UNIVERSITY OF CALCUTTA

Notification No. CSR/ 84 /18

It is notified for information of all concerned that the Syndicate in its meeting held on 13.07.2018 (vide Item No.11) approved the Syllabus of Two-Year (Four-Semester) M.Sc. Course of Study in Home Science (Food & Nutrition) under CBCS in the Post-Graduate Departments of the University and in the affiliated Colleges offering Post-Graduate Courses under this University, as laid down in the accompanying pamphlet.

The above shall be effective from the academic session 2018-2019.

(Debabrata Manna)
Deputy Registrar (Acting)

SENATE HOUSE
KOLKATA-700073
The 31st August, 2018

M.Sc. HOME SCIENCE (FOOD AND NUTRITION)

CBCS CURRICULUM

Department of Home Science
UNIVERSITY OF CALCUTTA
2018

SEMESTER I
Total marks 250 (Theory 200 + Practical 50)

COURSE CODE	PAPER	PAPER	LECTURE/ TUTORIALS/ PRACTICAL	CREDIT	MARKS
CC1	T1.1	FOOD CHEMISTRY	T	4	50
CC2	T1.2	NUTRITIONAL BIOCHEMISTRY	T	4	50
CC3	T1.3	APPLIED PHYSIOLOGY& CELL BIOLOGY	T	4	50
CC4	T1.4	ADVANCED NUTRITIONAL SCIENCE	T	4	50
CC5	P1.1	FOOD ANALYSIS AND CELL BIOLOGY	P	4	50

SEMESTER II
Total marks 250 (Theory 200 + Practical 50)

COURSE CODE	PAPER	PAPER	LECTURE/ TUTORIALS/ PRACTICAL	CREDIT	MARKS
CC6	T2.1	THERAPEUTIC NUTRITION AND DIETETICS	T	4	50
CC7	T2.2	GENETICS &INBORN ERRORS OF METABOLISM	T	4	50
CC8	T2.3	SPORTS AND SPACE NUTRITION	T	4	50
CC9	T2.4	FOOD MICROBIOLOGY AND FOOD TOXICOLOGY	T	4	50
CC10	T2.5	CLINICAL BIOCHEMISTRY & FOOD MICROBIOLOGY	P	4	50

SEMESTER III
Total marks 250 (Theory 200 + Practical 50)

COURSE CODE	PAPER	PAPER	LECTURE/ TUTORIALS/ PRACTICAL	CREDIT	MARKS
CC11	T3.1	MODERN CONCEPT OF COMMUNITY NUTRITION &PUBLIC HEALTH	T	4	50
CC12	T3.2	ADVANCED FOOD SCIENCE & FOOD PROCESSING	T	4	50
CC13	P3.1	FOOD PROCESSING THERAPEUTIC NUTRITION AND DIETETICS	P	4	50
CBCS1		Other Subject	T	4	50
CBCS2		Other Subject	T	4	50

SEMESTER IV
Total marks 200 (Theory 100 + Practical 100)

CORE COURSE	PAPER	PAPER	LECTURE/ TUTORIALS/ PRACTICAL	CREDIT	MARKS
CC14	T4.1	STATISTICS & RESEARCH METHODOLOGY	T	4	50
CC15	P4.1	COMMUNITY NUTRITION & COMPUTER APPLICATION	P	4	50
CC16	P4.2	DISSERTATION	P	4	50
DSE1		BIOPHYSICAL PRINCIPLES/ FOOD SERVICE MANAGEMENT/FOOD PRODUCT DEVELOPMENT	T	4	50
DSE2		MATERNAL AND CHILD NUTRITION/ GERIATRIC NUTRITION/ FUTURE NUTRITION RESEARCH	T	4	50

SEMESTER I

CC1 T1.1 FOOD CHEMISTRY Marks: 50 (credit 4)

1. **Proteins:** Structure, Classification and Properties –Native and denatured proteins, separation and purity of proteins, chemistry of amino acids, separation and purification of amino acids, functional properties of proteins, hydration, viscosity, gelation, texturation, emulsifying and foaming properties of proteins. Protein concentrate, isolate, hydrolysates and hydrolyser. Levels of protein structure-secondary and super secondary structures- domains, motifs, protein folding, active site.
2. **Carbohydrates:** Properties and reactions of all types of carbohydrates, types of isomerism, structural elucidation of mono (glucose and fructose) and disaccharides (lactose and sucrose), Structure of homo and hetero polysaccharides.
3. **Lipids:** Edible fats and oils – Classification and properties, Physical and Chemical properties of fatty acids, liposomes, phospholipids, cholesterols, saturated, monounsaturated, polyunsaturated fatty acids, trans chain fatty acids. Lipid modulators (Prostaglandins, leukotrienes, thromboxanes)

4. **Nucleic acids & Nucleotides:** Structures of nucleotides (major bases – purines and pyrimidines), ribose and deoxyribose sugars, concept of nucleosides (mono, di, triphosphates), Types of DNA and RNA (Primary and secondary structure of DNA and RNA, organisation of DNA in the cell).

5. **Dietary fibre:** Definition, fibre components – cellulose, hemicellulose, pectin substances, lignin, gums, mucilage and algal polysaccharides, Microbial polysaccharide – xanthan gum, gellan gum, curdlan, dextran, pullulan
6. **Water:** pH, structure and interactions of water molecule, Covalent, non-covalent bond, water in food, acid-base balance, buffer
7. **Vitamins:** Structure of fat soluble and water soluble vitamins and their biochemical functions, Coenzymes
8. **Minerals:** Minerals (Fe, Na, K, Ca, P, Cl, I, Zn, Mn, Se, Mo, Cu) as co factors, antioxidants, structural components
9. **Phytonutrients:** Polyphenols, flavonoids, lignans, stilbenes, phytosterols

CC2 T1.2 NUTRITIONAL BIOCHEMISTRY Marks: 50 (credit 4)

1. **Carbohydrate Metabolism:** Aerobic and anaerobic degradation, glycogenesis, glycogenolysis, gluconeogenesis, HMP shunt pathway; Regulations of blood glucose level; Biological oxidation and electron transport chain
2. **Enzymology:** Nomenclature and classification, general properties, coenzyme and their function, factors influencing enzyme reaction kinetic properties, Michaelis constant inhibition, purification, methods for determining activities of some important enzymes, isoenzyme, mechanism of enzyme action, regulation of enzyme activity, allostericity and feedback inhibition

3. **Protein Metabolism:** Common methods of amino acid breakdown. Urea formation and uric acid biosynthesis- clinical significance
4. **Lipid Metabolism:** Fatty acid synthase and *do novo* biosynthesis of fatty acid; regulation and mechanism of chain elongation; biosynthesis of eicosanoids – prostaglandins, and their physiological importance; metabolism of cholesterol, its control and pathophysiological importance.

CC3 T 1.3 APPLIED PHYSIOLOGY & CELL BIOLOGY Marks: 50 (credit 4)

1. **Applied Physiology**

- **Alimentation:** Mechanism of HCI secretion– physiological, nutritional and pharmacological aspects. Absorption of fat, minerals, vitamins. Bile formation and secretion; Nature of exo- and endopeptidases and their mechanism of action in protein digestion; Role of mucosal associated lymphocytes in health and disease; Neuroendocrine control of hunger and satiety. Physiology of obesity and starvation. The genomics of leptin mediated responses-obesity and its regulation.
- **Immunology:** Cells and organs of Immune system.Innate immunity and Acquired immunity, Antigen, hapten and allergen.I mmunoglobulins- different isotypes. Antigen-Antibody interactions. T cell cytotoxicity. Cell-mediated effectors function, Cytokines, Hypersensitivity reactions. Autoimmunity- autoimmune diseases, Immunodeficiency.
- **Endocrinology**: Mechanism of action—Steroid and Protein hormones, Gastro-intestinal hormones: Site of origin, chemical nature and mode of action.

2. **Cell Biology :** Ultramicroscopic structure of organelles of animal cell. Plasma membrane-transport through cell membrane- Transport of nutrients, study of active and passive transport mechanisms, the glucose transporter as unique family of proteins. Golgibodies, Endoplasmic reticulum, mitochondria, lysosomes- E/M structure related to functions. Cell junctions, cytoskeleton, Cell Cycle, factors controlling cell cycle; Cell to cell signalling: hormones and receptors, second messenger. Cell signalling pathways

CC4 T1.4 ADVANCED NUTRITIONAL SCIENCE Marks:50 (credit 4)

1. **Relation of Nutrition with Immunity and Infections.**
2. **Feeding Children with Special Needs:**
    - Conditions influencing feeding in children with special needs.
    - Development of the feeding process in children.
    - Common feeding disorder/issues.
    - Management of common feeding and diet-related problems.
    - Feeding implications in common disabilities/medical conditions.
    - Importance of the assessment of feeding issues and the child's nutritional status.
3. **Nutritional needs in special conditions:**
    - In extreme environmental temperature.
    - In high altitude.

- In flood & famine.

4. **Probiotics, Prebiotics:**
   - Definition.
   - Types.
   - Sources.
   - Conditions in which these are used.
   - Health benefits.

CC5 P1.1 FOOD ANALYSIS AND CELL BIOLOGY (PRACTICAL) Marks: 50 (credit 4)

A. Food Analysis

1. Proximate Analysis of foods: carbohydrates, proteins, fats, total ash, moisture content
2. Determination of mineral content in food: Calcium, Iron
3. Determination of vitamins in Food: Ascorbic acid, β-carotene
4. Estimation of fibre in food including pectin content of fruits
5. Measurement of viscosity, surface tension and pH of food
6. Estimation of gluten content
7. Estimation of polyphenols
8. Determination of titrable acidity

B. Cell Biology

1. Separation of amino acids by paper chromatography
2. Separation of lipids by thin layer chromatography
3. Estimation of DNA by DPA method
4. Estimation of RNA by spectrophotometric method
5. Separation of proteins by electrophoresis on SDS– polyacrylamide gel
6. DNA gel electrophoresis
7. Salting out of proteins from a solution

Semester II

CC6 T 2.1 THERAPEUTIC NUTRITION AND DIETETICS Marks: 50 (Credit-4)

1. **Cardiovascular Disorders, Specific nutritional Causes, Prevention & Management:**
   - Dyslipidimia
   - Medetarenian diet

- Dietary effects on serum lipids & lipoproteins.
- Dietary sources of cholesterol.
- Atherosclerosis
- Dietary guidelines for CVD
- Prevention of CVDs by lifestyle and non-lifestyle modifications
- Nutrition on hypertension

2. **Renal functions and nutrition:**

- Nutritional assessment in renal patient
- Daily nutrient & fluid needs
- Stages in renal failure
- Practical application of diet

3. **Hepatic functions & nutrition:**

- Role of liver in normal nutrient metabolism
- Impact of liver disease in nutritional metabolism
- Nutritional evaluation & management of hepatic diseases

4. **Nutritional management of diabetes:**

- Classification & diagnostic criteria
- Gestetional diabetes
- Diabetic complications
- Role of Physical activity on blood sugar control
- Dietary management of diabetes

5. **Osteoporosis and Osteopenea:**

- Causes & Consequences
- Nutritional management

6. **Cancer and Dietary aspects:**

- Types of Cancer
- Nutritional Management
- Nutritional management during Chemotherapy of the patients

7. **Dietary management in Surgical conditions & burns**

CC7 T2.2 GENETICS AND INBORN ERROR OF METABOLISM Marks: 50 (Credit-4)

1. **Genetics**

- Molecular anatomy of genes- Nucleic acids- structure and organization
- DNA replication, transcription, translation, Post-translational modification. Genetic code, Mutations-types. Physiological and genetic changes in aging.

2. **Inborn Error of Metabolism**

- Hereditary lactose malabsorption, Galactosemia
- Disorder of amino acid metabolism --- Albinism, Alkaptonuria, Phenylketonuria, Maple syrup urine disease, Tyrosinemia, Cystinuria, Homocystinuria, Hartnup disease
- Hereditary fructose intolerance, Essential fructosuria
- Willson's disease

CC8 T2.3 SPORTS AND SPACE NUTRITION Marks: 50 (Credit-4)

1. **Sports Nutrition**

- Basic Concept of Bioenergetics, energy sources during exercise (Phosphagen, Anaerobic system and aerobic system)
- Benefits of an active lifestyle, Fitness and its measurement
- Difference between physical activity, exercise, fitness and sport
- Health-related and sport-related components of physical fitness
- Energy system in exercise, factors affecting fuel utilization
- Dietary and nutritional recommendations for sports
- Nutritional allowances as given by NIN to different groups of players
- Pre-competition , during competition and post- competition meal

2. **Space Nutrition**

- Classification of space food, processing of food for space flight, planning and serving food.

CC9 T2.4 FOOD MICROBIOLOGY AND FOOD TOXICOLOGY Marks: 50 (Credit 4)

1. Microorganisms important in food microbiology- moulds, yeast, bacteria; Growth of Bacteria, isolation of pure culture and staining.
2. Physical and chemical means used in destruction of microbes: Definition of sterilization and disinfection, role of heat, filtration and radiation in sterilization, use of chemical agents-alcohol, halogens and detergents

3. Importance of microbes in food: genetically engineered organisms, probiotics and single cell proteins; Dairy products (cheese and yoghurt) and traditional Indian fermented foods and their health benefits.
4. Microbiology of water- Number and kinds of microorganisms present in water sample. Detection, classification and confirmation of coliform bacteria, Faecal and non-faecal coliform bacteria, Purification of water. Diarrhoea causing microorganisms, toxins
5. Definition, sources of contamination and microorganisms involved in spoilages of various foods: Milk, cereals, vegetables, fruits, fish, meat, egg and canned food.
6. Public health hazards due to microbial contamination of foods: Important food borne infections and intoxications due to bacteria and moulds; Symptoms, mode of transmission and methods of prevention. Food adulteration and Natural toxicant in food, Heavy metal toxicity
7. Assessing the microbiological quality of food: indicator organisms, microbiological standards, principles of GMP & HACCP in food processing. Safety management at household and industrial level.

CC10 P2.1 CLINICAL BIOCHEMISTRY AND FOOD MICROBIOLOGY Marks: 50 (Credit 4)

A. Clinical Biochemistry

1. Preparation of Buffers : Preparation of acidic buffers, Preparation of basic buffers
2. Determination of Enzyme Activity including protein estimation: Amylase, SGOT and SGPT
3. Determination of biochemical constituents in serum : Glucose, Urea, Uric Acid, Cholesterol, Calcium, Phosphorus

B. Food Microbiology

1. Preparation of culture media for bacteria, yeast, and fungus, Inoculation and staining of bacteria, fungus and yeast, Acid fast and endospore staining; Use of Biochemical tests for identifying bacteria

2. Microbiological analysis of Water, Milk, Canned product, Fruit juices and Street foods. Phosphatase test for pasteurization of milk, Gradation of milk by methylene blue reduction test, Coliform bacteria isolation from different water sources; MIC test for antibiotics

3. Adulteration of food: (i) Metanil yellow in sweets, ice-cream and beverages. (ii) Aluminium foil in sweet. (iii) Margarin in Ghee.(iv)Water in milk.(v) Chalk Powder in sugar. (vi) Khesari flower in Besan

Semester III

CC11 T 3.1 MODERN CONCEPT OF COMMUNITY NUTRITION &PUBLIC HEALTH Marks :50 (Credit 4)

1. Meaning of community and Community Nutrition

2. Malnutrition: Meaning, Types of Malnutrition, Ecology of malnutrition-environmental, social, and economical factors. Classification of PEM- causes, signs and symptoms , Treatment and Preventive measures.
3. Nutrition education –Meaning , objectives, process of nutrition education, communication, suitable aids
4. Nutrition Surveillance and monitoring: definition, milestone in the development of nutrition surveillance . AAP approach, monthly monitoring and nutrition surveillance
5. Approaches / strategies for improving nutrition and health status of the community –immunization, safe drinking water, sanitation, prevention and management of diarrhoeal diseases.
6. Concept definitions of food and nutrition security at national, household and individual level.
7. Principles of Nutrition Epidemiology. Structure , organisation and functions of public health set up in the country:
    - National Level - Union ministry of health and family welfare
        - Director General of health services
        - Health and family welfare
        - Indian system of medicine and homeopathy
        - Department of health research
    - State Level - Director of health
        - Health and family welfare
        - Director of medical education
    - Regional Level - Regional Director of health
        - Regional District Hospitals
    - Sub divisional or Taluka Level - Community health centres (CHC)
    - Sub Taluka or Mandal Level- PHC levels and sub-centres

CC12 T3.2 ADVANCED FOOD SCIENCE & FOOD PROCESSING Marks: 50 (Credit 4)

1. Genetic engineering: recombinant DNA technology: Plasmids, cosmids and bacteriophage based vectors for cDNA and genomic libraries. Principles and methods of protein and genetic engineering and gene targeting. Polymerase Chain Reaction, Genetically modified food for nutritional enhancement: principles, techniques, problem, prospects, and ethics.

2. Analysis of genetically modified food, Comparison between GM food and Organic food. Nutraceuticals and their importance. Functional food, structured lipids, Probiotics and prebiotics, synbiotcs, commensalism

3. Nanotechnology & food: General development of nano science and nano technology in food and food processing processes. Nanocarriers for drug and nutraceuticle. Properties Characteristics

4. Enzyme Technology: Structured lipids, synthesis of value added products, application of proteases, amylases and lipases, SCP, SCL, oleaginous
5. Food preservation: Different methods.
6. Fermentation technology: Microbial growth – batch culture, contentious culture, Fed–batch culture. Application of fermentation: Microbial biomass, microbial metabolites, microbial enzymes. Components of fermentation process (brief). Cost effective commercial production of fermented products by-mutation, recombination, rDNA Technology. Fermented milk foods-dahi, sweetened dahi, yoghurt, acidophilus milk, kumiss, Bulgarian, butter milk, natural butter milk cultured butter milk , Propiono –Acido- Bifido (PAB) milk. Cereal based fermented product- idli, dosa, pulse based-soya sauce, tempe, fish based dry fish, fish sauce, meat based-sausage, salami, starch corn products-gargi, tape and others like vinegar, pickled mushroom.
7. Physiochemical changes in food, colloidal properties, gelatinization, gel formation, emulsion, foam, browning reaction : enzymatic and non-enzymatic, crystallization.
8. Sugar cookery : fondants , fudges, caramel, brittle sweets, molasses;Pulses: effect of soaking, germination, fermentation and cooking; Egg: uses in food preparation and as binding agent, foaming and emulsifying agent. Meat and fish: Post mortem changes in meat, smoked fish.
9. Food processing methods: freeze drying, microwave irradiation, dehydration extrusion, cryopreservation, baking and roasting, factors effecting nutritive value in processed food; Food additives- food colour, preservatives, antioxidants, food toxins.

CC13 P 3.1 FOOD PROCESSING, THERAPEUTIC NUTRITION AND DIETETICS Marks :50 (Credit 4)

A. Food Processing

1. Techniques of food processing- frozen products, fast food, milk products. Preparation of confectionary products, fruits, fruit juice concentrates and vegetables. Safe use of preservatives.

2. Estimation of shelf life of packaged food stuff. Water vapour of flexible packaging materials. Identification and chemical resistance of plastic film. Pre-packaging of vegetables. Familiarization of types of packaging materials. Evaluation of new food products.
3. Visit to food industries and food technology institutes

B. Therapeutic Nutrition and dietetics

1. Planning, preparation, service and evaluation of therapeutic diets covered in theory
2. Dietary counselling of patients for the disorders covered in the theory. A minimum of two case histories should be done by each student
3. Visit to hospitals

CBCS1 Other Subject (To be taken from other departments of University of Calcutta)

CBCS2 Other Subject (To be taken from other departments of University of Calcutta)

Semester IV

CC14 T 4.1 STATISTICS & RESEARCH METHODOLOGY Marks :50 (Credit 4)

1. Introduction, Collection and presentation of data- Concept of continuous and dis-continuous data, Tally mark, class limit, boundary, Frequency distribution, Cumulative frequency. Graphical presentation techniques including Histogram, Bar chart, Pie chart along with the concepts of frequency polygon, o-give (Level of teaching-Intermediate)

2. Measurement of central tendency and dispersion- Mean, median, mode (grouped & ungrouped data) Mean absolute deviation (special case-Mean deviation), Mean square deviation (special case-variance), Root mean square deviation (special case- standard deviation), Range and coefficient of variation. (Level of teaching- Elementary)

3. Correlation and regression- Scatter diagram, Correlation coefficient & Rank correlation coefficient (Spearman's) Regression Analysis. (Level of teaching- Intermediate)

4. Elements of Sampling- Types of sampling, Complete enumeration vs sampling. Sampling error & bias. Standard Error. Statistics- sampling distribution of a statistic. Some distributions- Standard

normal distribution, Chi-square distribution, t-distribution and F-distribution (Level of teaching- in detail)

5. Statistical Inference: Statistical hypothesis testing, Null hypothesis & alternative hypothesis, Critical region, Type I & Type II error, Level of Significance (Level of teaching- in detail)

6. Probability theory: Introduction to the Classical & Frequency definition of probability. Elementary problems on simple & conditional probability. Theoretical distributions- Binomial, poisson, Normal (Level of teaching- Elementary).

7. Vital Statistics: Introduction to the concept of various birth rates, fecundity rates and mortality rates (Level of teaching- Elementary).

8. Types of Research: Descriptive/historical, Experimental, survey, case study; Research methods: Sample selection, questionnaire construction, interviewing techniques, interpretation of data, scaling methods. Bibliography & literature survey; Conclusions and recommendations; Summery techniques, Report writing

CC15 P4.2 COMMUNITY NUTRITION AND COMPUTER APPLICATION Marks :50 (Credit 4)

A. Community Nutrition

1. Diet and nutrition surveys
    a. Diet surveys and breast feeding and weaning practices of specific groups
    b. Assessment of nutritional status of community by using clinical and anthropometric technique
2. Methods of extension used in Community
    a. Lecture and Method demonstrations to target groups for health and nutrition education
    b. Preparation of low cost nutritious recipes suitable for various vulnerable sections of population
3. Field visits to—
    a. Observe the working of nutrition and health oriented programmes
    b. Observe public health centre,
    c. Food production centre
4. Use of factorial method for calculation of total energy requirement
5. Methods of determination of nutrients requirement of individual, experiment with one common nutrient
6. Meal Planning: distribution of energy, nutrients, and food items according to different age groups
7. Use of food value table with its limitations
8. Classification of locally available foods according to food groups

9. Preparation of food exchange list
10. Use of food exchange list in dietary calculation and meal planning
11. Visit to an ongoing nutrition programme centre

B. Computer Applications

1. Basic idea of Operating System
2. *Word Processing:* Opening, Creating, Saving and Quitting documents, using menus and toolbars. TEXT: Copy, Delete, move, spell check character & page formatting, size, font, header, footer, bordering, colouring, margins and justification, graph, text PICTURE: Creation, editing and import, printing. Use of other available features.
3. *Document Preparation & Presentation:* Slide Preparation, adding special effects, adding picture, animation time control, and slide show.
4. *Spread sheet:* Data Entry, Moving data, range selection, use of toolbars and menus: Editing, Calculation and use of formula, display, print, graph and charts: Formatting Facilities for presentation (example: Changing fonts, colours, sizes, adding titles, legends, and gridlines)
5. Standard deviation, correlation, Regression, Hypothesis, Testing, Basic of Image processing and image analysis

CC16 P4.3 DISSERTATION Marks :50 (Credit 4)

The students will be guided and supervised by a member of the teaching faculty of the department. The dissertation in which the research culminates should reflect the student's own work. Final Dissertation Thesis has to be submitted in hard copy and the candidates have to do a presentation of their work followed by viva-voce.

DSE1 BIOPHYSICAL PRINCIPLES Marks :50 (Credit 4)

- Physicochemical principles involved in assay technique.
- Physicochemical properties and biological applications of a) viscosity b) surface tension c) absorption e) colloids f) osmosis g) Donnan membrane equilibrium

- Principle of instrumentation and use of: Phase contrast, ultra- polarising and electron microscope: scanning and transmission, atomic force microscope
- Photoelectric colorimeter and spectrophotometer.
- Different types of electrophoresis apparatus. Western blot, northern blot, southern blot, ELISA, RIA.
- Chromatography; Spectroscopy: UV and fluorescence

OR

DSE1 FOOD SERVICE MANAGEMENT **Marks :50 (Credit 4)**

- Growth and development of food service in Institution
- Influencing factors in successful institutional menu-planning: consideration with regard to nutritional/metabolic disorder-medical aspect, food habit of consumers availability of ingredients and facilities.
- Personal management: The staffing pattern, criteria for selection of dietician and food handlers.
- Role of hygiene, sanitation and safety factor involved in institutional food service including the importance of creating right attitude of mind of the workers towards these factors in operational units
- Planning and layouts of food service units indifferent Institution with special emphasis on kitchen, dinning hall, store and other food movement complex
- Equipments for kitchen, dinning room and sun dry, food, sales and service points, type of equipment, criteria for their choice, efficiency in operation and care

OR

DSE1 FOOD PRODUCT DEVELOPMENT **Marks :50 (Credit 4)**

- **Introduction to product development** -- Food needs and consumer preference: need for new products, Trends and innovation in food markets, Consumer research and the market
- **Designing new products** -- new food product development process and activities**;** Planning stages, Prerequisites of a successful product development, the concept of added value
- **Product Development and Quality Evaluation** -- Standardization of food products (laboratory level, Scaling up, Understand sale and profit margin), Shelf life studies – chemical and microbiological parameters
- **Sensory Characteristics of Food and Selection of Panel** -- Colour, Texture, Consistency, Taste and odor; Effect of temperature on sensory characteristics of foods; Panels for Sensory Evaluation

(Types of panels, Training the panel members, Number of panel members for different tests); Types of Sensory Evaluation Tests -- Discriminative / Difference Test, Quality Test, Rating Test, Food Samples for Evaluation

- **Advertisement and Marketing** -- product performance testing; market positioning, marketing; developing test market strategies, various tools and methodologies to evaluate consumer attitudes, preferences and market acceptance factors

DSE2 MATERNAL AND CHILD NUTRITION Marks :50 (Credit 4)

1. Role of Nutrition during Pregnancy

- Regulation of nutrient supply to the fetus.
- The energy cost of Pregnancy.
- Birth Weight- the effect of maternal age, maternal weight and energy intake.
- Nutrient requirements during pregnancy.
- Lifestyle factors that impact on pregnancy outcome.

2. Role of Nutrition during Lactation:

- Compositions of breast milk and implications of maternal nutrition.
- Factors improving lactation performance.

3. Child Nutrition:

- Normal developmental milestones from 0 to 1 year- Failure to thrive- Causes & treatment
- Importance of exclusive breastfeeding during 1st 6 months of life
- Normal weaning method
- Growth & development of preschool children
- Nutritional requirement during preschool age- meal pattern & their nutritional problems in India.
- Meal pattern & nutritional requirements of school going children-Special feeding programmes of the school children.

OR

DSE2 GERIATRIC NUTRITION Marks :50 (Credit 4)

- The ageing process
- Physiological changes accompanying the ageing process

- Nutrients needs during ageing
- Special healthy eating pattern related to age-related changes of elderly
- Common health problems during old age & their nutritional management
- Factors influencing longevity and health

OR

DSE2 FUTURE NUTRITION RESEARCH Marks :50 (Credit 4)

- Nutrigenomics:Omics in nutrition, Nutrigenome, Metabolome and MetabolomicsGenomics &Trascriptomics
- Genetics, Measure of nutritional phenotype, epigenetics and nutritional epigenomics
- Nutrient sensing: The role of sensing transcription factors and dietary signalling routes
- Drug metabolism and drug nutrient interaction
- Global food policies and food security: Definition and Dimensions of Health – Morbidity – Mortality and Life Expectancy; Occupational Health Hazards; Determinants of Nutrition and Mal-Nutrition. Concepts of Infant Mortality Rate, NMR BMI, CMR, TFR, DALYs.
- Structural dimensions of Nutrition Policy, Nutritional Impact of Economic Shocks and Policies, Multiple Sectors linkages in determining Nutritional Goals, Nutrition-sensitive food and agriculture policies and programmes, Concepts of nutrition knowledge, nutrition labelling, food safety, food losses. Framework sketch - Sustainable development, Dietary diversity, Food Security, Nutrition Security and Nutrition Value Chains.