DEPARTMENT OF HOME SCIENCE
Shri Dev Suman University New Tehari

SYLLABUS
M.Sc. Home Science (Foods and Nutrition)
Two Year Course - Semester System
(2015-16 onwards)

First Semester (July to November)	Name of Course	Course Number	Credits	Marks
	Advanced Nutritional Biochemistry.	SOS/HFN/C001	03	100
	Human Physiology	SOS/HFN/C002	03	100
	Research methods	SOS/HFN/C003	03	100
	Food science-I	SOS/HFN/C004	03	100
	Food Preservation	SOS/HFN/C005	03	100
	Practical	SOS/HFN/C006	03	100
		Core Credits	18	600

Second Semester (December to April)	Name of Course	Course Number	Credits	Marks
	Advanced Food Science – II	SOS/HFN/C007	03	100
	Food Microbiology	SOS/HFN/C008	03	100
	Assessment of Nutritional Status	SOS/HFN/C009	03	100
	Clinical nutrition & dietetics-I	SOS/HFN/C010	03	100
	Statistics	SOS/HFN/C011	03	100
	Practical	SOS/HFN/C012	03	100
	Food Fortification(Self Study)	SOS/HFN/SS01	03	100
		Core Credits	18	600

Third Semester (July to November)	Name of Course	Course Number	Credits	Marks
	Public Nutrition	SOS/HFN/C013	03	100
	Advanced Nutrition	SOS/HFN/C014	03	100
	Practical	SOS/HFN/C015	03	100
	Electives (Any **three** of the following)			
	Nutrition management and health	SOS/HFN/E01	03	100
	Nutrition in emergencies and Disasters	SOS/HFN/E02	03	100
	Food Hygiene and Sanitation	SOS/HFN/E03	03	100
	Food Packaging Technology	SOS/HFN/E04	03	100

	Neutraceuticals and Health	SOS/HFN/E05	03	100
	Healthy Lifestyle and Nutrition (Self Study)	SOS/HFN/SS03	03	100
	Core Credits (09)+Elective Credits (09)	**Total Credits**	**18**	600

	Name of Course	**Course Number**	**Credits**	**Marks**
Fourth Semester (December to April)	Food Safety and Food Laws	SOS/HFN/C0016	03	100
	Clinical nutrition & dietetics-II	SOS/HFN/C0017	03	100
	Practical	SOS/HFN/C018	03	100
	Dissertation	SOS/HFN/C019	06	200
	Electives (Any **ONE** of the following)			
	Experimental cookery	SOS/HFN/E06	03	100
	Human Nutrition	SOS/HFN/E07	03	100
	Enzymes in Food Processing (Self Study)	SOS/HFN/SS05	03	100
	Core Credits (09)+Elective Credits (09)	**Total Credits**	**18**	600

Total 600

SEMESTER I

First Semester (July to November)	Name of Course	Course Number	Credits	Marks
	Advanced nutritional biochemistry.	SOS/HFN/C001	03	100
	Human Physiology	SOS/HFN/C002	03	100
	Research methods	SOS/HFN/C003	03	100
	Food science-I	SOS/HFN/C004	03	100
	Food Preservation	SOS/HFN/C005	03	100
	Practical	SOS/HFN/C006	03	100
		Core Credits	18	600

Paper-I ,SOS/HFN/C001 (Advanced Nutritional Biochemistry) marks-100

Objectives:

1. To augment the bio chemistry knowledge acquired at the undergraduate level.
2. To understand the basic nature of bio molecules.
3. To understand the machanisms adopted by human body for regulation of metabolic pathway.
4. To become proficient for specialization in nutrition.

Unit-I

Carbohydrates:- classification, structure and biological impotance.
Metabolism:- glycolysis, gluconeogenesis and citric acid cycle.

Unit-II

Protein-classification and biological importance.
Amino acid:- classification & structure.

Unit-III

Lipids:- classification and biological importance.
Metabolism of liquid.

Unit-IV

Energy metabolism:- respiratory quotient, calorimeter, basal metabolism, specific dynamic action of food.

Unit-V

Vitamins:- chemistry, food sources and functions.

Unit-VI

Nucleic acid:- structure of importance of base, nucleotides, nucleosides, DNA and RNA.

Reference:

Principles of biochemistry- Nelson and M.cox (lehniger).
Text book of biochemistry –West and Todd.
Fundamentals of biochemistry- A.C Deb.
Review and physiological chemistry- H.Harper
Experimental biochemistry- J.M.Clark

Paper-II SOS/HFN/C002 (Human Physiology)

Unit-I
Cell structure and function: levels of cellular organization and functions organells, tissue, cell membrane and intercellular communication, regulation of cell multiplication.
Unit-II
Respiratory system: exchange of gases, transport of oxygen and CO2 ,role of hemoglobin and buffer system.
Unit-III
Circulatory system: structure and system of heart and blood vessels, heart beats, blood and blood groups. Blood pressure and hypertension.
Unit-IV
Digestive system: structure and function, secretory, digestive and absorptive function, role of liver and pancreas.
Unit-V
Sense organs: structure and function, Role of skin, eye, ear, nose and tongue.
Unit-VI
Excretory system: structure and function of nephron, urine formation, role of kidney in maintaining PH of blood.

Paper-III SOS/HFN/C003 (Research methodology)

marks-100

Contents:
Unit-I
Science, scientific methods, scientific approach.
Research, definition, nature, role, need, step.
Types of research: Historical, descriptive, experimental, case study, social research, participatory research.

Unit-II
Definition and identification of research problem, selection of a problem nature, type and function of hypothesis. Types of variables.

Unit-III
Research design- definition, types, basic principles and purpose. Population and sample. Probability sampling, non probability sampling.

Unit-IV
Sources of data.

Paper-IV SOS/HFN/C004 (Food Science-I)

marks-100

1. **Constituents of foods:** properties and significance
2. **Cereals and cereals product:**
   - Cereals grain: structure and composition.
   - Cereals products.
   - Flours and flours quality.
   - Extruded foods, breakfast cereals, wheat germs, puffed and flaked cereals.
3. **Milk and milk product:**
   - Composition physical and functional properties. Denaturation effect of processing and storage.

- Dairy product: cultured milk, yogurt, butter, whey, cheese, concentrated and dried products, frozen desserts, dairy products substitutes.

4. **Meat and poultry:** muscle, composition, characteristics and structure. Post mortem changes. Processing, preservation and their effects. Heat induced change in meat. Variable and meat preparation. Tenderizers, meat product.
5. **Eggs:** structure and composition. Changes during storage. Functional properties of eggs, use in cookery. Egg processing. Low cholesterol egg substitutes.
6. **Fish and sea foods:** type and composition, storage and change during storage. Changes during processing. By-product and newer product.
7. **Pulses and legumes:** structure, composition, processing. Toxic constituents.
8. **Nut and oilseeds:** composition, oil extraction and by-product.
9. **Fruit and vegetables:** plant anatomy, gross composition, structural features and activities of living systems. Enzymes in fruit and vegetables. Flavor constituents. Plant phenolics. Pigments. Post harvest changes. Texture of fruit and vegetables. Effect of storage, processing and preservation.
10. **Spices and condiments:** composition, flavoring extracts- natural and synthetic.

PAPER V SOS/HFN/C005 - FOOD PRESERVATION

1. A. **Classification of food in relation to shelf life**-Spoilage in food and its control: spoilage caused by microorganism (bacteria, fungi and virus), enzymes, pets and rodents.
B. **Food dehydration and concentration**: methods of drying and concentration, types of dryers, factors affecting drying process.
2. **Heat processing** : Mechanism of action, methods of application to foods (Equipments), effect on food and micro-organisms
a. sterilization,
b. pasteurization,
c. blanching,
d. canning.
3. **Cold preservation** : Mechanism of action, methods of application to foods (Equipments), effect on food and micro-organisms
a. refrigeration,
b. freezing,
c. freeze drying,
d. refrigerated gas storage.
4. A. **Food irradiation**: technology, application and safety assessments, effects on food and microorganisms
B. Chemicals in food preservation, safety of preserved foods.

PAPER VI- SOS/HFN/C006- PRACTICAL

marks-100

1. Estimation of hemoglobin.
2. Estimation of glucose in blood and urine.
3. Estimation of vitamin C in lemon juice or any other fresh food stuff.
4. **Tissue**-examination of slides of connective tissue, muscular tissues and epithelial tissue.
-Estimation of hemoglobin.
-Blood film preparation, staining, blood groups.
-Blood pressure- clinical examination & recordings.

5. **Milk and milk products :-** scalding denaturation offect of acid, salt, alkali, sugar, heat, enzymes, polyhenols on milk, khoa, curd, paneer, chees (ripened and unripened)

6. **Egg:-** structure , assessing ege quality. Use of egg in cookery

7. Food preservation techniques (use of different techniques in product formulation and analysis of product for quality standards).

-. Sun drying and dehydration-cereals, legumes, vegetable based.
-. Preservation with sugar-jams, jelly, preserves, etc.
-. Preservation - salt, oil, vinegar-pickling.
-. Preservation of foods using chemicals –tomato ketchup, squash.

SEMESTER II

Second Semester (December to April)	Name of Course	Course Number	Credits	Marks
	Food Microbiology - S	SOS/HFN/C007	03	100
	Advanced Food Science – II - R	SOS/HFN/C008	03	100
	Statistics - M	SOS/HFN/C009	03	100
	Assessment of Nutritional Status Y	SOS/HFN/C010	03	100
	Clinical nutrition & dietetics-I Y	SOS/HFN/C011	03	100
	Practical	SOS/HFN/C012	03	100
	Food Fortification(Self Study)	SOS/HFN/SS01	03	100
		Core Credits	18	600

Paper-I SOS/HFN/C007- (Food Microbiology)

- To understand the role of micro organism in food, food spoilage.
- To understand advanced techniques of food preservation.
- To learn about food borne infections and intoxication.

Unit-I

- Introduction to food microbiology.
- Micro-organisms of importance in food- bacteria, yeast and moulds, morphology, primary sources and biochemical activities.
- Factors affecting the growth of micro-organism.

Unit-II

Food spoilage.

- Spoilage of different group of food.
- Cereal and cereal products.
- Vegetables and fruits.
- Milk products.
- Canned food.
- Meat, fish & poultry.

Unit-III

- Food preservation- physical methods and chemical methods.

Unit-IV

Food borne disease: bacterial and viral food borne illness, Food born parasites, mycotoxine.

Unit-V

- Methods of isolation and detection of micro- organism (only principles in brief)
- Immunological methods- fluorescent, antibody, radio-immunoassay, ELISA.
- Chemical methods- thermostable nuclease and PCR (polymers chain reactions)

Reference-

Food microbiology- Frazier and Westhoff
Food microbiology- Adam & Moss
Medical bacteriological- N.C. Dey
Experiment in Micribiology- K.R Anju

Paper-II SOS/HFN/C008- (Advanced Food science-II)

marks-100

Contents:

(1)Introduction to Food Science: Evolution of the food industry and allied industries. Develop of food science as a discipline.

(2)Water and food dispersions: Physical properties of water and ice, chemical nature, structure of the water molecule.

- Sorption phenomena, type of water, solution and colligative properties.
- Free and bound water.

- Water activity and food spoilage.
- Freezing and ice structure.
- Colloidal salts, stabilization of colloidal system, Rheology of food dispersions.
- **Gels:** structure, formation, strength, type and permanence.
- **Emulsions:** formation, stability, surfactants and emulsifiers.
- **Foams:** Structure, formation and stabilization.

(3)Polysaccharides, sugars and sweeteners:

- Starch: structure gelatinization, method of following gelatinization changes. Characteristic of some food starches. Effect of ingredients and condition on gelatinization. Modified food starches.
- Non-starch polysaccharides: cellulose, hemicelluloses, pectins, gums, animal polysaccharides.
- Sugar and sweeteners: sugars, syrups, sugar alcohols, potents sweeteners, sugar products.
- Sweetener chemistry related to uses in food product: Structure relationship to sweetness perceptions, hydrolytic reactions, solubility and crystallization hygroscopicity, colligative properties, textural contributions, fermentation, non-enzymatic browning.

(4)Fats, oil and related products:

- Source composition effects of composition on fat properties. Functional properties of fat and uses in food preparations. Fat substitutes. Fat deterioration and anti oxidants. Radiolysis , inter esterification of fat.

(5)Proteins: classification, composition, denaturation non enzymatic browning and other chemical changes.

(6)Enzymes: nature of enzymes, stability and action, proteolytic enzymes, oxidases, lipases, enzyme decomposing carbohydrates and application. Immobilized enzymes.

Paper-III SOS/HFN/C009- (Statistics)

marks-100

Unit-I

Meaning and uses of statistics, classification and tabulation of data construction of frequency distribution table.

Unit-II

Diagrammatic representation of data- single dimensional diagram (line and bar), two dimensional diagram(pie)

Graphical representation of data- Graphs of frequency distribution. (histogram, frequency polygon, frequency curve)

Unit-III

Measure of central tendency- mean, median, mode

Measure of dispersion- standard deviation

Unit-IV

Analysis of data, writing a research report.

Paper-IV SOS/HFN/C010- (Assessment of nutritional status)

Contents:-

1. Nutritional assessment as a tool for improving the quality of life of various segments of the population including hospitalized patients.
2. Current methodologies of assessment of nutritional status, their interpretation & comparative application of following:

- Food consumption
- Anthropometry
- Clinical & laboratory
- Rapid assessment & PRA
- Function indicators such as grip strength, respiratory fitness, harverd step test, squatting test.

3. Nutritional surveillance- basic concepts, uses & setting up of surveillance system.
4. Monitoring & evaluation.

PAPER V- SOS/HFN/C011- CLINICAL NUTRITION AND DIETETICS- I

1. **Dietary principles and management Gastro-Intestinal Disorders** –Etiology, symptoms, treatment and prevention of the following:

a. Gastritis
b. Peptic ulcer
c. Diarrhoea
d. Constipation
e. Malabsorption syndromes- Sprue/ Tropical sprue
f. Ulcerative colitis and Crohn's disease
g. Diverticulosis
h. Hernia. Irritable bowel syndrome.

2. **Upper gastrointestinal diseases**: Gastroesphophageal reflex and esophagitis. **Disorders of stomach**- indigestion, dyspepsia, gastritis, (causes, pathology, management).
3. **Nutritional management in pulmonary diseases**: Chronic obstructive Pulmonary disease, cystic fibrosis, pneumonia, tuberculosis; causes, pathology, effect of malnutrition, nutritional management.

4. **Rheumatic disorders**: Arthritis- osteo and rheumatoid arthritis, Gout: Symptoms, causes, treatment, prevention.
5. **Liver diseases:** Hepatitis (A, B, C). Cirrhosis, Cholecystisis, Cholelithiasis. alcoholic liver disease, cholestatic liver disease, inherited disorders
6. **Pancreatitis:** Functional tests and dietary management.
7. **Neurological diseases**: [Stroke, epilepsy, migraine, Parkinson's' neurotrauma myasthenia gravis], causes, effect of malnutrition, feeding problems, effect of nutrients.
Note: each chapter should be dealt under cause, etiology, symptom and management.

PAPER- SOS/HFN/C012- PRACTICAL

1. Study the use of compound microscope.
2. Staining of bacteria- Gram's staining, acid-fast staining, capsule and flagella staining.
3. Visit to food processing unit.
4. Effect of solutes on boiling point and freezing point of water.
5. Effect of types of water on characteristics of cooked vegetables, pulses and cereals.
6. Sugar and jaggery cookery: relative sweetness, solubility and size of sugar, stages of sugar cookery, caramelization, crystallization, factory affecting crystal formation.
7. Community based project for assessment of nutritional status of any vulnerable group.
8. A small evaluation study of a nutritional project
9. Visit to the hospitals- learn to use medical record and obtain required information.
10. Identify and collection of case studies- at least 3-4 cases in every condition.

PAPER- SOS/HFN/SS01-FOOD FORTIFICATION –(Self Study)

. **Food fortification** – Needs, objectives, principles and rationale, selection and basis of fortificants.
2. **Technology of fortifying cereal products**.
a. Characteristics of nutrients used in cereal fortification Types and levels of micronutrients to be added

b. Fortification methods
c. Fortification premixes, Design and composition of premixes and quality control Fortification of bread, pasta, noodles, biscuits, and breakfast cereals.
d. Use of enzyme in beverages- fruit juices, beer, wine, and distilleries; dairy, baking, oils and fats, plantation products, animal products.
e. Malting and germination of grains – process, characteristics, nutritional benefits and uses
3. **Technology of fortifying beverages, candies, snack products**
a. Technology of fortifying beverages - Importance of beverage fortification, Health benefits of fortification, Selection of nutrients for fortification, Levels to be added,

Characteristics of fortificants and method of fortification, Bioavailability, Organic Vs inorganic salts.

b. Technology of fortifying candies - Product formulation, Factors to be considered in selecting fortificants, Nutrient bioavailability and its interactions, Packaging, storage, shelf life and cost.

c. Snack products - Rationale for micronutrient fortification of snack products, Merits and demerits of fortification, Choice of products and selection of micronutrients, Setting level of fortification, Safety limits, Technological and cost limits, Challenges in fortifying snack products, Nutrient interaction and bioavailability.

4. **Other special fortified products** - salt, sugars, oils, Nutri-bars, Granola bars, health foods.

a. Salt: Technology of fortifying salt with iron and iodine, Iodine stability and quality of double fortified salt, Safety issues, Levels to be added.

b. Sugars: Fortification with iron and vitamin A, Premix formulation, Fortification level, Packaging.

c. Oils: Fortification with vitamin A, Rationale of vitamin A fortification, Stability of vitamin A in oil during storage and cooking, Effects of frying on Vitamin A content, Efficacy and safety of vitamin A added to oil, Technology of fortifying, Packaging

d. Nutri bars: Selection of nutrient, Advantages and disadvantages of fortification, Technology of fortification, Packaging.

e. Granola bars: Production of the product, Physical parameters of bars, Incorporation of fortificants, Technology of fortification, Packaging.

f. Health foods: Selection of nutrients, Technology of incorporation, Bioavailability, Packaging.

SEMESTER III

Third Semester (July to November)	**Name of Course**	**Course Number**	**Credits**	**Marks**
	Public Nutrition	SOS/HFN/C013	03	100
	Advanced Nutrition	SOS/HFN/C014	03	100
	Practical	SOS/HFN/C015	03	100
	Electives (Any **three** of the following			
	Nutrition management and health	SOS/HFN/E01	03	100
	Nutrition in emergencies and Disasters	SOS/HFN/E02	03	100
	Food Hygiene and Sanitation	SOS/HFN/E03	03	100
	Food Packaging Technology	SOS/HFN/E04	03	100
	Neutraceuticals and Health	SOS/HFN/E05	03	100
	Healthy Lifestyle and Nutrition (Self Study)	SOS/HFN/SS02	03	100
	Core Credits (09)+Elective Credits (09)	**Total Credits**	**18**	**600**

Paper-I SOS/HFN/C0013, Public Nutrition

Objectives: The course will enable the student to:

- Develop a holistic knowledge base and understanding of the nature of important nutrition problems and their prevention and control for the disadvantaged and upper socioeconomic strata in society.
- Understand the causes/ determinants and consequences of nutrition problem in society.
- Be familiar with various approaches to nutrition and health interventions, programmes and policies.

Contents

Theory

1. **Concept of public nutrition-** relationship between health and nutrition, role of public nutritionists in the health care delivery.
2. Sectors and public policies relevant to nutrition.
3. **Primary health care of the community**
   - National health care delivery system.
   - Determinants of health status
   - Indicators of health.
4. **Population Dynamics:** demographic transition, population structure, fertility behavior. population policy, fertility, nutrition and quality of life inter- relationship.
5. **Major nutritional problems-** etiology, prevalence, clinical manifestation, preventive and therapeutic measure of:

- Macro and micro nutrient deficiencies
- Other nutritional problem like lathyrism, dropsy, aflatoxicosis, alcoholism and fluorosis.
- Over weight, obesity and chronic degenerative diseases.

6. **Approaches and strategies for improving nutritional status and health:** programmatic otion- their advantages and demerits. Feasibility, political support, available resources (human, financial, infrastructural) case study of selected strategies and programme: their rationale and context, how to select intervention from a range of possible option:

health-based interventions, food based interventions including fortification and genetic improvement of foods, supplementary feeding, nutrition education for behavior change.

References:

1. Owen. A.Y and Frankle, R.T(1986): nutrition in the community, the art of delivering services, 2nd edition times mirror/mosby.
2. Park, K (2000): Park's textbook of preventive and social medicine, 18th edition, M/s. Banarasidas bhanot, Jabalpur.
3. SCN News, UN ACC/SCN subcommittee on nutrition.
4. State of the word's children, UNICEF
5. Census report

6. Berg, A. (1973): The nutrition Factor, the brookings institution, Washington.

PAPER II, SOS/HFN/C0014 - Advanced Nutrition

Unit-I

Energy- Energy content of food, physiological fuel value- review. Measurement of energy expenditure: BMR, thermic effect of feeding and physical activity, method of measurement.

Unit-II

Carbohydrates- Classification, digestion and transport- review, dietary fibre, fructoligosaccharides, resistant starch- chemical composition and physiological effect, sweetness- nutritive and non nutritive.

Unit-III

Protein- Classification, digestion, absorption review, metabolism of proteins, protein quality, methods of evaluation protein quality.

Unit-IV

Lipids- Classification, digestion, absorption, transport- review, function of EFA. Role of n-3, n-6, fatty acids in health and disease. Trans-fatty acids, prostaglandins.

Unit-V

Water- Regulation of intra and extra cellular volume. Osmolality, water balance and its regulation.

Unit-VI

Non-nutritive food components with potential health effect: polyphenols, tannins, phytate. phytoestrogens, cyanogenic compound, lectins and saponins.

References

1. Annual reviews of nutrition. Annual review Inc California USA.
2. Shils, M.E, Olson, J. Shike, M and Roos(1998): Modern nutrition in health and disease , 9th edition Williane and willians. A Beverly co. London.
3. Bodwell, C.E and erdman, J.W (1988) Nutrient Intractions, Marcel Dekker Inc. New York.
4. Indian council of medical research, Recommended Dietary intakes for Indians- latest Recmmandations.
5. World- Reviews of nutrition and dietetics.

PAPER III, SOS/HFN/C015- Practical
(+ practical related to Elective Courses)

1. Comparison of rural, urban and tribal communities for: (a) determinants of malnutrition (b) socio-economic group (c) the type of nutritional problem in different segments and age group through analysis of secondary data.

2. Development of a plan for a nutrition intervention project in the community (the target group (s) need to be specified).
   Develop of low cost nutritive recipes suitable for various vulnerable groups at micro and macro levels.
3. Field experience in operational public nutrition programmes: nutrition rehabilitation centers, fortification programmes, cost
   analysis.

4. Estimation of protein quality using different method PER, B.V, N.P.U.
5. Estimation of energy requirement:
   - BMR
   - Energy expenditure on physical activities.
6. Assessment of micronutrient status:
   - Iron
   - Vitamin C
   - Vitamin A
   - Vitamin from B- complex group.

Paper-IV, SOS/HFN/E01 (Nutrition Management and Health)

Objectives:- to enable the students to understand the:-

1. Basic principles of diet therapy.
2. Significance of dietary counseling.
3. Modification of the normal diet for therapeutic purpose.

Theory: 100 marks

- Principles and basic concept of diet therapy.
- Normal diet as the basis of therapeutic diets.
- Assessment of patient needs based on anthropometric, clinical, biochemical and dietary data.
- Team approach to health care.
- Planning, implementation, evaluation and dietary counseling in nutrition care.
- Application of computer in health care delivery.
- Role of nutritionist in health care delivery.
- Introduction to enteral and parenteral feeding.
- Progressive diets- clear fluid, full fluid, soft, bland and regular diet.
- Therapeutic adaptation of the normal diet.
- Recommended daily allowances of nutrient by ICMR. Role of nutrition during different life cycle:- infancy, preschool, school going children pregnancy, lactation and old age.

Practical

- Demonstration of a computer package for nutrition care its use.
- Planning, calculating, preparation, service and evaluation of the following:-
  1. Normal diet with a cycle menu
  2. Soft diet.
  3. Liquid diet.
- Development of a counseling aid.
- Planning and preparation of diet for different life cycle:- infancy, preschool, school going children, pregnancy and location.

Reference:

1. Anita, F.P.
2. Bamji M.S. Prahlad Rao N., Ready V., 1996.
3. Davis J, and shexex K 1994, Applied Nutrition and Diet Therapy.
4. Ghafoornunissa and Krishnaswamy K. 1995, Diet and Heart Disease, NIN, ICMR.
5. NIN, ICMR, 1998, Dietry Guidelines for Indians.

Paper-V SOS/HFN/E02 (Nutrition in Emergencies and Disasters)

Marks-100

Unit-I

- Natural/manmade disaster resulting in emergency situation.
- Drought, flood, earth quake, cyclone, war, civil and political emergencies
- Factors giving rise to emergency situation in these disasters.

Unit-II

Nutritional problems in emergencies in vulnerable groups.

- Causes of malnutrition in emergency situation.
- Major deficiency disease in emergencies.
- Protein- energy malnutrition.
- Specific deficiency.

Unit-III

Communicable diseases: surveillance and treatment.

- Control of communicable disease in emergencies- Role of immunization and sanitation.

Unit-IV

Nutritional relief and rehabilitation

- Assessment of food need in emergency situations.
- Food distribution strategy- Identification and reaching the vulnerable group.
- Mass and supplementary feeding.
- Local food in rehabilitation.
- Organization of mass feeding/ general food distribution.
- Feeding centers.
- Evaluation of feeding programmes.
- House hold food security and nutrition in emergencies.

Unit-V

Public nutrition approach to tackle nutritional problems in emergencies.

PAPER VI, SOS/HFN/E03-Food Hygiene and Sanitation

1. **General principle of food hygiene**, Hygiene in rural and urban areas in relation to food preparation, personal hygiene and food handling habits. Place of sanitation in food plants. Sanitary aspects of building and equipment: Plant layout and design.
2. A. **Safe and effective insect and pest control**: Extraneous materials in foods, Principles of Insects and **pests control**.
B. **Physical and chemical control**. Effective control of micro-organisms: micro-organisms important in food sanitation, micro-organisms as indicator of sanitary quality
3. **Sanitary aspects of water supply**: Source of water, quality of water, water supply and its uses in food industries. Purification and disinfection of water preventing contamination of potable water supply.
4. A. **Effective detergency and cleaning practices**: Importance of cleaning technology, physical and chemical factors in cleaning, classification and formulation of detergents and sanitizers, cleaning practices.
B. **Sanitary aspects of waste disposal**. Establishing and maintaining sanitary practices in food plants, role of sanitation, general sanitary consideration and sanitary evaluation of food

PAPER VII, SOS/HFN/E04- Packaging Technology

1. **Food packaging** - Need and role in extending shelf life of foods. Design and testing of package materials, package performance. Principles in the development of safe and protective packing, safety assessment of food packaging materials.
2. **Food packaging systems, product characteristics and package requirements**: Different forms of packaging such as rigid, semirigid, flexible forms and different packaging system for (a) dehydrated foods (b) frozen foods (c) dairy products (d) fresh fruits and vegetables (e) meat, poultry and sea foods.
3. **Types of packaging materials** (metals, glass, paper and plastics), their characteristics and uses. Paper: pulping, fibrillation and beating, types of papers and their testing methods.
Glass: composition, properties, types of closures, methods of bottle making;
Metals: Tinplate containers, tinning process, components of tinplate, tin free steel (TFS), types of cans, aluminum containers, lacquers;
Plastics; types of plastic films, laminated plastic materials, co-extrusion.
4. A. **Package accessories and advances in packaging technology** (active packaging, modified atmosphere packaging, aseptic packaging, and packages for microwave ovens, biodegradable plastics, edible gums and coatings).
B. **Packaging equipment and machinery**: Vacuum, CA and MA packaging machine; gas packaging machine; seal and shrink packaging machine; form and fill sealing machine; aseptic packaging systems; retort pouches, bottling machines; carton making machines, package printing.

PAPER VIII, SOS/HFN/E05--Neutraceuticals And Health Foods

1. **Nutraceuticals**:
a. Use of neutraceuticals in traditional health sciences. Their role in preventing /controlling diseases.
b. Definition, Classification, food and non food sources, mechanism of action. Role of omega-3, fatty acids, carotenoids, dietary fiber, phytoestrogens; glucosinates; organosulphur compounds as neutraceuticals.
2. **Prebiotics and probiotics**: Usefulness of probiotics and prebiotics in gastro intestinal health and other benefits. Beneficiary microbes; prebiotic ingredients in foods; types of prebiotics and their effects on gut microbes.
3. **Functional foods** Definition, development of functional foods, benefits and sources of functional foods in Indian diet. Effects of processing conditions and storage; Development of biomarkers to indicate efficacy of functional ingredients; Research frontiers in functional foods.
4. **Development of nutraceutical and functional foods** – Standards for health claims. Process of developing - preclinical & clinical studies, Marketing and Regulatory issues, Regulatory bodies in India.

PAPER X, SOS/HFN/E03- Healthy Lifestyle And Nutrition(Self Study)

1. **Factors affecting food habits, choices and dietary patterns** – Definition of Food, Nutrition, Health, Fitness. Interrelationship between nutrition and health, concept of a desirable diet for optimum nutrition, health and fitness.
2. **A brief review of nutrients in general**
a. Energy and macronutrients – Carbohydrates, Protein, Fat - functions, sources deficiency disorders and recommended intakes.
15
b. Micronutrients: Minerals – calcium, Iron, Iodine, and other elements. Vitamins – A, D, E, K, B-complex, Vitamin C.
3. **Basic principles of planning diet** – Nutritional assessment, RDA for Indians, Food groups, Dietary guides and balanced diets.
4. **Basics of Body composition and changes during life span.**
5. **Nutrition and physical fitness**:
Exercise and Fitness- Definition, benefits, components and indicators of fitness. Nutritional requirements of exercise – fluids, vitamins and minerals, energy, macronutrient needs and distribution, body adaptation.
Approaches to the management of fitness and health in weight management.
6. **Alternative systems for health and fitness** – Ayurveda, yoga and meditation and other methods.

SEMESTER- IV

Fourth Semester (December to April)	Name of Course	Course Number	Credits	Marks
	Food Laws and Food Safety	SOS/HFN/C0016	03	100
	Clinical nutrition & dietetics-II	SOS/HFN/C0017	03	100
	Practical	SOS/HFN/C018	03	100
	Dissertation	SOS/HFN/C019	06	200
	Electives (Any **ONE** of the following):			
	Experimental cookery	SOS/HFN/E06	03	100
	Human Nutrition	SOS/HFN/E07	03	100
	Enzymes in Food Processing (Self Study)	SOS/HFN/SS03	03	100
	Core Credits (09)+Elective Credits (09)	**Total Credits**	18	600

PAPER I- SOS/HFN/C0016-Food Laws and Food Safety

1. A. Concept and meaning of Food quality and food Safety, food adulteration, food hazards.
B. Natural toxins.
2. Food laws and regulations – National and international food laws, Governing bodies.
3. Exposure, estimation, toxicological requirements and risk assessment.
4. Safety aspects of water and beverages such as soft drinks, tea, coffee, cocoa.
5. A. Safety assessment of food contaminants and pesticide residues.
B. Safety evaluation of heat treatments and related processing techniques

PAPER II- SOS/HFN/C0017-Clinical Nutrition and Dietetics- II

NOTE: theories, etiology, symptoms, assessment and dietary management of each disease condition to be included.

1. **Dietary management of diseases of renal system**: etiology, symptoms, nephritis and nephrosis-metabolic and Nutritional implications in acute/ chronic renal failure, kidney, transplant. Renal calculi.
2. **Dietary management of Cardio vascular diseases**: Role of specific nutrients in cardiac efficiency-aetiology, incidence, symptoms, long-term and short-term treatment in Coronary disease. Myocardial infarction, cerebral infarction (atherosclerosis as one of the causative factor). **Other acute and chronic conditions**: congestive heart failure, hypertension, dyslipidemia (genetic hyperlipidemia).
3. **Obesity**: genetics, diet and physical activity, control of body weight, risk of diabetes and cardiovascular diseases.
4. **Dietary principles and management of Diabetes mellitus**: Incidence, aetiology, classification, therapy, diagnostic/monitoring criteria, long term and short-term management. Hypoglycemia of non-diabetic origin.

5. **General principles of diet for the following conditions**: gout, Cancer (home/ hospital management), Effect of cancer therapy on nutrition of the patient. AIDS (home/ hospital management.

References:

1. Mahan. L.K. and Escott-stump, S. (2000): Krause's food nutrition and diet therapy, 10th edition, W.B. Saunders Ltd.
2. Shils, M.E., Olson, J.A. Shike, M. and Ross. AC(1999) Modern nutrition in health and disease, 9th edition Williams and wilkins.
3. Escott-stump, S.(1998): nutrition and diagnosis related care, 4th edition, Williams and wilkins.

PAPER III- SOS/HFN/C018 -PRACTICAL

1. **Identifying a specialty care unit: diabetic clinic/ weight management center/ health clubs/ hospitals/ nursing homes- select at least 3-4 patients**
2. **Case studies:** Obtaining patient's medical history, planning for assessment and counseling for the following conditions (at least 2 to 3 cases to be taken up by each student). Obesity, diabetes mellitus (NIDDM and IDDM), hepatitis and cirrhosis, myocardial/ cerebral infarction, renal failure, calculi and nephritic syndrome, feverchronic and acute.
3. **Diet planning and preparation.**
4. **Preparation of enteral feeds**

PAPER IV- SOS/HFN/C019 DISSERTATION

PAPER V - SOS/HSC/E06 -Experimental Cookery

Unit-I

- Introduction to cookery.
- Aims & objectives of cookery.

Unit-II

Methods of cookery foods

- Solar cooking
- Microwave cooking
- & other methods of cooking.

Unit-III

Basic principles of food production

- Meat cookery
- Vegetables fruits
- Accompaniments

Unit-IV

Processed food

- James, jellies, pickles.
- Beverages

Unit-V

Traditional processed products:- fermented food cereal based, pulse band, fruit/vegetables based.

Unit-VI

Leavened product:- leavening agents, biological leavened & chemically products.

Practicals:

related to subject.

Related books:-

- Theory of cookery- Krishna Arora Institute of hotel management & catering technology, New Delhi.
- Experimental cookery- Lowe
- Sweet man- food selected & preparation IVth edition 1954
- Mejer- food chemistry

PAPER V- SOS/HFN/E07- HUMAN NUTRITION

1. **Basis for computing nutrient requirements,** latest concepts in dietary recommendations, RDA- ICMR and WHO: their uses and limitations.
2. **Body fluids and water balance**: Body water compartments. Regulation of water balance, disorders of water **imbalance**
3. **Body composition**: **Methods of studying body composition- underwater weighing, air displacement technique, DXA (dual X-ray absorptiometry), skin fold caliper, bioimpedance.**

Body composition changes during lifecycle- relationship between maternal anthropometry with fetal composition, determinants of postnatal growth and body composition during early child hood, during pregnancy, and elderly years. Nutritional disorders and effect on body composition- protein energy mal nutrition, cancer, renal failure and thyroid related disorders.

4. **Energy metabolism**: Basal and resting metabolism- influencing factors. Methods to determine

energy requirements & expenditure. Thermo genesis, adaptation to altered energy intake, latest concepts in energy requirements and recommendations for different age groups.

5. **Carbohydrates**: Occurrence and physiological functions, factors influencing metabolism. Lactose intolerance. Dental caries. Artificial sweeteners. Role of dietary fiber in health and disease. Disorders related to carbohydrate metabolism. Glycemic index and **glycemic load** of foods and their uses, **intrinsic and extrinsic factors affecting glycemic index.**
6. **Lipids**: Concepts of visible and invisible fats. EFA, SFA, MUFA, PUFA- sources and

PAPER VI, SOS/HFN/SS 03-Enzymes in Food Processing

1. **Enzymes**- Review of classification, specifications, factor affecting rate of enzyme catalyzed reactions, enzyme inhibitors, enzymic browning, immobilized enzymes.
2. A. **Application of enzymes in food processing**: Need for enzyme usage, sources of enzymes.
B. Application of enzyme in industrial production of starch, high fructose corn syrup, enzymes in sucrose industry.
3. **Use of enzyme in beverages**- fruit juices, beer, wine, and distilleries; dairy, baking, oils and fats, plantation products, animal products.
4. **Malting and germination of grains** – process, characteristics, nutritional benefits and uses.