ANDHRA PRADESH STATE COUNCIL OF HIGHER EDUCATION

MINOR

Subject: FOOD SCIENCE AND NUTRITION

w.e.f. AY 2023-24

COURSE STRUCTURE

Year	Semester	Course	Title of the Course	No. of Hrs /Week	No. of Credits
I	II	1	Food Science	3	3
			Food Science Practical Course	2	1
II	III	2	Basic Nutrition	3	3
			Basic Nutrition Practical Course	2	1
	IV	3	Human Physiology	3	3
			Human Physiology Practical Course	2	1
		4	Family & Community Nutrition	3	3
			Family & Community Nutrition Practical Course	2	1
III	V	5	Therapeutic Nutrition	3	3
			Therapeutic Nutrition Practical Course	2	1
		6	Food Microbiology	3	3
			Food Microbiology Practical Course	2	1

SEMESTER-II

COURSE 1: FOOD SCIENCE

Theory Credits: 3 3 hrs/week

Objectives: To enable students

1. Obtain knowledge of different food groups, their composition and role in diet.
2. To gain knowledge of different plant and animal derived foods and their nutritive values and properties.
3. Different methods of processing and cooking.

Learning outcomes:

1. Demonstrate and use the different methods of cooking
2. Understand the composition and nutritive value of both animal and plant food
3. Apply the different techniques to check the stages in sugar cookery.
4. Able to identify different structures and identification of spoilage of egg
5. Interpret the importance and functions of food and its nutrients

UNIT –I

Food groups: 8 hours

1. Basic food groups in foods and nutrition. Functional and objectives of food groups-energy yielding, body building and protective foods. Food Pyramid, My Plate.
2. Study of various cooking methods - Boiling, steaming, stewing, frying, baking, roasting, broiling, cooking under pressure.
3. Solar cooking and Microwave Methods-Advantages and disadvantages
4. Cereals – Structure, composition and nutrition of rice, wheat, milling process, cooking on parboiled and raw rice, principles of starch cookery, gelatinization.

UNIT –II 10 hours

1. Pulses and grams – Varieties of pulses & grams, composition, nutritive value, forms of pulses, effects of cooking, role of pulses in cookery, toxic constituents.
2. Vegetables - Classification, composition, nutritive value, selection and processing for cooking, methods and principles involved in cooking.
3. Fruits - Composition, nutritive value, changes during ripening, methods and effects of cooking, enzymatic browning.

UNIT –III 10 hours

1. Spices and Condiments - Uses and abuses. Fats and Oils - Types of oils, function of fats and oils, shortening effects of oil, smoking point of oil, factors affecting absorption of oil.
2. Sugar cookery- Stages of sugar cookery, crystallization and factors affecting crystallization.

UNIT –IV 10 hours

1. Milk - Composition, nutritive value, kinds of milk, pasteurization and homogenization of milk, changes in milk during heat processing, preparation of cheese and milk powder
2. Egg - Structure, composition, classification, nutritive value, uses of egg in cookery, methods of cooking, foam formation and factors affecting foam formation.

UNIT –V 10 hours

1. Meat -Structure, composition, nutritive value, selection of meat, post mortem changes in meat, aging, tenderness, methods of cooking meat and their effects.
2. Poultry – types, composition, nutritive value, selection, methods of cooking.
3. Fish - Structure, composition, nutritive value, selection of fish, methods of cooking and effects.

SEMESTER-II

COURSE 1: FOOD SCIENCE

Practical Credits: 1 2 hrs/week

Learning Outcomes:

1. Knowledge on standardization of weights.
2. Differentiate different methods of cooking
3. Understanding different pre preparation methods and time saving procedures
4. Able to calculate energies required for various health conditions
5. Skill in preparation of score cards for sensory evaluations

1. Measuring ingredients Methods of measuring different types of foods – grains, flours & liquids
2. Cooking methods Moist heat methods – (i) boiling, simmering, steaming, & Pressure cooking, (ii). Dry heat methods – baking. (iii), Fat as a medium, Cooking-shallow and deep fat frying.
3. Methods of cooking fine and coarse cereals. Examination of starch
4. Cooking of soaked and unsoaked pulses, Common preparations with pulses.
5. Experimental cookery using vegetables of different colours & textures. Common Preparations with vegetables. Preparation of soups and salads. Prevention of darkening in fruits & vegetables.
6. Milk & milk products: Common preparation with milk, cheese & curd.-cheese curry & cooking vegetables in milk.
7. Flesh foods: Fish, meat & poultry- preparations.
8. Egg Experimental cookery- boiled egg, poached egg. Common preparations with egg.
9. Beverages Preparation of hot beverages- coffee, tea. Preparation of cold Beverages-fruit drinks & milk shake.
10. Sensory Evaluation and preparation of score card.

Reference Books:

1. Food science, Chemistry and Experimental foods by M. Swaminathan.
2. Food Science by Norman.N.Potter.
3. Experimental study of Foods by Griswold R.M.
4. Food Science by Helen Charley.
5. Foundation of Food Preparation by A.G. Peckam.
6. Modern Cookery for teaching and trade, volume I&II, Thangam Philip. OrientLongmans Ltd.
7. Food Fundamentals by MacWiliams, John Willy and son‟s, New York.
8. Food Facts & Principles by Shakunthala manay & Shadakhraswamy.
9. Food Science by Srilakshmi, second edition,2002.

Co-Circular activities

1. Student Seminars on different food groups
2. Collection of samples of different food products available in the market and studytheirnutrient composition and use in cookery.

3. Field visits – Visit to food processing units.
4. Field study – Survey on Food Additives used in various food products/ processed foods.
5. Collection of different ready to eat foods and processed foods.
6. Celebration of Important Days (National and International)
    - World Nutrition day-May 28th
    - Nutrition week (Sep 1st 7th)
    - World food day – October 16th

SEMESTER-III

COURSE 2: BASIC NUTRITION

Theory Credits: 3 3 hrs/week

Objectives: To enable students
1. Understand the vital link between nutrition and health.
2. Gain knowledge on functions, metabolism and effects of deficiency of nutrients

Learning outcomes:
1. Knowledge on dietary foods and its importance
2. Learning about deficiency symptoms macro nutrients
3. Understanding energy imbalances and RDA calculations
4. Able to calculate energies required for various health conditions.
5. Skilled to give diet counselling and ORS supplements

UNIT-I -10 hours
1. Energy - Definition of Kilocalories, Joule, energy value of foods. Basal metabolic rate- definition, factors influencing BMR. Recommended Dietary Allowances for energy. Energy imbalance: undernutrition and obesity.
2. Carbohydrates – Classification**,** functions, source, utilization, Sources Role of dietary fiber in human nutrition.

UNIT-II -10 hours
1. Protein - Functions, sources and requirements, utilization, Protein quality – PER, BV, NPU, digestibility coefficient.
2. Essential amino acids, their importance.
3. Fats and Lipids – Classification of Fatty acids, functions, sources, requirement, importance of essential fatty acids, their requirements and deficiency.

UNIT-III -10 hours
1. Vitamins – Fat soluble vitamins –A, D, E and K- functions, source, requirements, deficiency disorders.
2. Vitamins – Water soluble vitamins –The B-complex vitamins – Thiamine, Riboflavin, Niacin, Folic acid, Biotin, Pantothenic acid, B12 and Vitamin C - functions, source, requirements and deficiency disorders.

UNIT-IV-10 hours
1. Minerals - General functions in the body, classification- macro and micro minerals. Micro minerals – Iron, Fluorine, Zinc, copper, Iodine -functions, absorption, utilization, requirements, deficiency and toxicity.
2. Macro minerals – Calcium & phosphorus - functions, absorption &utilization of iron, deficiency and toxicity.

UNIT-V -10 hours
1. Water Balance – Functions of water, water distribution, maintenance of water and regulation of acid-base balance in the body
2. Disturbances in fluid balance – Dehydration, oedema and water toxicity

SEMESTER-III

COURSE 2: BASIC NUTRITION

Practical | Credits: 1 | 2 hrs/week

Learning Outcomes:

1. Skills on selection of seasonal foods for planning of nutrient foods
2. Planning sessions for different combinations of foods
3. Critical analysis on sensory evaluation
4. Awareness on government schemes on food system.

(PRACTICAL)

1. Menu Planning and preparation of combination foods for different age groups
2. Plan and calculate one recipe mentioning the portion size and nutritive value of each.
3. Study of the nutritive foods supplied by the government through ICDS projects during the current 5 year plan.
4. Preparation and calculation of nutritive values of low-cost weaning foods.

Reference Books:

1. Essential of food & Nutrition –Vol. 1 M. Swaminathan, Bappco,Bangalore.
2. Human Nutrition and Dietetics –Davidson S. Passmore
3. Normal and Therapeutic Nutrition- Corinne. H.Robinson & Marilyn Lawler
4. Contemporary Nutrition - Gordon M. Wardlaw, Paul Insel et, al., (2000) Mosby,Chicago.
5. Nutrition- concepts and controversies- Eleanor Whitney –Eighth Edition (2000)
6. Basic principles of Nutrition- Seema Yadav, First edition (1997)
7. Essentials of Nutrition and Diet therapy -Sue Rodwell Williams, fifth edition, Times Mirror Mosby College Publishing, 1990.
8. Understanding Nutrition -Whitney P.N. and Roes S.R., West Publication Co, 1996.

Co-Circular activities:

1. Student seminars on different nutrients.
2. Preparation of posters, charts, flashcards etc. related to different nutrients – Functions, RDAdietary sources, nutrient content of foods and deficiency symptoms.
3. Collections of food samples rich in particular vitamins and minerals like calcium, iron etc.
4. Visit to food stores, vegetable and fruit markets to study locally available foods.
5. Study projects to collect the data from people. Eg. Foods avoided or given in specificconditions.
6. Celebration of Important Days (National and International)
    - World's Breast Feeding Week(August 1st - 7th)
    - Nutrition Week – September 1st - 7th
    - Nutrition Month – September month
    - Hand Washing Day – October 15th
    - World Food Day – October 16th

SEMESTER-IV

COURSE 3: HUMAN PHYSIOLOGY

Theory Credits: 3 3 hrs/week

Objectives: To enable students

1. Understand the structure and functions of various organs of the body.
2. Understanding of the physiology of various organ systems in human body.

Learning outcomes:

1. Gain knowledge on structure of different organs
2. Comprehend different mechanism action of organs
3. Acquire knowledge on biochemical test for assessment of clinical symptoms
4. Understand the physiology of different organs and its connection
5. Relate the different enzymes involved absorption and digestion of food

UNIT-I -8 hours

1. Cell - Structure and functions. Tissues - Structure and functions
2. Digestive system - Anatomical consideration – structure & functions, Brief study of the organization of the digestion, absorption and assimilation of carbohydrate, protein and fat. Structure, function of liver, gall bladder and pancreas

UNIT-II-10 hours

1. Blood and its composition, functions RBC, sWBC, Platelets and Lymph.
2. Clotting factor, blood grouping and blood transfusion and Rh factor.
3. Circulatory system - Heart structure and functions, blood vessels, types of circulation. Cardiac cycle and cardiac output, Blood pressure and its factors affecting blood pressure.

UNIT-III -10 hours

1. Respiratory system - Basic Physiology of the respiratory system, process of respiration, mechanism of transport and exchange of oxygen and carbon di oxide in the body. Oxygen dissociation curve, tidal values
2. Endocrine glands - Structure and function of pituitary, thyroid, parathyroid, islets of Langerhans and adrenal gland.

UNIT-IV -12 hours

1. Reproductive system - Physiology of the male and female reproductive organs. Menstrual cycle. Pregnancy and associated changes.
2. Sense organs - Structure and function of eye, ear, nose, tongue and skin.

UNIT-V -10 hours

1. Excretory system - Excretory organs - structure of kidney and functions, formation of urine, composition of urine.
2. Central nervous system - Physiology of the nerve cell, parts of the central nervous system and function.

SEMESTER-IV

COURSE 3: HUMAN PHYSIOLOGY

Practical Credits: 1 2 hrs/week

Learning outcomes:

1. To identify different tissues
2. Assessment of different biochemical parameters
3. Acquire knowledge on blood grouping
4. Complete picture on CBC count

Practical

1. Identification of tissues
2. Bleeding time, Clotting time
3. Blood groups – identification
4. Measurement of Hemoglobin
5. Measuring Pulse Rate, Measuring Blood Pressure
6. RBC, WBC – demonstration

Reference Books:

1. Chaterjee, C.C., Human Physiology, Vol-I&II Medical allied agency, Calcutta 1981.
2. Best and Taylor, Living body. Mc.Graw hill company, Newyork.
3. Sathya Narayana, Essentials of Biochemistry (2000).
4. Saratha Subramanian,Text of Human Physiology(2000).
5. Stuart Ira Fox,Human Physiology(2003)

Co-Circular activities

1. Preparation of posters, charts, ppt of different organs
2. Model making of different mechanisms of organs
3. Visits to different lab to learn the techniques of blood samples
4. Seminar, quiz, JAM and games for improving knowledge
5. Week celebration related to human organs- Heart day, Aids day, Hypertension week, Diabetes week

SEMESTER-IV

COURSE 4: FAMILY AND COMMUNITY NUTRITION

Theory Credits: 3 3 hrs/week

Objectives: To enable students

1. Understand the nutritional demands in various stages of life cycle.
2. Acquire skills in planning adequate meals in different stages of life cycle to maintain health.

Learning Outcomes:

1. Comprehend dietary guidelines and menu planning
2. Skills in planning a balanced and menu plan for all age groups
3. Aware of all complication and risk factors during pregnancy and lactation
4. Acquire knowledge of epidemiological aspects
5. Excel in assessment of nutritional status in community

UNIT I-8 hours

1. Basic Principles of Meal Planning –Basic Principles & factors to be consider while planning menu for different age groups
2. Recommended dietary allowances for adults with different lifestyles (sedentary, moderate, heavy workers) and nutritional requirement, reference man and reference woman.

UNIT II-10 hours

1. Nutritional Needs during Pregnancy – Physiological and psychological changes, hormonal changes and weight change, symptoms, complications, Nutritional requirements, &meal planning.
2. Nutritional needs during Lactation - physiology of lactation, hormonal control, nutritional components of colostrum and mature milk. Nutritional requirements of lactating women, galactagogues, Meal planning.

UNIT III- 10 hours

1. Nutrition during Infancy - Growth and development, factors influencing growth, , exclusive breastfeeding and its benefits, difference between breast feeding and bottle feeding, factors to be considered in bottle feeding, different types of milk formulae available commercially.
2. Weaning Foods – Preparation of Weaning foods, types of weaning food. Uses of growthchart to monitor growth & development. Nutritional requirements of infants‟ upto oneyear. Problems of feeding in normal and premature infants.
3. Nutritional needs of toddlers (1-5 year) &School children - Nutritional requirements of toddlers &school going children. Factors to be considered while planning meals for pre-school children. Eating problems of children and their management, packed lunch.

UNIT IV -10 hours

1. Nutrition during Adolescence - Physical growth and changes. Nutritional requirement, nutritional problems in adolescence- anemia, obesity, eating disorders of adolescent-anorexia nervosa, bulimia nervosa and binge eating. Nutrition in Menopausal women- hormonal changes.
2. Nutrition during Old Age - Physiological changes in ageing- psycho-social factors effecting nutrition. Nutritional problems of aged and their nutritional and dietary management.

UNIT V-10 hours

1. Definition of community nutrition and its scope and functions
2. Direct methods of nutritional assessment-Anthropometry, Biochemical, Clinical and Dietary assessment, Biophysical assessment.
3. Indirect methods- Ecological factors, vital statistics

SEMESTER-IV

COURSE 4: FAMILY AND COMMUNITY NUTRITION

Practical Credits: 1 2 hrs/week

Learning Outcomes:

1. Skills in preparation of different menu plans for different age groups
2. Acquire knowledge on meal planning, meal management and portion sizes
3. Application of variety of food according to age group and nutritional requirement

1. Standardization of portions for cooked food.
2. Preparation and serving the planned menu for men and women of different occupations.
3. Planning a low-cost balanced menu for a pregnant mother and display.
4. Planning a low-cost balanced menu for a lactating mother and display. Calculation of nutritive value for the prepared menu.
5. Planning and preparing diet for infants and preschool children
6. Packed lunch planning for school going children.
7. Menu planning for and adolescent girls and boys.
8. Menu planning for adult Man and Woman (moderate man and sedentary woman).
9. Preparation of diet for old age.

Reference Books:

1. Nutrition Trends in India -Vinodhini Reddy, Prahlad Rao, Govmth Sastry and Kashinath, NIN, Hyderabad, 1993.

2 Modern Nutrition in Health and Diseases- Shills, E.M. Olson, A.J. and Shike, Lea and Febiger

3. Dietetics -B. Srilakshmi, New Age International Pvt. Ltd, 2003.

4.NutritionScience-B.Srilakshmi,NewAgeInternationalPvt.Ltd., 2003.

5.Food,nutrition and diet therapy -Krause, Eleventh edition

6. Human Nutrition and Dietetics- Davidson S Passmore R, Brock JP, ELBS and Churchill, Livingstone.

7.Fundamentals of foods and Nutrition - Mudambi SR and Rajagopal M Y, Wiley Eastern Ltd. 8.ICMR- Nutritive value of Indian Foods, 1989.

9.Nutrition throughout the life cycle, Bonnie S.Worthinton, Roberts, Sue Rod well Williams.,The McGraw- Hill company,1996.

10.Nutrition in the life span- Virginia Beal, John Wiley & sons New York.

Co-Circular activities:

1. Academic based: -
    - Preparation of charts and posters for Nutrition education
    - Essay writing competitions
    - Group discussions on topics relevant to community nutrition
    - Exhibition on low cost nutritious foods and balanced diet

1. Lab/Research based: -
    - Visit to Anganwadi centre
    - Visit to school lunch programs
    - Visit to village and urban slum area for assessing the nutritional status of rural andurban slum population
2. Value based: -
    - Nutrition and Health awareness camp
    - Poster and puppet show regarding nutrition education and importance of communityparticipation
3. Celebration of Important Days (National and International): -
    - Breast feeding week-August 1to7th
    - International Women's day-March 8th
    - World Health day-April 7th
    - International day of elderly-October 1st

SEMESTER-V

COURSE 5: THERAPEUTIC NUTRITION

Theory Credits: 3 3 hrs/week

Objectives: To enable students

1. Gain knowledge about principles of diet therapy and different therapeutic diets.
2. Develop aptitude for taking up dietetics as a profession.

Learning outcomes:

1. Understands about modification of normal diets to therapeutic diets.
2. Skills in Planning and preparation of diets for different diseases like Obesity, Cardiovascular, Renal, Diabetes mellitus etc,
3. Assessment on nutritional status
4. Acquire knowledge of IV feeds
5. Comprehend on calculation of various disease conditions

UNIT – I -10 hours

1. **Objectives of diet therapy** - Role of a dietitian. Principles of diet preparation and counselling.
2. Therapeutic diet: clear fluid, full fluid, semi soft diet, soft diet, bland diet and regular diet Different types of Feeding - Basic concepts of oral feeding, tube feeding, IV feeding, gastrostomy feeding.

UNIT – II -10 hours

1. Underweight and Obesity - definition, etiology, complications, risk factors, types and nutritional requirement
2. Diseases of the gastro intestinal tract- peptic ulcer, constipation & diarrhea
3. Diet in febrile conditions - Short duration e.g. Typhoid, Long duration e.g. Tuberculosis.

UNIT – III -10 hours

1. **Cardiac disease:** Atherosclerosis-etiology, complication, symptoms, dietary management. Hypertension-types, etiology, complication, symptoms, dietary management.
2. **Liver disease: Hepetitis-** types, etiology, complication, symptoms, dietary management. Liver cirrhosis- etiology, complication, symptoms, dietary management.

UNIT – IV-10 hours

1. **Diabetes mellitus** – Types, causes, symptoms, bio-chemical changes, insulin thrapy, dietary management.
2. **Renal disease:** Acute and chronic nephritis, Nephrotic syndrome, Renal failure, Urinary calculi: Causes and dietary treatment of kidney diseases and dialysis, ESRD (End Stage Renal Dialysis).

UNIT – V -10 hours

1. **Nutrition and cancer**- types, symptoms, complications and Dietary guidelines for management.
2. **Diet in Allergy** - Definition, classification, common food allergy, test of allergy, diet therapy. Diet in relation to deficiency diseases-Protein calorie deficiency, vitamin A deficiency and anemia.

SEMESTER-V

COURSE 5: THERAPEUTIC NUTRITION

Practical | Credits: 1 | 2 hrs/week

Learning Outcomes:

1. Demonstrate the ability to plan hospital diets for different health conditions
2. Be familiar with all clinical condition that impact diet planning.
3. Possess hands-on knowledge of physiology of diseases, to be considered in diet planning under different disease conditions
4. Be qualified to take up career as a diet planner in a hospital

Practical

1. Planning and preparation of hospital diets a. normal diet, regular diet, light diet, soft diet, full liquid diet, clear liquid diet & bland diet.
2. Diet for obesity & under weight
3. Diet for anaemia
4. Diet for diseases of the GI tract – peptic ulcer, diarrhea, constipation.
5. Diet for Cardio-vascular diseases- atherosclerosis, hypertension.
6. Diet for diseases of the kidney – nephritic and nephrotic syndrome.
7. Diet for diabetes mellites
8. Diet in febrile conditions- Short duration – typhoid; long duration – tuberculosis
9. Diet in liver diseases – Viral hepatitis and cirrhosis
10. Preparation of power point presentations on diet and disease conditions

Reference Books:

1.Krause and Mahan – Food ,Nutrition and Diet therapy, 6th Edition W.B. Saunders company, London

2. Normal and therapeutic nutrition –17th Edition, Robinson et. al ., Mac Millan Pub.Co., New York

3.ICMR(1989) Nutrient Requirements and recommended dietary allowances for Indians.

4.Antia FP (1987) Clinical Dietetics and Nutriton, Oxford University Press, New Delhi

5.Srilakshmi (2002) Dietetics, IVth Edition. New Age International (P) Limited, Publishers, New Delhi

6. Shubhangini. A. Joshi (2002) Nutrition and dietetics, Tata Mc Graw- Hill publishing company limited, New Delhi.

7. B. Srilakshmi (2002) Nutrition science, New age international (P) limited, New Delhi

8. Carolynn E.Town send and Ruth A. Roth (2002) Nutrition and Diet Therapy, Delmar publisher

9. Sue rod Williams, Nutrition and diet Therapy, Times Mirror Mosby College publishing,Boston, 1989.

10.The Indian journal of nutrition and dietetics, Avinashilingam Deemed University, Coimbatore

Co-Circular Activities:

1. Academic based: -
   - Visit to dietetics Dept. and diet counselling centre
   - Exhibition on therapeutic diets
   - Diet plans and laboratory reports
2. Research based: -
   - Case studies
   - Project work on assessment of obesity among staff members and students of the college
3. Value based: -
   - Clean and green, nutrition games
   - Drama, dance, and music to propagate and promote nutrition education
4. Celebration of Important Days (National and International): -
   - World Diabetes day -November 14th
   - World Cancer day -February 4th
   - World Health day -April 7th
   - National Cancer Awareness Day-Nov 7th

SEMESTER-V

COURSE 6: FOOD MICROBIOLOGY

Theory Credits: 3 3 hrs/week

Objectives: To enable students

1. To know the important genera of microorganisms associated with food and their characteristics.
2. To understand the role of microbes in fermentation, spoilage and food borne diseases.

Learning Outcomes:

1. Understanding the concept of sterilization and disinfectant
2. Knowing about the microbial analysis and assessment and comparing with indices
3. Comprehending importance of microbes in food fermentation.
4. Learning different staining techniques and isolation methods
5. Knowing about factors effecting microorganisms' survival and practically applying it

UNIT 1

1. History and Development of Food Microbiology. Definition and Scope of food microbiology.
2. General characteristics of bacteria, molds, virus and yeast- Beneficial effect of microorganisms. Types of microorganisms associated with food, their morphology and structure.

UNIT2. -10 hours

1. **Cultivation of Micro-organisms:** Methods of isolation and cultivation, Serial dilution method, Pure culture technique.
2. **Microbial Growth in Food:** Bacterial growth curve and microbial growth in food. Factors affecting the growth of micro organisms in food, effect of environmental factors in growth of microorganism - pH , water activity , oxygen availability, temperature and others.

UNIT3: 10 hours

1. **Microbial Food Spoilage:** Sources of Microorganisms in foods.
2. Spoilage of specific food groups- Milk and dairy products, Meat, poultry and seafoods,
3. Spoilage of specific food groups -Cereal and cereal products, Fruits and vegetables and Canned products.

UNIT4. 10 hours

1. **Foodborne Diseases:** Microbial intoxication and infections:
2. Common and Recent Examples of Food borne out breaks. Food borne diseases: Bacterial, and viral foods-borne disorders, Food-borne important animal parasites, Mycotoxins.
3. HACCP-principles

UNIT5. 10 hours

1. **Control of Microorganisms in Foods:** Principles and methods of preservation.
2. Physical Methods of Food Preservation- Dehydration, Freezing, Cool Storage, Heat Treatment), Irradiation, Chemical methods, Bio preservative.
3. Rapid Methods of detection and recent advances.
4. Introduction to Hurdle concept and Non-Thermal methods.

SEMESTER-V

COURSE 6: FOOD MICROBIOLOGY

Practical | Credits: 1 | 2 hrs/week

Learning outcomes:

1. Display ability to explore beneficial and harmful activities of microorganism
2. Demonstrate skill in the usage of equipment used for sterilization and disinfectants
3. Exhibit skill in scheduling and types of immunity
4. Acquire skills in studying microorganisms in sewage and water treatment

Practical:

1. Functioning and use of compound microscope
2. Cleaning and sterilization of glassware
3. Preparation and sterilization of nutrient broth
4. Preparation of slant, stab and plates using nutrient agar
5. Cultivation and sub-culturing of microrganisms
6. Morphological study of bacteria and fungi using permanent slides
7. Simple staining
8. Gram's staining
9. Standard Plate Count Method
10. Visits (at least two) to food processing units or any other organization dealing with advanced methods in food microbiology.

References:

1. Frazier William C and Westhoff, Dennis C. Food Microbiology, TMH, New Delhi,2004
2. Jay, James M. Modern Food Microbiology, CBS Publication, New Delhi, 2000
3. Garbutt, John. Essentials of Food Microbiology, Arnold, London, 1997.
4. Banwartt: Food Microbiology
5. Pelczar MJ, Chan E.C.S and Krieg, Noel R. Microbiology, 5th Ed., TMH, New Delhi, 1993.

Co-Circular Activities:

1. As a group student also spend time discussing some of the lesser-known roles microbes have in food preparation such as the production of food additives or in modifying starting ingredients.
2. This is an excellent opportunity to help students draw connections between their everyday lives and the microbial sciences
3. Visits to food labs and learn the different method
4. Ppt, quiz, seminar need to be presented
5. Food microbiology course to encourage students to learn about fermented foods from around the world and share their discoveries with their colleagues.