technology Centre/Community Welfare Centre and field report preparation.

3. Daily record of laboratory note book and submission of field study report

- **Reference Books (Latest Edition):**

1. Community Nutrition Assessment: Methods and Tools for the Practitioner by Mary Litchford (Jones & Bartlett Learning)
2. Practical Epidemiology: Tools for Public Health and Community Nutrition Professionals by Susan West and David B. Sarwer (Springer)
3. Handbook of Epidemiology: With Multiple Case Studies by Sudhir Kumar Jain (Jaypee Brothers Medical Publishers)
4. Community Nutrition: A Handbook for Health and Social Workers by Anne Baeseman and Barbara F. Leach (Jones & Bartlett Learning)

5. Nutrition Epidemiology: Issues and Challenges in Public Health by Raghupathi Raj and G. R. Sridhar (CRC Press)
6. Community Nutrition: Planning Health Promotion and Disease Prevention by Sanjiv Kumar (Jaypee Brothers Medical Publishers)
7. Nutrition and Health: A Public Health Perspective by Raghupathi Raj (Orient BlackSwan)
8. Public Health Nutrition in India: A Practical Guide by Archna Singh and Manisha Sahay (Elsevier India)
9. Community Nutrition for India by M. Gopalan (National Institute of Nutrition, India)
10. Nutrition in Public Health: Principles, Policies, and Practice by Archna Singh and Vishwa Mohan Katoch (Elsevier India)

MINOR COURSE

Course Code: FNT-MI-2

Course Name: NUTRITIONAL CHEMISTRY AND FOOD SCIENCE (PART-II) (THEORY)

Total Credit: 4

FM: 50 [Theory: 40 (Term End) + 10 (Internal)]

No. of Lectures: 60

1. Fat-soluble vitamin-Physiological role, dietary sources and deficiency disorders.
2. Water-soluble vitamin- Physiological role, dietary sources and deficiency disorders.
3. Role of Minerals (Ca, Fe, Na, K, I, Zn, Mn, Mg, Co) and micronutrients: Physiological role, dietary sources and deficiency disorders.
4. Minimum nutritional requirement and RDA: Formulation of RDA, dietary guidelines with reference to man and woman.
5. Energy in human nutrition: Energy and its unit, Energy assessment and balance, Factors of energy requirement, BMR and its regulation, SDA of food.
6. Clinical assessment and sign of nutrient deficiency disorders: Protein energy malnutrition (PEM), Anemia, Rickets, Goiter, Vitamin A, Vitamin C and Vitamin B-complex.

- **Reference Book (Latest Edition):**

1. Food Science by B Srilakshmi (New Age International Publishers)
2. Food Science and Nutrition by Sunetra Roday (Oxford University Press)
3. Textbook of Food Science and Technology by Sharma A (CBS Publishers)
4. Biochemistry by Debajyoti Das (Academic Publishers)
5. Harper's Illustrated Biochemistry By Victor W. Rodwell, David Bender, Kathleen M. Botham, Peter J. Kennelly, P. Anthony Weil (McGraw-Hill Education)
6. Lehninger Principles of Biochemistry By David L. Nelson, Michael Cox (W.H.Freeman & Co Ltd)

SEMESTER-V

Course Structure

SEMESTER V

Course Code	Course Title	Nature of Course	Credit of Course	Evaluation		Total
				Internal	Semester End	
FNT-M-5.1	Immunology & Food Toxicology	Major	6	15	60	75
FNT-M-5.2	Clinical Nutrition & Critical Care Management	Major	6	15	60	75
FNT-MI-3	Practical on Food Sciences	Minor	4	10	40	50
	Other/Separate Subject	Minor	4	10	40	50
04			**20**	**50**	**200**	**250**

MAJOR COURSE

Course Code: FNT-M-T-5.1

Course Name: IMMUNOLOGY & FOOD TOXICOLOGY (THEORY)

Total Credit: 6 [Theory: 4 + Practical: 2]

FM: 50 [Theory: 40 (Term End) + 10 (Internal)], [Practical: 20 (Term End) + 5 (Internal)]

No. of Lectures: 60

1. Basic concept of immunity, Types of immunity-Naturally acquired active and passive immunity, artificially acquired active and passive immunity; Mechanisms, the antigens and antibodies-their structure, immunoglobulin isotypes-IgG, IgM, IgA, IgD, and IgE; Types of effector T cells, mechanisms of cell mediated immunity.
2. Definition and scope of food toxicology; Basic principles of toxicology: Dose-response relationship, exposure assessment, and risk characterization; Classification of chemical contaminants in food: Naturally occurring toxins, food additives, pesticides, heavy metals, and environmental pollutants; Toxicokinetics and toxicodynamics of chemical hazards
3. Foreign objects and contaminants: Glass, metal, plastic, and other physical hazards; Mechanisms of injury and risk mitigation strategies; Factors influencing toxicity: Age, gender, genetics, and nutritional status
4. Principles of risk assessment: Hazard identification, exposure assessment, toxicity assessment, and risk characterization; Risk management strategies: Prevention, monitoring, and regulatory control measures; Management of poisoned patients, clinical methods to decrease absorption and enhance excretion of toxicants from the body use of antidotes.

- **Reference Books (Latest Edition):**

1. Kuby Immunology by Judy Owen, Jenni Punt, Sharon Stranford (W. H. Freeman).
2. Janeway's Immunobiology by Kenneth Murphy, Casey Weaver (Garland Science).
3. Basic Immunology: Functions and Disorders of the Immune System by Abul K. Abbas, Andrew H. Lichtman, Shiv Pillai (Elsevier).
4. Principles of Food Toxicology by ATõnu Püssa (CRC Press).
5. Food Toxicology: Principles and Concepts by José L. Domingo (CRC Press).
6. Introduction to Food Toxicology by Takayuki Shibamoto, Leonard F. Bjeldanes (Academic Press).

Course Code: FNT-M-P-5.1

Course Name: IMMUNOLOGY & FOOD TOXICOLOGY (PRACTICAL)

Total Credit: 2

FM: 25 [20 (Term End) + 5 (Internal)]

No. of Lectures: 60

1. Determination of benzoic acid in food samples by Modified Mohler's Test (Qualitative) and Titrimetric methods
2. Determination of aspartame content in food samples by UV Spectrophotometric methods.
3. Identification of Food Colors by Paper Chromatography
4. Detection of Sucrose, Starch, Urea in milk
5. Detection of Formaldehyde in milk
6. Detection of Lead Salts, Aniline Dyes, Chalk Powder, Added Starchin Turmeric Powder
7. Detection of adulterants in edible oil
8. Alkaline Phosphatase Test for Checking Efficiency of Pasteurization Liquid Milk

MAJOR COURSE

Course Code: FNT-M-T-5.2

Course Name: CLINICAL NUTRITION & CRITICAL CARE MANAGEMENT (THEORY)

Total Credit: 6 [Theory: 4 + Practical: 2]

FM: 50 [Theory: 40 (Term End) + 10 (Internal)], [Practical: 20 (Term End) + 5 (Internal)]

No. of Lectures: 60

1. Fundamentals of Clinical Nutrition, Introduction to Clinical Nutrition: Definitions, importance, and goals; Assessment of Nutritional Status: Tools and techniques for nutritional assessment in critically ill patients; Macronutrients and Micronutrients: Overview, functions, and requirements; Nutritional Requirements in Critical Care: Energy requirements, protein needs, and special considerations; Case Studies: Analysis of nutritional management in various critical care scenarios.
2. Nutrition Support in Critical Care; Enteral Nutrition (EN): Indications, contraindications, formulations, and administration; Parenteral Nutrition (PN): When EN is not feasible, components of PN, risks, and monitoring; Transitioning Between EN and PN: Protocols and considerations; Nutrition for Specific Conditions: Burns, trauma, surgery, and sepsis.
3. Critical Care Nutrition; Nutritional Physiology in Critical Illness: Understanding metabolic changes during critical illness, including hypermetabolism and the stress response; Energy Balance and Nutrient Utilization: Calculating energy expenditure and adjusting nutrient intake based on metabolic demands; Specialized Nutritional Formulations: Tailoring nutrition for conditions such as acute renal failure, liver failure, and respiratory distress; Integration of Nutritional Care with Overall Management: Coordinating nutrition with medical and pharmacological treatments; Nutrition in Prolonged Critical Illness: Managing long-term ICU patients, preventing muscle wasting, and strategies for rehabilitation.
4. Monitoring and Managing Nutritional Therapy; Monitoring Nutritional Intake and Status: Biomarkers, clinical outcomes, and patient feedback; Complications of Nutritional Support: Recognition and management; Drug-Nutrient Interactions: Common interactions and their management in critical care; Ethical Considerations in Nutritional Support: End-of-life care, consent, and patient autonomy.

- **Reference Books (Latest Edition):**

1. Clinical Nutrition and Dietetics by Mannu Rajput (Oxford University Press, New Delhi, India)
2. Nutrition and Dietetics in Critical Care by Rita Rani (Jaypee Brothers Medical Publishers, New Delhi, India)
3. Textbook of Nutrition and Dietetics by Kumud Khanna (Allied Health Sciences, New Delhi, India)
4. Modern Nutrition in Health and Disease by A. Catharine Ross, Benjamin Caballero, Robert J. Cousins, Katherine L. Tucker, Thomas R. Ziegler (Lippincott Williams & Wilkins, Philadelphia, PA, USA)
5. Clinical Nutrition in Practice" by Nikolaos Katsilambros, Meropi D. Kontogianni, Evangelia Manglara, Kalliopi-Anna Poulia (Wiley-Blackwell, Oxford, USA)

6. ASPEN Clinical Guidelines: Nutrition Support in Adult Acute and Chronic Illness by American Society for Parenteral and Enteral Nutrition (ASPEN Publications, Silver Spring, MD, USA)

Course Code: FNT-M-P-5.2

Course Name: CLINICAL NUTRITION & CRITICAL CARE MANAGEMENT (PRACTICAL)

Total Credit: 2

FM: 25 [20 (Term End) + 5 (Internal)]

No. of Lectures: 60

1. Nutritional Assessment Techniques: Learning to perform anthropometric measurements, biochemical assessments, and clinical evaluations.
2. Workshop on Nutritional Tools: Training on the use of various tools and technologies for nutritional assessment, including software for diet analysis.
3. Simulation Lab on Enteral Feeding: Hands-on practice setting up and managing enteral feeding in a simulated environment (Demonstration).
4. Parenteral Nutrition Mixing and Administration: Practical sessions on the preparation and administration of parenteral nutrition solutions.
5. Case Studies on Special Populations: Developing and discussing nutritional plans for patients with specific needs (Burn, Infection, renal failure, liver disease, respiratory distress).

- **Reference Books (Latest Edition):**

1. Practical Aspects of Nutrition Support in Critical Care by Deepa Handu (Jaypee Brothers Medical Publishers, New Delhi, India)
2. Clinical Dietetics and Nutrition: With Practical Applications by Prema Ramachandran (Orient BlackSwan, Hyderabad, India)
3. Applied Nutrition and Dietetics by Gargi Datta (Thieme Medical and Scientific Publishers, New Delhi, India)
4. Handbook of Clinical Nutrition and Diet Therapy by Carol Rees Parrish (Elsevier Health Sciences, St. Louis, MO, USA)
5. Clinical Nutrition in Practice: An Evidence-Based Approach" by Nikolaos Katsilambros, Meropi D. Kontogianni (Wiley-Blackwell, Oxford, UK)
6. Practical Gastroenterology and Hepatology: Nutrition and Metabolism in Practice by Nicholas J. Talley, Keith D. Lindor, Hugo E. Vargas (Wiley-Blackwell, Oxford, UK)

MINOR COURSE

Course Code: FNT-MI-3

Course Name: PRACTICAL ON FOOD SCIENCES (PRACTICAL)

Total Credit: 4

FM: 50 [Theory: 40 (Term End) + 10 (Internal)]

No. of Lectures: 60

1. Qualitative Detection of Carbohydrate (Molisch Test, Benedict's Test, Iodine Test, Fehling's Test, Tollen's Test, Bial's Test, Seliwanoff's Test, Barfoed's Test, Phenylhydrazine Test), Non-Reducing Sugar (Hydrolysis Test or Inversion Test).
2. Quantitative Measurement of Carbohydrate (Benedict's Test, Glucose-Oxidase Test)
3. Qualitative Detection of Protein (Biuret, Ninhydrin, Xanthoproteic Test, Millon's Test).
4. Qualitative Detection of Fat (Solubility Test, Translucent Spot, Acrolein Test, Baudouin Test, Huble's Test)
5. Proximate analysis of different food products
6. Microbiological assessment of water, dairy and fruit products

- **Reference Books (Latest Edition):**

1. Food Analysis: Theory and Practice by Y. Pomeranz, C. E. Meloan (CBS Publishers, New Delhi, India).
2. Practical Manual of Food Science and Technology by Vijay Kumar Gupta (IK International Publishing House, New Delhi, India).
3. Food Analysis Laboratory Manual by S. Suzanne Nielsen (Springer, New York, NY, USA).
4. Practical Food Microbiology by Diane Roberts, Melody Greenwood (Wiley-Blackwell, Oxford, UK).

SEMESTER-VI

Course Structure

SEMESTER VI

Course Code	Course Title	Nature of Course	Credit of Course	Evaluation		Total
				Internal	Semester End	
FNT-M-6.1	Molecular Nutrition	Major	6	15	60	75
FNT-M-6.2	Food Processing & Preservation	Major	6	15	60	75
FNT-M-6.3	Food Technology & Food Packaging	Major	6	15	60	75
FNT-M-6.4	Outreach/Internship	Major	2			
03			**20**			

MAJOR COURSE

Course Code: FNT-M-T-6.1

Course Name: MOLECULAR NUTRITION (THEORY)

Total Credit: 6 [Theory: 4 + Practical: 2]

FM: 50 [Theory: 40 (Term End) + 10 (Internal)], [Practical: 20 (Term End) + 5 (Internal)]

No. of Lectures: 60

1. Nucleic acid: Bases, nucleosides and nucleotides; DNA structure: DNA double helix (Watson and Crick Model); Types of DNA and RNA, DNA and RNA as genetic material.
2. DNA replication: Semi-conservative replication, Basic mechanism of replication (Prokaryotes); Transcriptional unit and basic concept of transcription (Prokaryotes); Genetic code and basic mechanism of translation (Prokaryotes).
3. Introduction to recombinant DNA techniques and their application; Basic concept of genomics, proteomics and metabolomics; Nutrigenomics and Nutrigenetics: Basic Concept.
4. Molecular mechanisms of obesity and diabetes, Nutritional modulation of the immune response, The role of nutrition in cancer biology.

- **Reference Books (Latest Edition):**

1. Molecular Biology: Principles and Practice by P.S. Verma (S. Chand Publishing, New Delhi, India)
2. Textbook of Molecular Biology by Chandra Shekhar Bhatia (Oxford University Press, New Delhi, India)
3. Nutrigenomics and Nutraceuticals: Clinical Relevance and Disease Prevention by Neelesh Sharma (CRC Press, New Delhi, India)
4. Molecular Basis of Nutrition and Aging: A Volume in the Molecular Nutrition Series by Rajkumar Rajendram, Victor R. Preedy, Vinood B. Patel (Elsevier India, New Delhi, India)
5. Molecular Biology of the Cell by Bruce Alberts, Alexander Johnson, Julian Lewis, Martin Raff, Keith Roberts, and Peter Walter (Garland Science, New York, NY, USA)
6. Molecular Biology: Principles of Genome Function by Nancy Craig, Rachel Green, Carol Greider, Gisela Storz, Cynthia Wolberger, and Orna Cohen-Fix (Oxford University Press, Oxford, UK)
7. Essentials of Molecular Biology" by George M. Malacinski (Jones and Bartlett Publishers, Sudbury, MA, USA)
8. Molecular Nutrition and Genomics: Nutrition and the Ascent of Humankind by Mark Lucock (Wiley-Blackwell, Oxford, USA)
9. Biochemical, Physiological, and Molecular Aspects of Human Nutrition by Martha H. Stipanuk, Marie A. Caudill (Elsevier Health Sciences, St. Louis, MO, USA)
10. Nutritional Biochemistry by Tom Brody (Academic Press, San Diego, CA, USA)

Course Code: FNT-M-P-6.1

Course Name: MOLECULAR NUTRITION (PRACTICAL)

Total Credit: 2

FM: 25 [20 (Term End) + 5 (Internal)]

No. of Lectures: 60

1. Demonstration of plasmid DNA isolation.
2. Demonstration of Agarose Gel electrophoresis.
3. Demonstration of PCR.
4. Demonstration of SDS-PAGE.
5. Exposure visit in Post Graduate Department of Food & Nutrition (University of Kalyani) laboratory of and documentation.

Note: Wherever lab experiments are not possible, the principles and concepts can be demonstrated through Post Graduate Department of Food & Nutrition (University of Kalyani).

- **Reference Books (Latest Edition):**

1. Laboratory Manual of Biotechnology by R.C. Dubey (S. Chand Publishing, New Delhi, India)
2. Practical Biochemistry & Molecular Biology by Rajeshwar P. Sinha (Narosa Publishing House, New Delhi, India).
3. Molecular Cloning: A Laboratory Manual by Joseph Sambrook, David W. Russell (Cold Spring Harbor Laboratory Press, Cold Spring Harbor, NY, USA).
4. Current Protocols in Molecular Biology edited by Frederick M. Ausubel, et al. (Wiley, Hoboken, NJ, USA).

MAJOR COURSE

Course Code: FNT-M-T-6.2

Course Name: FOOD PROCESSING & PRESERVATION (THEORY)

Total Credit: 6 [Theory: 4 + Practical: 2]

FM: 50 [Theory: 40 (Term End) + 10 (Internal)], [Practical: 20 (Term End) + 5 (Internal)]

No. of Lectures: 60

1. Introduction to Food Processing: Overview of the food processing industry, Basic principles of food preservation; Fundamentals of food spoilage: Classification of food based on pH; Definition-shelf life, perishable and semi perishable foods, shelf stable foods; Role of microorganisms in the spoilage of different kinds of food.
2. Physical Methods of Food Preservation; Heat processing (Principle, Types & Methods): pasteurization, sterilization, and canning; Refrigeration and freezing (Principle, Types & Methods); Drying and dehydration; Irradiation (Principle, Types & Methods); Filtration and centrifugation (Principle, Types & Methods).
3. Chemical and Biological Methods; Fermentation: principles and applications; Use of preservatives and additives; Edible coatings and films; High-pressure processing; Pulsed electric fields and ultrasound treatments.
4. Quality Control and Safety; Microbiological and chemical hazards in processed foods. Quality control tests and sensory evaluation; Emerging Technologies and Future Trends; Innovations in food processing and preservation; The role of nanotechnology in food science; Environmental impacts of food processing; Consumer trends and market dynamics.

- **Reference Books (Latest Edition):**

1. Fundamentals of Food Processing and Technology by B. Sivasankar (PHI Learning, New Delhi, India).
2. Food Processing and Preservation by S. Prasad (Anmol Publications Pvt Ltd, New Delhi, India).
3. Introduction to Food Engineering by R. Paul Singh, Dennis R. Heldman (Academic Press, San Diego, CA, USA).
4. Food Processing Technology: Principles and Practice" by P.J. Fellows (CRC Press, Boca Raton, FL, USA).
5. Principles of Food Sanitation" by Norman G. Marriott, Robert B. Gravani (Springer, NY, USA).

Course Code: FNT-M-P-6.2

Course Name: FOOD PROCESSING & PRESERVATION (PRACTICAL)

Total Credit: 2

FM: 25 [20 (Term End) + 5 (Internal)]

No. of Lectures: 60

1. Pasteurization of milk: Demonstration of the process and testing for microbial presence.

2. Canning of fruits and vegetables: Hands-on activity in canning various seasonal produce (Demonstration).
3. Refrigeration and freezing: Effects on microbial growth and food texture in various food samples (Demonstration).
4. Making ice cream: Understanding the principles of freezing point depression and overrun calculation.
5. Visit to Food Industry / Dairy Industry and Report Preparation (Special attention: Processing, Packaging, Preservation techniques, food plant sanitation and hygiene).

- **Reference Books (Latest Edition):**

1. Practical Manual of Food Science and Technology by Vijay Kumar Gupta (IK International Publishing House, New Delhi, India).
2. Practical Handbook on Food Processing and Preservation" by M. Premavalli (New Age International Publishers, New Delhi, India).
3. Food Analysis Laboratory Manual by S. Suzanne Nielsen (Springer, New York, NY, USA).
4. The Food Processing Handbook by James G. Brennan and Alistair S. Grandison (Wiley-Blackwell, Oxford, UK).

MAJOR COURSE

Course Code: FNT-M-T-6.3

Course Name: FOOD TECHNOLOGY & FOOD PACKAGING (THEORY)

Total Credit: 6 [Theory: 4 + Practical: 2]

FM: 50 [Theory: 40 (Term End) + 10 (Internal)], [Practical: 20 (Term End) + 5 (Internal)]

No. of Lectures: 60

1. Introduction to Food Technology: Key concepts and the role of food technology in processing fruits and vegetables; Handling and Pre-processing Operations: Techniques for washing, sorting, grading, and preparing raw materials; Overview of Processing Techniques: Blanching, pasteurizing, freezing, and drying specifically designed for fruits and vegetables.
2. Advanced Processing Techniques: Juicing, Concentration, and Fermentation: Methods for creating juices, concentrates, and fermented products like pickles and kimchi; Minimal Processing: Techniques for producing ready-to-eat and ready-to-cook products that retain freshness and nutritional value; Innovative Technologies: High-pressure processing, pulsed electric fields, and vacuum impregnation applied to fruit and vegetable processing.
3. Packaging Technologies: Different Packaging Syatem, Packing Materials, Traditional Packaging Systems: Containers, wraps, and bulk packaging typically used for fruits and vegetables; Modified Atmosphere Packaging (MAP): Techniques and benefits of using MAP for extending the shelf life of fresh produce; Active and Intelligent Packaging: Latest innovations in packaging that respond to environmental changes or enhance the preservation of packaged food.
4. Sustainability and Environmental Impact; Sustainable Packaging Materials: Use of biodegradable and recyclable materials in packaging design; Waste Reduction and Management: Strategies for reducing waste in the fruit and vegetable processing industry; Energy and Resource Efficiency: Practices to minimize energy and water usage during processing and packaging operations.

- **Reference Books (Latest Edition):**

1. Handbook of Postharvest Technology: Cereals, Fruits, Vegetables, Tea, and Spices by Amalendu Chakraverty, R. A. Mujumdar, G. S. Vijaya Raghavan, Hosahalli S. Ramaswamy (Asiatech Publishers, New Delhi, India).
2. Fruit and Vegetable Processing: Improving Quality by S. M. Bhatt (Woodhead Publishing India, New Delhi, India).
3. Postharvest Technology of Fruits and Vegetables: Handling, Processing, Fermentation, and Waste Management by L. R. Verma, V. K. Joshi (Indus Publishing, New Delhi, India).
4. Fruit and Vegetable Preservation: Principles and Practices by R. P. Srivastava, Sanjeev Kumar (International Book Distributing Co., Lucknow, India).
5. Packaging of Pharmaceuticals and Healthcare Products by S. B. Gupta (PHI Learning, New Delhi, India).

6. Food Packaging Technology by R. Coles, D. McDowell, M. J. Kirwan (Blackwell Publishing, Oxford, UK).
7. Food Packaging: Principles and Practice by Gordon L. Robertson (CRC Press, Boca Raton, FL, USA).
8. Innovations in Food Packaging by Jung H. Han (Academic Press, San Diego, CA, USA).
9. Principles and Applications of Modified Atmosphere Packaging of Foods by B. A. Blakistone (Blackie Academic & Professional, Glasgow, UK).

Course Code: FNT-M-P-6.3

Course Name: FOOD TECHNOLOGY & FOOD PACKAGING (PRACTICAL)

Total Credit: 2

FM: 25 [20 (Term End) + 5 (Internal)]

No. of Lectures: 60

1. Sorting and grading fruits and vegetables based on size, color, and ripeness.
2. Techniques for washing and peeling, focusing on minimizing waste.
3. Blanching small batches of vegetables and assessing the effects on color and texture (Demonstration).
4. Applying mild heat treatments to fruits for enzyme inactivation and testing their impact on shelf life (Demonstration).
5. Juice extraction from different types of fruits and measuring yield and clarity.
6. Creating dried fruit products using a simple dehydrator and evaluating the final product quality.
7. Performing basic sensory evaluation tests to assess taste, texture, and aroma of processed products.
8. Visit of State/National Food Processing Unit.

- **Reference Books (Latest Edition):**

1. Practical Manual on Food Processing and Preservation by N. Shakuntala Manay, M. Shadaksharaswamy (New Age International Publishers, New Delhi, India).
2. Handbook of Postharvest Technology: Cereals, Fruits, Vegetables, Tea, and Spices by Amalendu Chakraverty, R. A. Mujumdar, G. S. Vijaya Raghavan, Hosahalli S. Ramaswamy (Asiatech Publishers, New Delhi, India).
3. Postharvest Technology of Fruits and Vegetables: Handling, Processing, Fermentation, and Waste Management by L. R. Verma, V. K. Joshi (Blackwell Publishing, Oxford, UK).
4. Fruit and Vegetable Processing: Improving Quality by W. Jongen (Woodhead Publishing, Cambridge, UK).

SEMESTER-VII

Course Structure

SEMESTER VII

Course Code	Course Title	Nature of Course	Credit of Course	Evaluation		Total
				Internal	Semester End	
FNT-M-7.1	Basic Principles & Instrumentation for Food Processing Industry	Major	6	15	60	75
FNT-M-7.2	Maternal & Child Nutrition Development	Major	6	15	60	75
FNT-M-7.3	OMICS in Food & Nutrition	Major	6	15	60	75
FNT-MI-4	Nutritional Physiology	Minor	4	10	40	50
FNT-MI-5	Other/Separate Subject	Minor	4	10	40	50
5			**26**	**65**	**260**	**325**

MAJOR COURSE

Course Code: FNT-M-T-7.1

Course Name: BASIC PRINCIPLES & INSTRUMENTATION FOR FOOD PROCESSING INDUSTRY (THEORY)

Total Credit: 6 [Theory: 4 + Practical: 2]

FM: 50 [Theory: 40 (Term End) + 10 (Internal)], [Practical: 20 (Term End) + 5 (Internal)]

No. of Lectures: 60

1. Concept of energy, wavelength, wave numbers and frequency; Beer-Lambert law, light absorption and its transmittance; Theory of fluorescence, static and dynamic quenching, fluorescent probes in the study of protein and nucleic acids.
2. Sedimentation: Physical basis of centrifugation, Svedberg equation, differential and density gradient centrifugation, ultracentrifugation techniques.
3. Separation and identification of materials: Concept of chromatography-Mobile phase, Stationary phase, Partition chromatography, Absorption chromatography; Principal, Methods and Application-Paper chromatography, Thin layer chromatography (TLC), Gas liquid chromatography (GLC), High performance liquid chromatography (HPLC).
4. Flow cytometry: Basic principle of flow cytometry and cell sorting, detection strategies in flow cytometry.

- **Reference Books (Latest Edition):**

1. Food Analysis and Instrumentation by S. S. Kadam and D. K. Salunkhe (Oxford & IBH Publishing, New Delhi, India)
2. Principles of Food Analysis by N. S. Rathore and A. K. Chikara (New India Publishing Agency, New Delhi, India)
3. Techniques for Food Analysis by M. K. Basu (Wiley India, New Delhi, India)
4. Food Analysis by Suzanne Nielsen (Springer, New York, USA)
5. Instrumental Methods in Food and Beverage Analysis by D. L. Pyle (Elsevier, Amsterdam, Netherlands)
6. Principles and Techniques of Biochemistry and Molecular Biology by Keith Wilson and John Walker (Cambridge University Press, Cambridge, UK)
7. Handbook of Food Analytical Chemistry by Ronald E. Wrolstad (Wiley-Interscience, Hoboken, USA)

Course Code: FNT-M-P-7.1

Course Name: BASIC PRINCIPLES & INSTRUMENTATION FOR FOOD PROCESSING INDUSTRY (PRACTICAL)

Total Credit: 2

FM: 25 [20 (Term End) + 5 (Internal)]

No. of Lectures: 60

1. Demonstration on Instrument details, operation and maintenance:

a. Colorimeter/UV visible spectrophotometer.

b. Centrifuge machine (high speed and low speed).

c. High Performance Liquid Chromatography (HPLC).

d. Flow cytometry.

2. Exposure visits in Post Graduate Department of Food & Nutrition (University of Kalyani) laboratory and documentation.

Note: Wherever lab experiments are not possible, the principles and concepts can be demonstrated through Post Graduate Department of Food & Nutrition, University of Kalyani.

- **Reference Books (Latest Edition):**

1. Food Analysis and Instrumentation by S. S. Kadam and D. K. Salunkhe (Oxford & IBH Publishing, New Delhi, India).
2. Principles of Food Analysis by N. S. Rathore and A. K. Chikara (New India Publishing Agency, New Delhi, India).
3. Techniques for Food Analysis by M. K. Basu (Wiley India, New Delhi, India).
4. Principles and Techniques of Biochemistry and Molecular Biology by Keith Wilson and John Walker (Cambridge University Press, Cambridge, UK).
5. Food Analysis by Suzanne Nielsen (Springer, New York, USA).
6. Instrumental Methods in Food and Beverage Analysis by D. L. Pyle (Elsevier, Amsterdam, Netherlands)
7. Flow Cytometry: First Principles by Alice Longobardi Givan (Wiley-Liss, Hoboken, USA).

MAJOR COURSE

Course Code: FNT-M-T-7.2

Course Name: MATERNAL & CHILD NUTRITION DEVELOPMENT (THEORY)

Total Credit: 6 [Theory: 4 + Practical: 2]

FM: 50 [Theory: 40 (Term End) + 10 (Internal)], [Practical: 20 (Term End) + 5 (Internal)]

No. of Lectures: 60

1. Introduction to Maternal and Child Nutrition: Importance of nutrition during pregnancy and early childhood, Global and local nutritional challenges; Nutritional Requirements During Pregnancy and Lactation: Macronutrients and micronutrients, Physiological changes and their nutritional implications; Maternal Nutrition and Fetal Development: Impact of maternal diet on fetal growth and development, Critical periods of development; Assessment of Nutritional Status: Methods for assessing dietary intake and nutritional status, Biomarkers and clinical assessments
2. Infant Feeding Practices: Breastfeeding: benefits, challenges, and guidelines, Formula feeding: types, preparation, and safety; Introduction to Complementary Feeding: Timing and methods of introducing solid foods, Nutritional requirements for infants and toddlers; Nutrition for Preschool and School-Age Children: Dietary guidelines and nutrient requirements, Role of nutrition in growth and cognitive development; Childhood Obesity and Malnutrition: Causes and consequences, Prevention and intervention strategies
3. Public Health Nutrition Programs: Overview of maternal and child nutrition programs globally and locally, Success stories and challenges; Nutritional Education and Counseling: Strategies for effective communication, Tools and techniques for nutrition education; Policies and Regulations: National and international policies affecting maternal and child nutrition, Role of government and NGOs; Monitoring and Evaluation of Nutrition Programs: Frameworks and indicators for evaluation, Case studies on program impact assessment
4. Nutrition and Infectious Diseases: Impact of infections on nutritional status, Nutritional management of common infectious diseases; Micronutrient Deficiencies: Prevalence and consequences of deficiencies in iron, vitamin A, iodine, and zinc, Strategies for prevention and treatment; Nutritional Challenges in Emergency Settings, Maternal and child nutrition in humanitarian crises, Planning and implementing nutrition interventions in emergencies; Innovations and Future Directions: Technological advances in nutrition assessment and intervention, Future research and emerging trends

- **Reference Books (Latest Edition):**

1. Textbook of Maternal and Child Health Nursing by M. Jayalakshmi (Jaypee Brothers Medical Publishers, New Delhi, India).
2. Textbook of Pediatric Nutrition by Veena Shatrugna (Parivar Prakashan, Mumbai, India).
3. Essentials of Pediatrics by O. P. Ghai (CBS Publishers, New Delhi, India).
4. Nutrition Through the Life Cycle by Judith E. Brown (Cengage Learning, Boston, USA).

5. Krause's Food & the Nutrition Care Process by L. Kathleen Mahan and Janice L. Raymond (Elsevier, St. Louis, USA).
6. Nutrition for Health, Fitness & Sport by Melvin H. Williams (McGraw-Hill Education, New York, USA).

Course Code: FNT-M-P-7.2

Course Name: MATERNAL & CHILD NUTRITION DEVELOPMENT (PRACTICAL)

Total Credit: 2

FM: 25 [20 (Term End) + 5 (Internal)]

No. of Lectures: 60

1. 24-Hour Dietary Recall of Pregnant Woman/New mother: Conduct and record a dietary intake over 24 hours to analyze nutrient consumption.
2. Making of Food Frequency Questionnaire (FFQ): Prepare a Food Frequency Questionnaire and discuss the results with a group.
3. Anthropometric Measurements of Pregnant Woman/New mother: Measure height and weight to calculate and interpret Body Mass Index (BMI) and assess different parameter.
4. Measure Mid-Upper Arm Circumference (MUAC): Measure a MUAC to assess nutritional status.
5. Formula Preparation: Prepare infant formula according to guidelines and discuss safe preparation and storage.
6. Homemade Baby Food Preparation: Prepare simple homemade baby food purees using common fruits and vegetables.
7. Menu Planning for Toddlers: Create a simple one-day meal plan for a toddler, ensuring it includes a variety of food groups.
8. Nutrition Education Materials: Create an educational flyer or poster on a topic such as the importance of breastfeeding or balanced diets for children.
9. Role-Playing Counseling Sessions: Pair up and practice nutrition counseling skills by role-playing scenarios such as advising a pregnant woman or a new mother.
10. Growth Monitoring: Use growth charts to plot and interpret the growth data of a hypothetical child.
11. Report Writing and Case Study Evaluation

- **Reference Books (Latest Edition):**

1. Maternal and Child Nutrition in India: Policy and Programmatic Responses by T. V. Sekher and Neelambar Hatti (Routledge, Abingdon, UK).
2. Nutrition in Children: Developing Country Concerns by P. N. Tandon, Sandhya Ghai, and I. C. Verma (CBS Publishers, New Delhi, India).
3. Textbook of Human Nutrition by M. S. Bamji, N. Pralhad Rao, and Vinodini Reddy (Oxford & IBH Publishing, New Delhi, India).

4. Nutrition and Metabolism in Pregnancy: Mother and Offspring by Pedro A. de Almeida and Lucilla Poston (CRC Press, Boca Raton, USA).
5. Maternal and Child Nutrition: The First 1,000 Days by J. Bhatia, F. Bhutta, S. Kalhan, and P. Makrides (Karger, Basel, Switzerland).
6. Handbook of Nutrition and Pregnancy by Carol J. Lammi-Keefe, Sarah C. Couch, and Elliot Philipson (Humana Press, New York, USA).

MAJOR COURSE

Course Code: FNT-M-T-7.3

Course Name: OMICS IN FOOD & NUTRITION (THEORY)

Total Credit: 6 [Theory: 4 + Practical: 2]

FM: 50 [Theory: 40 (Term End) + 10 (Internal)], [Practical: 20 (Term End) + 5 (Internal)]

No. of Lectures: 60

1. Introduction to OMICS Technologies in Food and Nutrition; Overview of OMICS Technologies: Definition and Scope of OMICS, Historical Development and Milestones; Genomics in Food and Nutrition: Basic concept DNA Sequencing and Analysis, Genomic Applications in Food Quality and Safety
2. Proteomics in Food and Nutrition; Basics of Proteomics: Protein Structure and Function, Techniques in Proteomics (Mass Spectrometry, 2D Gel Electrophoresis); Proteomic Applications, Proteomics in Nutritional Research
3. Nutrigenomics and Pharmacogenomics: Concept and applications.
4. Nucleic acid and Protein Data Bases, Nutrient data bases, Sequence similarity searching by BLAST, Principle, features and types of BLAST, Significance of Multiple Sequence Alignments, Phylogenetic Tree

- **Reference Books (Latest Edition):**

1. Genomics and Proteomics in Nutrition by P. K. Ghosh (McGraw Hill Education, New Delhi, India).
2. Molecular Nutrition: Principles and Practice by K. V. Peter (Orient Blackswan, Hyderabad, India).
3. Advances in Nutritional Genomics by R. K. Sharma (Narosa Publishing House, New Delhi, India).
4. Nutritional Genomics: Discovering the Path to Personalized Nutrition by Jim Kaput and Raymond L. Rodriguez (Wiley, Hoboken, USA).
5. Molecular Nutrition and Genomics: Nutrition and the Ascent of Humankind by Mark Lucock (Wiley-Blackwell, Hoboken, USA).
6. Omics Technologies and Bio-engineering: Towards Improving Quality of Life by Debmalya Barh, Vasco Azevedo, and Alok Pandey (Academic Press, London, UK).

Course Code: FNT-M-P-7.3

Course Name: OMICS IN FOOD & NUTRITION (PRACTICAL)

Total Credit: 2

FM: 25 [20 (Term End) + 5 (Internal)]

No. of Lectures: 60

The following practical be demonstrated through Post Graduate Department of Food & Nutrition, University of Kalyani.

1. DNA Extraction and Purification (Demonstration): Hands-on extraction of DNA from food samples, Purification and quality assessment using a spectrophotometer.

2. RNA Extraction and Purification (Demonstration): Extraction of RNA from plant or animal tissues, Quality assessment using gel electrophoresis

3. Protein Extraction and Quantification (Demonstration): Extraction of proteins from food samples, Quantification using Bradford assay or BCA assay.

4. Bioinformatics Tools (Demonstration): Introduction to bioinformatics tools (e.g., BLAST, STRING), Hands-on data analysis and interpretation.

- **Reference Books (Latest Edition):**

1. Laboratory Manual for Food Science, Nutrition and Dietetics by Sumati R. Mudambi and Rajagopal M. V. (New Age International Publishers, New Delhi, India).
2. Practical Manual of Biochemistry and Molecular Biology by R. C. Gupta (CBS Publishers, New Delhi, India).
3. Food Analysis and Instrumentation by S. S. Kadam and D. K. Salunkhe (Oxford & IBH Publishing, New Delhi, India).
4. Molecular Cloning: A Laboratory Manual by Michael R. Green and Joseph Sambrook (Cold Spring Harbor Laboratory Press, Cold Spring Harbor, USA).
5. Current Protocols in Food Analytical Chemistry by Wrolstad Ronald E. (Wiley, Hoboken, USA)
6. Laboratory Techniques in Biochemistry and Molecular Biology by Rodney F. Boyer (Academic Press, London, UK).
7. Food Analysis by Suzanne Nielsen (Springer, New York, USA).
8. Protein Purification: Principles and Practice by Robert K. Scopes (Springer, New York, USA).

MINOR COURSE

Course Code: FNT-MI-4

Course Name: NUTRITIONAL PHYSIOLOGY (THEORY)

Total Credit: 4

FM: 50 [Theory: 40 (Term End) + 10 (Internal)]

No. of Lectures: 60

1. Introduction to Nutritional Physiology; Overview of Nutritional Physiology: Definition and Scope, Importance in Health and Disease; Gastrointestinal Tract Anatomy and Physiology: Mechanisms of Digestion, Nutrient Absorption Processes
2. Metabolism and Energy Balance; Energy Balance and Expenditure: Thermogenesis; Physical Activity and Energy Expenditure; Regulation of Food Intake: Hormonal Regulation; Neural Control; Role of the Gut-Brain Axis
3. Nutritional Physiology in Health and Disease; Role of Nutrition in Chronic Diseases: Obesity, Diabetes Mellitus, Cardiovascular Diseases, Renal Diseases, Cancer (Pathophysiology, Nutritional management, Diet chart preparation; Nutrition and Immune Function: Nutrients and Immune System, Impact of Malnutrition on Immunity
4. Recent Advances in Nutritional Physiology; Nutrigenomics and Personalized Nutrition: Probiotics and Gut Health, Functional Foods and Bioactive Compounds.

Reference Books (Latest Edition):

1. Textbook of Nutrition and Dietetics by N. Shubhangini A. Joshi (Tata McGraw-Hill Education, New Delhi, India).

2. Human Physiology for B.Sc. Nursing Students by S. Manivannan (Jaypee Brothers Medical Publishers, New Delhi, India).

3. Principles of Human Nutrition by M. S. Bamji, N. P. Rao, and V. Reddy (Oxford & IBH Publishing, New Delhi, India).

4. Nutritional Physiology by Warren F. Dickerson (Springer-Verlag, New York, USA)

5. Human Nutrition and Dietetics by J. S. Garrow, W. P. T. James, and A. Ralph (Churchill Livingstone, New York, USA).

6. Modern Nutrition in Health and Disease by A. Catherine Ross, Benjamin Caballero, Robert J. Cousins, Katherine L. Tucker, and Thomas R. Ziegler (Lippincott Williams & Wilkins, Baltimore, USA).

SEMESTER-VIII

Course Structure

SEMESTER VIII

Course Code	Course Title	Nature of Course	Credit of Course	Evaluation		Total
				Internal	Semester End	
FNT-M-8.1	Statistical Application in Nutrition	Major	4	10	40	50
FNT-M-8.2	Nutritional Consideration for Athletes & Aging Individual	Major	4	10	40	50
FNT-M-8.3	Post-Harvest Technology of Fruits & Vegetables	Major	4	10	40	50
FNT-M-8.4	Literature Studies in Nutrition	Major	6	15	60	75
FNT-M-8.5	Research Ethics	Major	6	15	60	75
***FNT-M-8.4 & FNT-M-8.5* For Honours Without Research Student**						
FNT-M-8.6	**Research Project/Dissertation** Recent Advances in the Food & Nutrition (Hypothesis proposed, Protocol Designing, Methodology, Work Execution, Data Interpretation, Preparation of Report) Note: Students may opt to undertake the research on any chosen topic and complete their research within the Post Graduate Department of Food and Nutrition, University of Kalyani with prior permission from the department head and relevant authorities. This study aims to explore the role of various nutritional interventions in supporting and enhancing the human system, contributing to a deeper understanding of diet and health.		12		150	150
***FNT-M-8.6* For Honours with Research Students**						
5			**24**		**300**	**300**

MAJOR COURSE

Course Code: FNT-M-T-8.1

Course Name: STATISTICAL APPLICATION IN NUTRITION (THEORY)

Total Credit: 6 [Theory: 4 + Practical: 2]

FM: 50 [Theory: 40 (Term End) + 10 (Internal)], [Practical: 20 (Term End) + 5 (Internal)]

No. of Lectures: 60

1. Data and Data Types: Primary data and Secondary Data, Methods of data collection, presentation of data-diagrammatic and graphical.
2. Measures of Central Tendency: Mean, Median, Mode.Frequency distrubution, histogram plot
3. Dispersion: Range, Standard Deviation,Average deviation,Standard error of mean
4. Hypotheis: Concept and different types: null and alternate hypothesis,confidence interval
5. Hypothesis Testing: Chi-square Test, Student's t test, Corelation: product moment and Pearson's product moment correlation, Analysis of Variance (ANOVA): One way ANOVA only.

- **Reference Books (Latest Edition):**

1. Mahajan's Methods in Biostatistics For Medical Students and Research Workers by Arun Bhadra Khanal (Jaypee Brothers Medical Publishers, New Delhi, India).
2. Biostatistics: The Bare Essentials by Geoffrey Norman and David Streiner (BC Decker Inc, Hamilton, Canada).
3. Biostatistics for the Biological and Health Sciences with Statdisk: Pearson New International Edition by Marc M. Triola and Mario F. Triola (Pearson Education, United States).
4. Biostatistics: A Foundation for Analysis in the Health Sciences by Wayne W. Daniel and Chad L. Cross (Wiley, USA).
5. Essentials of Biostatistics in Public Health by Lisa M. Sullivan (Jones & Bartlett Learning, USA).
6. Essentials of Biostatistics & Research Methodology by Indranil Shah and Boddy Paul (Academic Publishers, New Delhi, India).

Course Code: FNT-M-P-8.1

Course Name: STATISTICAL APPLICATION IN NUTRITION (PRACTICAL)

Total Credit: 2

FM: 25 [20 (Term End) + 5 (Internal)]

No. of Lectures: 60

1. Computerized (MS Excel) presentation of bar diagram, histogram, line diagram, pie chart using various data.
2. Calculation and interpretation of a data sest using any of the following test: Student's t test, Chi square test, Correlation: product moment and Pearson's product moment correlation

- **Reference Books (Latest Edition):**

1. Mahajan's Methods in Biostatistics For Medical Students and Research Workers by Arun Bhadra Khanal (Jaypee Brothers Medical Publishers, New Delhi, India).
2. Biostatistics: The Bare Essentials by Geoffrey Norman and David Streiner (BC Decker Inc, Hamilton, Canada).
3. Biostatistics for the Biological and Health Sciences with Statdisk: Pearson New International Edition by Marc M. Triola and Mario F. Triola (Pearson Education, United States).
4. Biostatistics: A Foundation for Analysis in the Health Sciences by Wayne W. Daniel and Chad L. Cross (Wiley, USA).
5. Essentials of Biostatistics in Public Health by Lisa M. Sullivan (Jones & Bartlett Learning, USA).
6. Essentials of Biostatistics & Research Methodology by Indranil Shah and Boddy Paul (Academic Publishers, New Delhi, India).

MAJOR COURSE

Course Code: FNT-M-T-8.2

Course Name: NUTRITIONAL CONSIDERATION FOR ATHLETES & AGING INDIVIDUAL (THEORY)

Total Credit: 6 [Theory: 4 + Practical: 2]

FM: 50 [Theory: 40 (Term End) + 10 (Internal)], [Practical: 20 (Term End) + 5 (Internal)]

No. of Lectures: 60

1. Foundations of Nutrition for Health and Performance; Introduction to Nutritional Science: Overview of macronutrients, micronutrients, and water balance; Nutrition and Metabolism: How nutrients are processed in the body during different stages of life and physical activity; Dietary Requirements: Analyzing the energy, protein, fats, and carbohydrate needs of athletes and aging individuals; Assessment of Nutritional Status: Tools and techniques to evaluate nutritional health.
2. Specialized Nutrition for Athletes; Energy Expenditure and Replenishment: Optimizing energy intake according to training and competition schedules; Hydration Management: Importance of fluid balance and strategies to prevent dehydration; Ergogenic Aids and Supplements: Safe use of supplements and their regulatory status; Recovery Nutrition: Nutrient timing and meal planning to enhance recovery post-exercise.
3. Nutritional Strategies for Healthy Aging Process of Aging: Understanding how aging affects metabolism and nutrient utilization; Nutrient Needs for the Aging Body: Adjustments in dietary requirements due to changes in metabolism and physiological status; Preventing Nutrient Deficiencies: Managing common deficiencies in aging individuals; Diet and Chronic Disease Management: Role of nutrition in managing diseases like osteoporosis, hypertension, and diabetes; Cognitive Health and Nutrition: Link between diet, cognitive decline, and neurodegenerative diseases.
4. Applications and Case Studies; Gerontology: An introduction to the study of aging and its impacts; Diet Planning for Athletes and Seniors: Creating diet plans based on individual needs, preferences, and medical conditions; Interpreting Research and Current Trends: Evaluating the latest research and trends in nutrition for athletes and aging populations; Ethical and Cultural Considerations: Addressing ethical issues and respecting cultural differences in dietary practices; Case Studies: Applying theoretical knowledge to practical situations.

- **Reference Books (Latest Edition):**

1. Sports Nutrition by Ira Wolinsky, Judy A. Driskell (CRC Press, Florida, USA)
2. Nutritional Guidelines for Sportspersons by Geetanjali Bhide, Subhadra Mandalika (Jaypee Brothers Medical Publishers, New Delhi, India)
3. Exercise Physiology, Fitness and Sports Nutrition by Srilakshmi B, V Suganthi, C Kalaivani Ashok (New Age International Publishers, New Delhi, India

4. Textbook of Nutrition and Dietetics by Ranjana Mahna, Seema Puri, Kumud Khanna, Sharda Gupta, Santosh Jain Passi, Rama Seth
5. (Elite Publishing House, New Delhi, India)
6. Geriatric Nutrition: The Health Professional's Handbook by Ronni Chernoff (Jones and Bartlett Publishers, Massachusetts, USA)

Course Code: FNT-M-P-8.2

Course Name: NUTRITIONAL CONSIDERATION FOR ATHLETES & AGING INDIVIDUAL (PRACTICAL)

Total Credit: 2

FM: 25 [20 (Term End) + 5 (Internal)]

No. of Lectures: 60

1. Nutrient Composition Analysis: Analyse food nutrient profiles of different food groups using software (Open Source Software/Demonstration).
2. Diet Formulation: A tailored diet plans has to be formulated for athletes and elderly patients with specific health conditions.
3. Supplement Evaluation Exercises: Assessment and review various nutritional supplements.
4. Dietary Assessment Practical: Application of dietary assessment tools in clinical settings to evaluate and improve patient diets (Demonstration).
5. Meal Planning Session: Planing of weekly meals for case studies, considering nutritional needs and preferences.

Note: In laboratory note book, calculation of nutritive value should be recorded according to portion size of specific diet for particular individual.

- **Reference Books (Latest Edition):**

1. Sports Nutrition by Ira Wolinsky, Judy A. Driskell (CRC Press, Florida, USA)
2. Nutritional Guidelines for Sportspersons by Geetanjali Bhide, Subhadra Mandalika (Jaypee Brothers Medical Publishers, New Delhi, India)
3. Exercise Physiology, Fitness and Sports Nutrition by Srilakshmi B, V Suganthi, C Kalaivani Ashok (New Age International Publishers, New Delhi, India
4. Textbook of Nutrition and Dietetics by Ranjana Mahna, Seema Puri, Kumud Khanna, Sharda Gupta, Santosh Jain Passi, Rama Seth
5. (Elite Publishing House, New Delhi, India)
6. Geriatric Nutrition: The Health Professional's Handbook by Ronni Chernoff (Jones and Bartlett Publishers, Massachusetts, USA)

MAJOR COURSE

Course Code: FNT-M-T-8.3

Course Name: POST-HARVEST TECHNOLOGY OF FRUITS & VEGETABLES (THEORY)

Total Credit: 6 [Theory: 4 + Practical: 2]

FM: 50 [Theory: 40 (Term End) + 10 (Internal)], [Practical: 20 (Term End) + 5 (Internal)]

No. of Lectures: 60

1. Importance of fruits and vegetable, history and need of preservation, reasons of spoilage, method of preservation (short & long term); Classification of fruits and vegetables, general composition, enzymatic browning, names and sources of pigments. Pathological and chemical changes during the storage of fruits and vegetables.
2. Canning and Bottling of Fruits and Vegetables:Selection of fruits and vegetables, process of canning, factors affecting the process- time and temperature, containers of packing, lacquering, syrups and brines for canning, spoilage in canned foods.
3. Fruits Beverages: Introduction, Processing of fruit juices (selection, juice extraction, deaeration, straining, filtration and clarification), preservation of fruit juices (pasteurization, chemically preserved with sugars, freezing, drying, tetra-packing, carbonation)
4. Jams, Jellies and Marmalades; Jam: Constituents, selection of fruits, processing and technology. Jelly: Essential constituents (Role of pectin), Theory of jelly formation, processing and technology, defects in jelly. Marmalade-Types, processing and technology, defects; Pickles, Chutneys, Sauces and Tomato Products: Processing, Types, Causes of spoilage in pickling. Selection of tomatoes, pulping and processing of tomato juice, tomato puree, paste, ketchup, sauce and soup; Dehydration of Fruits and Vegetables: Drying and mechanical dehydration, process variation for fruits and vegetables, packing and storage.

- **Reference Books (Latest Edition):**

1. Postharvest Technology of Fruits and Vegetables by by Dr Sasi Kumar R (Biotech Books, New Delhi, India)
2. Postharvest Management and Processing of Fruits and Vegetables: Instant Notes by Satish K. Sharm (New India Publishing Agency, New Delhi, India)
3. Postharvest Technology of Tropical Fruits and Vegetables by Surajit Mitra (Astral International Pvt. Ltd, New Delhi, India)
4. Postharvest Technology and Food Process Engineering by Amalendu Chakraverty (CRC Press, Florida, USA)

Course Code: FNT-M-P-8.3

Course Name: POST-HARVEST TECHNOLOGY OF FRUITS & VEGETABLES (PRACTICAL)

Total Credit: 2

FM: 25 [20 (Term End) + 5 (Internal)]

No. of Lectures: 60

1. Assessment of Ripeness in Fruits and Vegetables: Learn methods to evaluate ripeness through physical and chemical properties.
2. Determination of Moisture Content: Use different methods to determine the moisture content in fruits and vegetables.
3. Measurement of Respiration Rates in Fruits: Measure and analyze the respiration rates of different fruits under various storage conditions (Demonstration).
4. Quality Assessment of Fresh Produce: Conduct quality assessments using sensory evaluation and instrumental measurements (Demonstration).
5. Jam and Jelly Preparation: Preparation of Fruit Jam, Learn the step-by-step process of making fruit jam, including selection of fruit, cooking, and preservation techniques.
6. Preparation of Fruit Jelly: Understand the process of making fruit jelly, focusing on pectin extraction, sugar concentration, and setting properties.
7. Preparation of Laboratory Note Book

- **Reference Books (Latest Edition):**

1. Postharvest Technology of Fruits and Vegetables by by Dr Sasi Kumar R (Biotech Books, New Delhi, India)
2. Postharvest Management and Processing of Fruits and Vegetables: Instant Notes by Satish K. Sharm (New India Publishing Agency, New Delhi, India)
3. Postharvest Technology of Tropical Fruits and Vegetables by Surajit Mitra (Astral International Pvt. Ltd, New Delhi, India)
4. Postharvest Technology and Food Process Engineering by Amalendu Chakraverty (CRC Press, Florida, USA)

MAJOR COURSE

Course Code: FNT-M-T-8.4

Course Name: LITERATURE STUDIES IN NUTRITION (THEORY)

Total Credit: 6 [Theory: 4 + Practical: 2]

FM: 50 [Theory: 40 (Term End) + 10 (Internal)], [Practical: 20 (Term End) + 5 (Internal)]

No. of Lectures: 60

1. Fundamental of research: Objectives, Types of research-Action research, Applied research, Experimental research, Steps of research.
2. Types of sampling, Design of Sampling, Characteristics of good sampling.
3. Research and academic activities: Concept and purpose - Seminar, Workshop, Conference, Symposium
4. Elementary concept of literature database: Google Scholar, Pubmed, Research gate and highwire press
5. Elementary concept of different format of referencing
6. Concept of research project and writing of research report.

Course Code: FNT-M-P-8.3

Course Name: LITERATURE STUDIES IN NUTRITION (PRACTICAL)

Total Credit: 2

FM: 25 [20 (Term End) + 5 (Internal)]

No. of Lectures: 60

1. Preparation and submission of a review report on the concept related to nutrition (Assessment to be done on the report submitted by the candidates).

MAJOR COURSE

Course Code: FNT-M-T-8.5

Course Name: RESEARCH ETHICS (THEORY)

Total Credit: 6 [Theory: 4 + Practical: 2]

FM: 50 [Theory: 40 (Term End) + 10 (Internal)], [Practical: 20 (Term End) + 5 (Internal)]

No. of Lectures: 60

1. Philosophy and Ethics: Introduction to Philosophy: definition, nature and scope, concept, branches, Ethics: Definition, moral philosophy, nature of moral judgments and reactions.
2. Scientific Conduct: Ethics with respect to science and research, Intellectual honesty and research integrity
3. Scientific misconducts: Falsification, Fabrication and Plagiarism (FFP), Redundant publications: duplicate and overlapping publications, Selective reporting and misrepresentation of data
4. Publication Ethics: Publication ethics: definition, introduction and importance, Best practices/standards setting initiatives and guidelines: COPE, WAME etc. Conflicts of interest
5. Publication misconduct: Definition, concept, problems that lead to unethical behavior and vice versa, types, Predatory publishers and journals.

Course Code: FNT-M-P-8.5

Course Name: RESEARCH ETHICS (PRACTICAL)

Total Credit: 2

FM: 25 [20 (Term End) + 5 (Internal)]

No. of Lectures: 60

1. Practical demonstration of plagiarism detection software (Free Source). Paid version of software can be demonstrated through Post-graduate Department of Food & Nutrition, University of Kalyani.
2. Integrated data analysis through software
3. Report writing on various research methodological skills

MAJOR COURSE

Course Code: FNT-M-T-8.6

Course Name: RESEARCH PROJECT

Total Credit: 12 [Theory: 4 + Practical: 2]

FM: 50 [Theory: 40 (Term End) + 10 (Internal)], [Practical: 20 (Term End) + 5 (Internal)]

No. of Lectures: 60

Students who are willing to take up research projects will conduct the research work under the supervision of a faculty. The students should select a specific problem and should submit a research report in a specific format. The research project report should be structured as follows:

Introduction, Aim and objectives, Review of literature, Materials and Methods, Results and discussion and conclusion followed by references.

[Note: Students may opt to undertake the research on any chosen topic and complete their research within the Post Graduate Department of Food and Nutrition, University of Kalyani with prior permission from the department head and relevant authorities. This study aims to explore the role of various nutritional interventions in supporting and enhancing the human system, contributing to a deeper understanding of diet and health.]