

**SYLLABUS FOR MSc FOOD AND NUTRITION**  
**(Semester-I&II)**  
**[AS PER NEP, 2020]**  
**(With effect from - Session 2026-27 onwards)**  
**[DRAFT]**



**UNIVERSITY OF GOUR BANGA**  
**MALDA**  
**WEST BENGAL, INDIA**

### SEMESTER WISE BREAKUP

| Semester            | Discipline Specific Course                                                                                                                                                                                                 | Credits | Full marks | Marks Division |    |
|---------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|------------|----------------|----|
|                     |                                                                                                                                                                                                                            |         |            | Theory         |    |
| <b>I</b>            | Course Code: FOOD-DSC-101<br>Course Name: Food Processing, Packaging and Labeling                                                                                                                                          | 4       | 50         | 40             | 10 |
|                     | Course Code: FOOD-DSC-102<br>Course Name: Food Product Development and Entrepreneurship                                                                                                                                    | 4       | 50         | 40             | 10 |
|                     | Course Code: FOOD-DSC-103<br>Course Name: Advanced Nutrition                                                                                                                                                               | 4       | 50         | 40             | 10 |
|                     | Course Code: FOOD-DSC-104: Practical                                                                                                                                                                                       | 4       | 50         | 40             | 10 |
|                     | Course Code: FOOD-DSE-105(A): Pediatric and Geriatric Nutrition OR<br>FOOD-DSE-105(B): Advanced Women's Nutrition Across the Lifespan OR<br>FOOD-DSE-105(C): SWAYAM MOOCs Course as suggested by the Department.           | 4       | 50         | 40             | 10 |
| <b>II</b>           | Course Code: FOOD-SEC-106: Skill-based course/Specialized laboratory/Hands on Learning                                                                                                                                     | 4       | 50         | 40             | 10 |
|                     | Course Code: FOOD-DSC-201<br>Course Name: Molecular Biology & Bioinformatics                                                                                                                                               | 4       | 50         | 40             | 10 |
|                     | Course Code: FOOD-DSC-202<br>Course Name: Nutrition and Diet Counselling                                                                                                                                                   | 4       | 50         | 40             | 10 |
|                     | Course Code: FOOD-DSC-203<br>Course Name: Nutraceuticals, Functional Foods and Health                                                                                                                                      | 4       | 50         | 40             | 10 |
|                     | Course Code: FOOD-DSC-204: Practical                                                                                                                                                                                       | 4       | 50         | 40             | 10 |
|                     | Course Code: FOOD-DSE-205(A)<br>Course Name: Sports Nutrition OR<br><br>Course Code: FOOD-DSE-205(B)<br>Course Name: Public Nutrition and Health OR<br>FOOD-DSE-205(C): SWAYAM MOOCs Course as suggested by the Department | 4       | 50         | 40             | 10 |
|                     | Course Code: FOOD-SEC-206: Skill-based course/Specialized laboratory/Hands on Learning<br>Advanced Food Quality Testing & Nutritional Diagnostics                                                                          | 4       | 50         | 40             | 10 |
| <b>Semester-III</b> | Course Code: FOOD-DSC-301<br>Course Name: Nutritional Biochemistry                                                                                                                                                         | 4       | 50         | 40             | 10 |

|                         |                                                                                                                                                                                                                                                        |    |     |    |    |
|-------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|-----|----|----|
|                         | Course Code: FOOD-DSE-302(A)<br>Course Name: Food Commodities<br>Course Code: FOOD-DSE-302(B)<br>Course Name: Biophysics OR<br>FOOD-DSE-303C: SWAYAM MOOCs<br>Course as suggested by the Department                                                    | 4  | 50  | 40 | 10 |
|                         | Course Code: FOOD-DSE-303A<br>Course Name: Food Waste Management<br>OR<br>Course Code: FOOD-DSE-303B<br>Course Name: Food Service<br>Management                                                                                                        | 4  | 50  | 40 | 10 |
|                         | Course Code: FOOD-DRP-304:<br>Advance Research Methodology                                                                                                                                                                                             | 4  | 50  | 40 | 10 |
|                         | Course Code: FOOD-DRP-305:<br>Dissertation/Research<br>Project//Entrepreneurship                                                                                                                                                                       | 8  | 100 |    |    |
| <b>Semester-<br/>IV</b> | Course Code: FOOD-DSC-401<br>Course Name: Therapeutic Nutrition.                                                                                                                                                                                       | 4  | 50  | 40 | 10 |
|                         | Course Code: FOOD-DSE-402A<br>Course Name: Epidemiology and<br>Relevant Statistical Analysis OR<br><br>Course Code: FOOD-DSE-402B<br>Course Name: Drug Nutrient Interaction<br>OR<br>FOOD-DSE-402C: SWAYAM MOOCs<br>Course suggested by the Department | 4  | 50  | 40 | 10 |
|                         | Course Code: FOOD-DSE-403A<br>Course Name: Advance Food<br>Microbiology<br>Course Code: FOOD-DSE-403B<br>Course Name: Food Toxicology                                                                                                                  | 4  | 50  | 40 | 10 |
|                         | Course Code: FOOD-DRP-404:<br>Course Name: Dissertation/Research<br>Project//Entrepreneurship                                                                                                                                                          | 12 | 150 |    |    |

## **Semester- I**

**Course Code: FOOD-DSC-101**

**Course Name: Food Processing, Packaging and Labelling**

### **Course Objectives:**

1. To enable students to learn different methods of processing of plant and animal derived foods.
2. To understand the principles of food packaging and acquire skills in methods of food packaging.
3. To understand labeling, quality control, and regulatory compliance of finished products.

**Learning outcomes:** Comprehend thermal and non-thermal food processing methods. Enhance knowledge regarding dairy, meat, and aquatic food processing. Students will understand about the food packaging materials and labeling of the finished product.

### **Unit-I: Introduction to Food Processing:**

- Principles and applications of advanced food processing: Membrane filtration (microfiltration, ultra-filtration, reverse osmosis), Pulsed Electric Field (PEF), High-Pressure Processing (HPP), Ultrasound processing, and Hurdle Technology.
- Processed foods: Bakery products, confectioneries, and value addition of fruits and vegetables (drying, freezing, concentration and purees).
- **Introduction to Indian knowledge system (IKS) and traditional food processing and preservation methods:**
  - Traditional Indian food culture, oil extraction, Processing of plant foods: Milling, parboiling, and processing techniques of wheat, rice, pulses, and oilseeds.
  - Preservation methods- pickles, jam and jellies, smoking, sun drying.
  - Health effects of traditional fermented foods like-idli, dosa, yoghurt, pickles).

### **Unit-II: Animal, Aquatic, and Dairy Product Processing:**

- Processing of liquid milk and dairy products: Pasteurized, UHT, homogenized milk, butter, cheese, yoghurt, skim milk, chhana, paneer, and gulab jamun.
- Processing of egg, fish, meat, and poultry: Canning, drying, freezing, cooking, curing, pickling, smoking, irradiation.
- By-product utilization: Egg Powder, Fish protein concentrates (FPC), fish oils, and meat by-products.

### **Unit-III: Fortification, Fermentation, and Food Safety Regulations:**

- Food fortification and enrichment technology: Fortification vehicles, micronutrient stability, and applications.
- Fermentation technology: Fermented dairy, beverages, vegetables, and fermented soya products.
- Extrusion technology: Single and twin-screw extruders, mechanism, applications, merits, and demerits.
- Food safety & quality management: Food adulteration testing, Food Safety and Standards Authority of India (FSSAI) guidelines, international food standards (Codex Alimentarius), GMP, GHP, and HACCP principles.

### **Unit-IV: Food Packaging, Labelling, and Shelf-Life Evaluation:**

- Packaging fundamentals: Definition, functions, classification, and physical/mechanical properties of packaging materials.
- Packaging materials & forms: Glass, metal cans composite containers, rigid plastics, flexible films, biopolymer-based edible films/coatings, and eco-friendly packaging.
- Advanced packaging systems: Modified Atmosphere Packaging (MAP), Controlled Atmosphere Packaging (CAP), Active packaging, Intelligent/Smart packaging, and Aseptic packaging.
- Packaging machinery & operations: Weighing, filling, sealing, wrapping, cartooning, labeling, marking, and strapping.
- Labeling rules & standards: FSSAI packaging & labeling regulations, mandatory information, nutrition facts panel, health/nutritional claims, allergen warnings, barcoding, and QR systems.

### **Suggested Readings:**

- ❖ Sacha rows. S. Handbook of packaging materials. Avi Pub Co. Westport.
- ❖ Sri Lakshmi B (2004) Food Science. New Age Int.
- ❖ Subbulakshmi G and Udipi A. 2004. Food Processing and Preservation techniques. New Age Int.
- ❖ Swaminathan M (1992) Handbook of Food Science and Experimental foods. 2nd Ed. Bangalore.
- ❖ Potter NH and Hotchkiss JH (1996) Food Science. 5th ed. New Delhi, CBS pbs.
- ❖ Sethi M and Rao SE (2001) Food science experiments and application. CBS pbs. New Delhi.

**Course Code: FOOD-DSC-102**

**Course Name: Food Product Development and Entrepreneurship**

**Course Objectives:** The students will be able to

1. Illustrate new product categories in the food market and their characteristics.
2. Elucidate the step-by-step process of food product development and commercialization.
3. Acquire skills to design, formulate, optimize, and sensory-evaluate new nutritional products

**Learning Outcomes:** Apply product development steps from ideation to test marketing. Master sensory profiling, shelf-life testing, scale-up dynamics, regulatory approvals, and business plan creation.

**Unit-I: Concepts of New Food Product Development:**

- Introduction and need for new product development (NPD).
- Classification of new products: Line extensions, repositioned products, reformulations, innovative/creative products, value-added products, and novelty foods.
- Market dynamics: Consumer behavior, market segmentation, target demographics, and market trend analysis.
- Intellectual Property Rights (IPR): Patents, trademarks, copyrights, trade secrets, and IP protection in food innovation.

**Unit-II: Product Lifecycle, Scale-up, and Regulatory Compliance:**

- Stages of product development: Idea generation, screening, concept testing, bench-scale formulation, pilot-scale production, commercial scale-up, and test marketing.
- Product standardization: Recipe optimization, ingredient functionality, shelf-life estimation, and stability studies.
- Safety and quality assurance: Industrial sanitation, effluent treatment/waste disposal, FSSAI licensing, and safety audits.

**Unit III: Sensory Evaluation Techniques and Analytical Protocols:**

- Sensory attributes: Olfactory, gustatory, visual, kinesthetic, and tactile characteristics.
- Sensory panel setup: Designing a sensory laboratory, panelist selection, screening, training, and performance evaluation.

- Sensory testing methods: Discrimination tests (Triangle, Duo-Trio), Descriptive analysis (QDA), and Affective/Consumer acceptance tests (Hedonic scoring).
- Sample preparation, score card development, statistical analysis of sensory data, and role in quality control.

#### **Unit-IV: Entrepreneurship, Business Planning, and Financial Management:**

- Entrepreneurship: Characteristics, traits, and skills of a successful food entrepreneur.
- Principles and functions of management: Operations, marketing, human resources, supply chain, and food distribution systems.
- Financial management: Cost concepts (fixed, variable, marginal), break-even analysis, budgeting, cash flow management, and funding sources (loans, venture capital, government grants/schemes).
- Business plan development: Feasibility analysis, market survey, resource identification, menu planning, equipment selection, and operational layout for small-scale food enterprises.

#### **Suggested Readings:**

- ❖ Debashri, Ray. (2002). Nutritional Challenge and Total Quality Management, 1st edition; Arup and Sons, New Delhi.
- ❖ Gordon W.Fuller (2011), New Food Product development, 3rd edition, CRC press, New York.
- ❖ Graf, E. and Saguy, I.S. (1991).Food Product Development: From Concept to the Market Place, Van Nostrand Reinhold New York.
- ❖ Howard R. Moskowitz, (2009), An integrated approach to new product development, CRC press, New York.
- ❖ Sethi Mohini (2005). Institution Food Management New Age International Publishers. Knight JB & Kotschevar LH (2000). Quantity Food Production Planning & Management 3rd edition John Wiley & Sons.
- ❖ Taneja S and Gupta SL (2001). Entrepreneurship development, Galgotia Publishing.

**Course Code: FOOD-DSC-103**

**Course Name: Advanced Nutrition**

**Course Objectives:** The students will be able to

1. Understand the integrated metabolic pathways of human physiology and biochemistry.
2. Know about energy balance, body composition assessment, and RDA guidelines.

**Learning Outcomes:** Demonstrate deep knowledge of macronutrient metabolism and physiological roles of micronutrients. Evaluate nutrient bio-availability, metabolic disorders, and nutritional deficiencies.

### **Unit-I: Human Energy Balance and Requirements:**

- Progress of nutrition research in India and global nutrition trends.
- Recommended Dietary Allowances (RDA) and Estimated Average Requirements (EAR): Concept, updates (ICMR-NIN guidelines), and applications.
- Total Energy Expenditure (TEE): Components (BMR, RMR, Thermic Effect of Food, Physical Activity Level), factors influencing TEE.
- Measurement of energy expenditure: Direct and indirect calorimetry, doubly labeled water technique, non-calorimetric methods.
- Health implications of energy imbalance: Pathophysiology of under nutrition, starvation, and obesity.

### **Unit-II: Body Composition Assessment & Metabolic Regulation:**

- Body composition models: Anatomical and biological models (2-compartment to multi-compartment).
- Techniques for assessment: Hydro densitometry, Air Displacement Plethysmography (BodPod), DXA, Bioelectrical Impedance Analysis (BIA), skin folds thickness, and anthropometry.
- Factors affecting body composition: Genetics, age, gender, hormonal regulation, physical activity, trauma, and chronic disease.
- Regulation of food intake: Central nervous system control (hypothalamus), hunger and satiety hormones (leptin, ghrelin, insulin, PYY, CCK).

### **Unit-III: Metabolism and Clinical Aspect of Carbohydrates, Proteins, and Lipids:**

- Carbohydrates: Glycemic Index (GI), Glycemic Load (GL) and metabolic effects; Resistant starch, Fructooligosaccharides (FOS), Dietary Fiber types, and their role in metabolic syndrome, cardiovascular disease, and gut health.
- Proteins: Metabolic fate of amino acids, Essential Amino Acids (EAA), conditionally essential amino acids; Protein quality evaluation (PER, BV, NPU, PDCAAS, DIAAS); Protein-Energy Malnutrition (PEM-Kwashiorkor, Marasmus, Acute, Chronic, Underweight, SAM, MAM, Gomez Classification, Wellcome Classification, Waterlow's Classification, IAP (Indian

Academy of Pediatrics) Classification ); Therapeutic bio-active oligopeptides (Glutathione, Vasopressin, Oxytocin, Carnosine).

- Lipids: Essential fatty acids (n-3 and n-6 series), metabolic pathways, recommended ratios and implications in inflammatory cascades; Trans-fatty acids, eicosanoids, prostaglandins, cholesterol homeostasis; Medium-Chain Triglycerides (MCTs) and their therapeutic uses; Role of lipids in CVD, NAFLD, Type 2 Diabetes, and Neurodegenerative disorders.

#### **Unit-IV: Advanced Micronutrient Metabolism and Bioavailability:**

- Vitamins (Fat-soluble & Water-soluble): Biochemical roles, absorption mechanisms, intracellular transport, tissue storage, deficiency states, hypervitaminosis/toxicity, and metabolic inter-relationships.
- Vitamin bio-availability, stability during processing, and fortification strategies.
- Minerals & Trace Elements (Macrominerals, Iron, Zinc, Iodine, Selenium, Copper, Fluoride): Biological functions, homeostasis, transport mechanisms, deficiency syndromes, and toxicity levels

#### **Suggested Readings:**

- ❖ Shills ME, Olson JA, Shike N, Ross AC (1999): Modern Nutrition in Health and Disease. 9th Ed. Williams and Wilkins
- ❖ Mahan LK & Ecott- Stump S (2000): Krause's Food, Nutrition and Diet therapy, 10th ed. WB Saunders Ltd.
- ❖ Anderson L, Dibble M, Mitchell N (1982) Nutrition in health and disease (17th ed). Philadelphia: JB. Lippincott co.
- ❖ McArdle W, Katch F, Katch V (1996) Exercise Physiology. Energy, Nutrition and Human Performance. 4th ed. Williams and Wilkins, Philadelphia
- ❖ Bamji M, Prahlad Rao N, Reddy V (2000). Text book of Human Nutrition. publishing Co. Pvt.Ltd.. 6. Swaminathan M(1985) Essentials of Food and Nutrition. Vol I and II.

**Course Code: FOOD-DSC-104: PRACTICAL (Advanced Nutrition and Food Product Development)**

1. Microscopic examination of starch from different sources.
2. Qualitative & Quantitative estimation of carbohydrate, protein & fat.
3. Preparation of food by sun drying, using natural and chemical preservatives.
4. Testing of physical/mechanical properties of food packaging material.
5. Preparation of fermented milk products. (curd/chhana/paneer/sima).
6. Submission of a project proposal with estimated budget for a food service unit.
7. Visit to a food industry/ food service unit.

**Course Code: FOOD-DSE-105A**

**Course Name: Paediatric and Geriatric Nutrition**

**Course objectives:**

The course is designed to:

1. Get acquainted with growth and developmental changes from conception till childhood.
2. Understand the inter-relationship between nutrition and growth and development during infancy and childhood.
3. Familiarize the students with the multifaceted aspects of ageing.
4. Make the students competent for nutritional and health care of the elderly.

**Learning outcomes:**

**The students will be able to:**

1. Understand the role of nutrition in growth and development of infants and childhood. 2. Assess and evaluate the nutritional status of infants and children using different techniques.
3. Gain a deeper understanding of the etiology, pathophysiology and clinical features of pediatric diseases and conditions that require dietary modification.
4. Understand the theories of ageing and the nutritional impact of physiological changes occurring in older adults.

**Unit I: Nutrition, Growth and Development During Infancy and Childhood:**

- Principles of growth and development during infancy, early childhood, preschool, and school-age years.
- Nutritional requirements during infancy and childhood: energy, macronutrients, micronutrients, and fluids.
- Assessment of nutritional status: anthropometry, growth monitoring, dietary assessment, and interpretation of growth standards.
- Infant and Young Child Feeding (IYCF): Breastfeeding and complementary feeding practices. Feeding of infants, preschool children, and school-aged children. Nutrition education and strategies for promoting healthy eating habits and prevention of childhood obesity and other diet-related chronic diseases.

- **Nutrition in special situations:**

- Nutrition of low birth weight (LBW) and preterm infants.
- Physiology, growth, nutritional requirements, and feeding strategies for preterm infants.
- Nutritional support for children with developmental disabilities and special healthcare needs.

## **Unit II: Nutrition in Inborn Errors of Metabolism:**

- Overview, classification, and nutritional implications of inborn errors of metabolism.
- Disorders of amino acid metabolism: Phenylketonuria (PKU), Maple Syrup Urine Disease (MSUD), Homocystinuria
- Disorders of carbohydrate metabolism: Galactosemia, Glycogen Storage Disorders (GSD)
- Disorders of mineral and trace element metabolism: Wilson's disease
- Principles of nutritional management:
- Dietary modification and therapeutic diets.
- Medical nutrition therapy and specialized nutritional formulations.
- Monitoring growth, nutritional status, and metabolic control.

## **Unit III: Nutrition During Ageing:**

- Physiology of ageing and its impact on nutritional status. Age-related changes in digestion, absorption, metabolism, body composition, and nutrient utilization.
- Nutrient requirements for older adults: energy, protein, vitamins, minerals, fluids, and dietary fibre.
- Food selection, meal planning, and dietary modifications for healthy ageing.
- Nutritional assessment of older adults:
- Anthropometric, biochemical, clinical, dietary, and functional assessment.
- Screening tools for malnutrition and frailty.

## **Unit IV: Nutrition-Related Health Problems in Older Adults:**

- Nutritional and lifestyle-related health issues in ageing.
- Medical nutrition therapy for: Protein-energy malnutrition, Sarcopenia and frailty
- Osteoporosis, Obesity, Anaemia, Constipation, Cognitive decline and neurological disorders
- Nutrition in age-related degenerative diseases: Etiopathogenesis, prevention, and dietary management.
- Drug-nutrient interactions and polypharmacy in older adults.
- Nutrition interventions for healthy and active ageing.
- Community nutrition programmes and policies for the elderly.

**Suggested Readings:**

1. Baker S.S. Baker R.D and Davis A.M. Pediatric nutrition support, Jones and Barlett Publishers, Sudbury, Massachusetts. 2007.
2. Chernoff R. Geriatric Nutrition, The Health professionals Hand book.4th Edition, Jones and Bartlett Learning, Burlington. 2013.
3. Ghai, O P. Essential Pediatrics, Interprint, New Delhi. 1990. Page 71 of 95 Applicable from 1st June 2019
4. Thaman O P. Text book of Pediatrics. Tata McGraw Hill Publishing Ltd, New Delhi.1984.
5. John E M and David R T. Geriatric Nutriiton. CRC Press. Taylor & Francis group. Boca Raton. 2007.

**Course Code: FOOD-DSE-105B:**

**Course Name: Advanced Women's Nutrition Across the Lifespan**

**Course objectives:**

To enable the students to:

1. Address the health issues affecting women of all ages.
2. Understand the nutritional needs of women during the lifecycle.
3. Understand the relation between maternal nutrition, fetal programming and adult onset of diseases.
4. Explore the relationship between nutrition and health and onset of nutrition related diseases in women of all age groups.

**Learning outcomes:**

The students will be able to:

1. Identify and map the causes of malnutrition in women and their consequences on health.
2. Gain knowledge on the nutritional concerns of women at different age periods.
3. Describe the nutritional needs of women at different stages of life span.
4. Focus on role of nutrition in disease risk reduction and management of the diseases in women.

**Unit I: Life-Course Approach to Women's Nutrition and Health:**

➤ Women's Health Across the Life Course-

- Life-course approach to women's nutrition and health.
- Determinants of women's nutritional status: biological, genetic, hormonal, socioeconomic, environmental, behavioural and cultural factors.
- Gender disparities in nutrition and health.

➤ Nutrition and Women's Health-

- Body composition and metabolic changes across the lifespan.
- Nutrition, immune competence and inflammation.
- Gut microbiome and health.
- Lifestyle determinants: physical activity, sleep, stress, substance use and environmental exposures.

## **Unit II: Nutrition During Adolescence and Reproductive Years:**

### ➤ Growth and Development-

- Pubertal growth spurt and endocrine regulation.
- Changes in body composition and energy metabolism.
- Nutrient requirements during adolescence.

### ➤ Nutritional Challenges-

- Iron deficiency anaemia.
- Calcium and vitamin D deficiency.
- Eating disorders.
- Obesity and metabolic syndrome.
- Micronutrient deficiencies.

### ➤ Menstrual and Reproductive Health-

- Physiology of the menstrual cycle.
- Dysmenorrhoea, menorrhagia, amenorrhoea.
- Polycystic Ovary Syndrome (PCOS): pathophysiology, metabolic disturbances and nutritional management.

## **Unit III: Maternal Nutrition, Foetal Programming and Lactation:**

### ➤ Maternal Physiology-

- Physiological and metabolic adaptations during pregnancy.
- Maternal body composition changes.

### ➤ Evidence-Based Maternal Nutrition-

- Nutritional recommendations throughout pregnancy.
- Medical nutrition therapy in: Gestational diabetes mellitus, Pregnancy-induced hypertension, Anaemia, Hyperemesis gravidarum, Intrauterine growth restriction (IUGR), Eclampsia

### ➤ Lactation and Postpartum Nutrition-

- Physiology of lactation, Nutrient requirements during breastfeeding.
- Human milk composition and bioactive components.
- Maternal nutrition and breast milk quality.
- Maternal mental health and nutritional interventions.

#### **Unit IV: Nutrition During Midlife, Menopause and Healthy Ageing:**

- Menopausal Transition-
  - Endocrine and metabolic changes.
  - Menopause-associated physiological adaptations.
  - Body composition changes.
- Nutrition in Ageing Women-
  - Changes in nutrient metabolism.
  - Sarcopenia and osteosarcopenia.
  - Nutrition and cognitive ageing.
  - Neurodegenerative diseases

#### **Suggested Reading:**

1. Carol West and Merrily Forbes Browley, Nutrition: Principles and Application in Health, Edn. 2nd J.B. Lippincott Company, Philadelphia. 1984.
2. Lilian U Thompson, Wendy E Ward. Optimizing women's health through nutrition. Taylor and Francis group. CRC Press, 2007.
3. Marlene Goldman, Rebecca Troisi and Kathryn Rexrode. Women and Health. 2nd Ed, Academic Press, 2013.
4. Rajendram Rajkumar, Preedy Victor and Vinod R Patel. Diet, Nutrition and foetal programming. 1stE, Humana press, Springer link. 2017.
5. Simon and Langley Evans. Nutrition: A Life span approach. Wiley Blackwell publishing. 2009.

**Course Code: FOOD-SEC-106: (Skill-based course/Specialized laboratory/Hands on Learning)**

**Course Name: Advanced Nutritional Diagnostics**

**Course Objectives:** To enable the students to:

1. Learn the principles and practical techniques for detecting malnutrition and evaluating nutritional status.
2. Acquire practical skills in field-level anthropometric measurements, dietary assessment tools, and diagnostic techniques for evaluating nutritional status.

**Learning Outcomes:** The students will be able to:

Community-based nutritional status assessment nutritional status using anthropometric measurement tools. Execute anthropometric assessments, interpret bio-impedance/skin fold measurement data, and formulate personalized diet plans using digital assessment tools.

**Hands-on Skill Modules:**

1. Preparation of report by collecting anthropometric data from an old age home/school/college/ ICDS centre/ NGO operated well being centre etc. OR
2. Nutritional Status Diagnostics & Field Assessment: Field execution of anthropometric measurements (MUAC, skin fold, bio-impedance), dietary recall tools, and computer-assisted meal planning software. OR
3. Short term hands on learning in a food industry/ institutions/university.

**Suggested Readings:**

1. Gibson, R. S. (2005). *Principles of Nutritional Assessment* (2nd ed.). Oxford University Press.
2. ICMR-NIN. (2020). *Nutrient Requirements for Indians: A Report of the Expert Group*. National Institute of Nutrition, Indian Council of Medical Research, Hyderabad.
3. Jelliffe, D. B., & Jelliffe, E. F. P. (1989). *Community Nutritional Assessment: With Special Reference to Less Developed Countries*. Oxford University Press.

## **SEMESTER-II**

**Course Code: FOOD-DSC-201**

**Course Name: Molecular Biology & Bioinformatics**

### **Course Objectives:**

1. To understand nucleic acids and their structure.
2. To know about genetics and bioinformatics.

### **Learning Outcomes:**

The course deals with the basics of genetic material and the mechanism of genetic exchange. Students get introduced with the concept of genomics, proteomics and DNA recombinant Technology. In Bioinformatics, students learn how computer programming can help to restore the biological data through biological algorithm.

### **Unit-I: Introduction to nucleic acid:**

- 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.
- DNA replication: Semi-conservative replication, Basic mechanism of replication (Prokaryotes). Transcriptional unit and basic concept of transcription (Prokaryotes).

### **Unit-II: Genetics and Recombinant DNA Technology:**

- Genetic code and basic mechanism of translation (Prokaryotes).
- Basic idea on recombinant DNA technology and its applications including agriculture and food.
- Restriction endonuclease type I, II, III and IV.
- Principal and applications - PCR, SDS-PAGE and agarose gel electrophoresis

### **Unit-III: Introduction to Bioinformatics:**

- Definition, scope, Types of biological data.
- Biological Databases-GenBank, EMBL, DDBJ, UniProt, PDB.
- Data formats- fasta, Database searching and retrieval.

- Bioinformatics Tools and Software - NCBI tools, EMBL-EBI resources.
- Applications in medicine, agriculture, food, and environment.
- Concept of BLAST, Sequence alignment (pair-wise alignment and multiple sequence alignment).

#### **Unit-IV: Nutrigenomics, Nurtrigenetics and Epigenetics:**

- Introduction to Nutrigenomics, Nurtrigenetics and Epigenetics, evolution from traditional nutrition to personalized molecular nutrition.
- Genetic variations in macronutrient metabolism (APOE & fat, AMY1 & starch), inherited differences in vitamin absorption and utilization (MTHFR & folate).
- Impact of amino acids, fattyacids and phytochemicals on cellular pathways.
- Mechanisms of DNA methylation, role of caloric restriction and poluphenols on epigenetic aging.

#### **Suggested Readings:**

- ❖ Bolandar, M. (2001). Molecular Endocrinology. Elsevier Science.
- ❖ Alberts, B. et al. (2008). Molecular Biology of the Cell. 5th Ed. Garland Publishing
- ❖ House. Yoshinori Mine (Editor), Kazuo Miyashita (Editor), Fereidoon Shahidi (Editor): Nutrigenomics and Proteomics in Health and Disease: Food Factors and Gene Interactions.
- ❖ Van Ommen, B. (2004). Nutrigenomics: Exploiting systems biology in the nutrition and health arenas. Nutrition.20:4-8.
- ❖ Simopoulos, A.P. and Ordovas, J.M. (Editors) (2004). Nutrigenetics and Nutrigenomics. Roche, H.M. (2004). Dietary lipids and gene expression. Biochem Soc Trans. 32 (Pt6): 999 1002.
- ❖ Lesk M.A. (2008) Introduction to Bioinformatics. Oxford Publication, 3rd International Student Edition.
- ❖ Rastogi S.C., Mendiratta N. and Rastogi P. (2007) Bioinformatics: methods and applications, genomics, proteomics and drug discovery, 2nd ed. Prentice Hall India Publication.

**Course Code: FOOD-DSC-202**

**Course Name: Nutrition and Diet Counselling**

**Course Objectives:** To enable the students to:

1. Develop diet counselling skills
2. Prepare the patients for food acceptability
3. Create awareness among the communities about the importance of diet and good health
4. Develop humanistic approach towards patients

**Learning Outcomes** - After the completion of the course, the students will be able to understand psychology, goals and response of patients. They will learn and develop data collecting tools. They will be able to design food and nutrition education audio visual aids and materials like pamphlets. They can develop demonstration skills to conduct group counselling.

**Unit-I: Introduction to counselling and counselling process:**

- Counselling – Definition, Expectations, goals, scope, limits, individual group and family counselling. Counsellor – Characteristics of an effective counsellor. The Client – Characteristics, expectations.
- The Counselling Process: Techniques for obtaining relevant information. Clinical Information, Medical History and General Profile, Dietary Diagnosis - Assessing food and nutrient intakes, Lifestyles, physical activity, stress and Nutritional Status.

**Unit-II: Counselling Theories.**

- Counselling stages- correlating relevant information and identifying areas of need. Stage I: Problem exploration and clarification Stage II: Developing new perspectives and setting goals Stage III: Implementation follow up and evaluation.
- Counselling Theories: Key Concepts and Techniques Counselling techniques, strategies and communication skills. Rapport building and opening techniques Questioning, listening, reflecting, acceptance, silence, leading reassurance, non-verbal behaviour, terminating skills, ethical principle of counselling, special areas of counselling- educational, family, health, community and counselling of alcoholic and drug addicts.

### **Unit-III: Diet counselling at hospital and community levels:**

- Approaches to counselling: psychoanalytic, behaviouristic and humanistic approach. Relation between psychology and counselling. Factors influencing personality.
- Diet counselling at hospital and community levels: psychology of feeding the patients- Assessment of needs, education of the patient and follow up and establishing rapport with the patient and the family member, facilitative condition and counselling relationships, patient follow up/home visit, geriatric counselling, organizing health camp and patient feedback at community levels.

### **Unit IV Nutritional counselling techniques:**

Behaviour modification – Classical conditioning, operant conditioning and modelling approaches; Assessment of the client's readiness for change; Techniques for behavior modification – incentives, record keeping and self monitoring, controlling stimuli and environments, changing actual eating habits, changing activity pattern, rewards and reinforcements; Enhancing social support.

### **Suggested Readings:**

- ❖ Gelso Charles, J. and Fretz Bruce, R. Counselling Psychology, a PRISM Indian edition Harcourt Brace College Publishers, 1995.
- ❖ Srilakshmi, B. Dietetics New Age International (P) Ltd, 1997.
- ❖ Gable, J. (1997): Counselling Skills for Dietitians, Blackwell Science.
- ❖ Holli, B.B. and Calabrese, R.J. (1998): Communication and Education Skills for Dietetics Professionals. Lippin Cott Williams & Wilkins, New York.

**Course Code: FOOD-DSC-203**

**Course Name: Nutraceuticals, Functional Foods and Health**

**Course objectives:** To enable students to understand:

1. Nutraceuticals and functional foods.
2. Probiotic, prebiotic and oxidative stress.

**Learning Outcomes:**

This course gives an insight into the recent discoveries in the field of Food and Nutrition especially Functional Foods and Nutraceuticals. It enlists the potential health benefits of common functional foods and nutraceuticals – like Prebiotics, Probiotics and Dietary Fibers. Knowledge is also imparted on the fundamentals of various methods to enhance the nutritional quality of food and nutraceutical enrich medicinal plants.

**Unit-I: Functional foods, Nutraceutical and Health:**

- Definition and importance-functional foods, nutraceuticals, bioactive compound, phytochemicals. Development of functional foods.
- Concept, classification and sources of nutraceuticals.
- Natural occurrence of certain phytochemicals, and their role including bioavailability-flavonoids, omega-3 fatty acids, carotenoids, dietary fiber, phytoestrogens, glucosinates, organosulphur compounds, lycopene, isoflavonoids.

**Unit-II: Therapeutic application of Nutraceutical:**

- Concept of oxidant and ROS, Antioxidant (Natural and synthetic)
- Enzymatic and non-enzymatic antioxidant.
- Oxidative stress and effect of nutraceutical on oxidative stress.
- Role of nutraceuticals in the management of diabetes, obesity and cardiovascular diseases, cancer, eye health.
- Understanding national and international regulatory frameworks for nutraceuticals and functional foods.

**Unit-III: Traditional Prebiotic and Probiotic (IKS):**

- Types of prebiotics and their effects on gut microbes.

- Health benefits and recent development of prebiotics, probiotics and Symbiotics.
- Probiotics in various foods: fermented milk products, non-milk products etc. d. Quality Assurance of probiotics and safety.
- Traditional functional foods: takra (buttermilk)- health benefits, role as probiotics, ghrita (clarified butter)- the role of ghrita as a lipophilic carrier of fat soluble phytonutrients.
- Prebiotics- Definition, chemistry, sources, metabolism and bioavailability, effect of processing, physiological effects, effects on human health and potential applications in risk reduction of diseases.

#### **Unit-IV: Traditional Functional Foods & Nutraceutical Enriched Medicinal Plants (IKS):**

- Medicinal importance of ayurvedic plants- Amla, Brahmi, Arjuna, Tulsi, Ashwagandha, Aloe-Vera, Sarpogandha, Thankuni and Triphala.
- Spice pharmacopeia: the functional roles of everyday spices- turmeric, garlic, ginger, fenugreek, cardamom, clove.
- Functional beverages: Health benefits and preparation of Panakas, Asavas and Arishtas.
- Preventive and Rejuvenative health care- importance of traditional brain tonics and cognitive enhancers such as Brahmi and Shankhapushpi.

#### **Suggested Readings:**

- ❖ Ramesh C. Chandan & Arun Kilara, *Dairy Ingredients for Food Processing*, 2011, Wiley-Blackwell, John Wiley & Sons Inc., Hoboken, New Jersey, USA.
- ❖ M. G. Traber & J. Packer, *Nutrition and Health: Oxidative Stress and Antioxidant Protection*, 2008, CRC Press, Taylor & Francis Group, Boca Raton, Florida, USA.
- ❖ Fereidoon Shahidi, *Nutraceuticals and Functional Foods*, 2004, CRC Press, Taylor & Francis Group, Boca Raton, Florida, USA.
- ❖ Norman J. Temple, Ted Wilson & David R. Jacobs, *Nutritional Health: Strategies for Disease Prevention*, 2012, Humana Press (Springer), New York, USA.
- ❖ M. S. Swaminathan, *Food and Nutrition*, 2011, Bappco Publishers, Bangalore, India.
- ❖ Shyam S. Chauhan & M. P. Dobhal, *Medicinal Plants of India*, 2010, Bishen Singh Mahendra Pal Singh, Dehradun, Uttarakhand, India.
- ❖ Gibson, Glenn R. & Roberfroid, Marcel B., *Handbook of Prebiotics and Probiotics*, 2008, CRC Press, Taylor & Francis Group, Boca Raton, Florida, USA.

**Course Code: FOOD-DSC-204: Practical (Nutrition and Diet Counselling and Functional Foods)**

1. Preparation of counselling tools – questionnaire, charts, posters, interview schedule, dietary guidelines pamphlet for any one disease.
2. Conducting mock counselling sessions – group and individual counselling for Obesity/Diabetes/Gastric disorders/Allergies/Cardiac disorders.
3. Formulation of the functional foods and assessment of its nutritional value.
4. Sensory evaluation and analysis of shelf-life studies on developed functional foods.

**Course Code: FOOD-DSE-205A**

**Course Name: Sports Nutrition**

**Course objectives:**

The course will prepare the students to:

1. Understand the components of health and fitness and the role of nutrition
2. Make nutritional, dietary and physical activity recommendations to achieve fitness and well-being.
3. Develop ability to evaluate fitness and well-being.

**Learning outcomes:**

The students will be able to apply the art and science of sports nutrition. Understand the philosophy of wellness as a lifestyle strategy. Utilize exercise for weight & body composition management. Describe the role of nutrition for health and sports performance.

**Unit-1: Introduction, Performance and endurance nutrition, Nutritional requirements of athletes:**

Evolution of sports nutrition; Special nutrition for performance and physical fitness.

Sports specific requirements – short term, intermediate term and long term • pre-event, during the event and post-event meal requirements. • Carbohydrate requirements; Carbohydrate loading and performance.

- Fat requirements; Role of saturated and unsaturated fat on the athletic performance.
- Protein requirements, specific amino acid needs and role of protein quality.
- Vitamin and minerals requirements, sources and functions of water-soluble vitamins, vitamin C and  $\beta$ -carotene and role of major (including electrolytes) and trace minerals in athletic performance.
- Water requirements; Regime of hydration and dehydration, symptoms and effects of dehydration.

#### **Unit-2: Nutrition for special needs:**

- Weight loss and weight gain challenges for athletes; effective weight management and muscle gain in athletes.
- Special nutritional considerations based on gender and age.
- Special nutritional needs for injured and vegetarian athletes.

#### **Unit-3: Supplements and performance enhancers and traditional superfoods (IKS):**

- Use of protein and antioxidant supplements, Branched Chain Amino Acids (BCAA), caffeine, L- Carnitine, Coenzyme Q10, creatine, creatinine, choline and glutamine.
- Importance and use of Endurance boosting grains: Barley (Yava), Finger Millet (Ragi), Sorghum (Jowar), Ojas- building foods: pure ghee (Ghruta), Honey (Madhu) and Dates.

#### **Unit-4: Traditional Functional foods in sports nutrition (IKS):**

- Ergogenic aids: Beverages, sports drinks, energy bars, energy gels and other power boosters; Meal replacement products.
- Functional electrolyte drinks: coconut water- role and health benefits, sattv sharbat- thermoregulatory importance,
- Traditional Pre and post workout event meal.
- Role of Traditional anti-inflammatory and recovery compounds- turmeric, black pepper and dry ginger.

**Course Code: FOOD-DSE-205B**

**Course Name: Public Nutrition and Health**

**Course Objectives:**

This course enables students to:

1. To understand the concept of public health nutrition.
2. To be familiar with national health care delivery system
3. To understand the concept of food and nutrition security
4. To gain knowledge regarding national/ public sector policies and programs for improving food and nutrition security.

**Learning Outcomes:** Develop a holistic knowledge base and understanding of the nature of important nutritional problems and their prevention and control for the disadvantaged and upper socio-economic strata in society. Understand the causes /determinants and consequences of nutritional problems in society

**Unit-I: Public Health Nutrition& Health Care System:**

Aim, scope and content of public health nutrition. Current concerns in public health nutrition: An overview. Role of Public health nutritionists in National Development - - Health-definition, dimensions, determinants, indicators - - Community health care. National Health care delivery system.

**UNIT-II Public Health Aspect of Under Nutrition:**

Aetiology, public health implications, prevention and community-based management of PEM, Severe acute malnutrition. Micronutrient deficiencies of public health significance.

**UNIT-III-Food and Nutrition Security:**

Concepts and definitions of food and nutrition security at National, regional, household and individual levels. Public sector programmes for improving food and nutrition security. National Plan of Action on Nutrition

#### **UNIT-IV Behaviour Change Communication for Nutrition and Health Promotion:**

Planning of communication strategies for behaviour change programme. - Stakeholders in nutrition promotion. - Developing nutrition education plan - Identifying communication strategies and approaches for health promotion (e.g social marketing) - Designing nutrition and health messages, selecting communication channels, developing and field testing of communication materials. Ethics in Nutrition and Health Communication.

#### **Suggested Readings:**

- ❖ Ghosh S (1997). Nutrition and child care – A practical guide. 1st ed. Jaypee Brothers;New Delhi.
- ❖ K. Park, Parks Textbook of Preventive and Social Medicine, 23<sup>RD</sup> Edition.
- ❖ Gopalan C (1992). Growth charts in Primary Health Care – Time For Reassessment.
- ❖ Hughes O, Bennion M (1970). Introductory Foods, Macmillan& Co. New York.
- ❖ Jelliffe DB and Jelliffe EFP (1989). Community Nutritional Assessment, Oxford University Press WHO. The growth chart: A tool for use in infant and child health care. Geneva: WHO; 1986.
- ❖ NFI Bulletin.
- ❖ Pomeranz Y (Ed) (1991). Functional Properties of Food Components, (2nd edition), Publishers. Tindall HD (1983). Vegetables in the Tropics, MacMillan Press, London.
- ❖ Winton AL, Winton KB (1999). Techniques of Food Analysis. Allied Scientific]

**Course Code: FOOD-SEC-206: (Skill-based course/Specialized laboratory/Hands on Learning)**

**Course Name: Advanced Food Quality Testing**

**Course Objectives:** To enable the students to:

3. Learn the principles and practical techniques for detecting adulteration and evaluating the quality of common food products.
4. Gain hands-on experience in proximate analysis, instrumental methods, and sensory profile evaluation.
5. Acquire practical skills in field-level anthropometric measurements, dietary assessment tools, and diagnostic techniques for evaluating nutritional status.

**Learning Outcomes:** The students will be able to:

1. Detect food adulterants using rapid test kits and laboratory-based qualitative/quantitative testing protocols.

2. Perform sensory evaluation profiling, construct descriptive scorecards, and analyze sensory panel data.
3. Execute anthropometric assessments, interpret bio-impedance/skinfold measurement data, and formulate personalized diet plans using digital assessment tools.
4. Prepare comprehensive technical reports on industrial quality control standards or community-based nutritional status assessment

### **Hands-on Skill Modules:**

- Food Adulteration & Quality Testing: Rapid test kits and wet-chemical methods for detecting adulterants in milk, edible oils, spices, and honey.
- Proximate Analysis & Instrumentation: Spectrophotometric estimation of micronutrients, chromatographic separation (HPLC/TLC demonstration), and moisture/ash evaluation in packaged foods. OR
- Industrial/Field Visit & Report Presentation: Exposure visit/ short term training to an institutions/ university/food processing plant/quality testing laboratory or field survey report presentation.

### **Suggested Readings:**

4. Gibson, R. S. (2005). *Principles of Nutritional Assessment* (2nd ed.). Oxford University Press.
5. Nielsen, S. S. (2014). *Food Analysis* (4th ed.). Springer Science & Business Media.
6. Ranganna, S. (1986). *Handbook of Analysis and Quality Control for Fruit and Vegetable Products* (2nd ed.). Tata McGraw-Hill Education.
7. Pomeranz, Y., & Meloan, C. E. (2012). *Food Analysis: Theory and Practice* (3rd ed.). Springer Science & Business Media.
8. AOAC International. (2019). *Official Methods of Analysis of AOAC International* (21st ed.). AOAC International, Rockville, MD.
9. ICMR-NIN. (2020). *Nutrient Requirements for Indians: A Report of the Expert Group*. National Institute of Nutrition, Indian Council of Medical Research, Hyderabad.
10. Jelliffe, D. B., & Jelliffe, E. F. P. (1989). *Community Nutritional Assessment: With Special Reference to Less Developed Countries*. Oxford University Press.
11. Lawless, H. T., & Heymann, H. (2010). *Sensory Evaluation of Food: Principles and Practices* (2nd ed.). Springer Science & Business Media.