



Master of Science (M.Sc.) Food and Nutrition

SYLLABUS

OUTCOME BASED EDUCATION

BASED ON

REVISED BLOOMS TAXONOMY

(Under Choice Based Credit System)

For the Students Admitted in the

Academic year 2021-2022



PG DEPARTMENT OF FOOD AND NUTRITION

BISHOP HEBER COLLEGE (AUTONOMOUS)

(Affiliated to Bharathidasan University)
(Reaccredited with 'A' Grade (CGPA – 3.58/4.0) by the NAAC &
College of Excellence by the UGC)
DST – FIST Sponsored College & DBT Star College
TIRUCHIRAPPALLI - 620017
TAMILNADU, INDIA

**PG DEPARTMENT OF FOOD AND NUTRITION
BISHOP HEBER COLLEGE
TIRUCHIRAPPALLI-17**

**Programme Outcomes – M.Sc., FOOD SCIENCE AND
NUTRITION**

VISION

The department seeks to function with mutual love, social commitment to educate and engage students in research and extension activities to serve the community

MISSION

- Provide in-depth knowledge on nutrients so as to rule-out disorders and diseases at cellular and systemic levels, ultimately promoting good health.
- Ignite curiosity and inquiry on the interrelationship between theoretical knowledge obtained with field exposure, leading to innovative discoveries and application of knowledge in the areas of nutrition, as well as food product development.
- Transform the academic knowledge obtained to social benefits, thus helping the nation in eradication of malnutrition and improving the quality of life of citizens.
- Achieve academic excellence in the area of food and nutrition, making them full-fledged professionals in the area of research, teaching, clinical and community nutrition, dietetics, food science and food safety and quality control.

Programme Outcomes – M Sc. Food Science and Nutrition

On Successful completion of M.sc Food Science and Nutrition Program, the Post Graduates will be able to:

Knowledge:

PO1: Apply the principle of science and technology thus understanding the complex and heterogeneous aspect of food in treating diseases, as well as inventing new innovative food products.

PO2: Evaluate, adopt and apply best practices relating to health, safety, quality, food industry and client satisfaction in the field of Food Science and nutrition.

PO3: Appraise the concepts on systematic research in Food Science and Nutrition, Analysis of Nutrients, Nutritional Assessment and Diet Planning to combat malnutrition.

Attitude:

PO4: Develop critical thinking, decision making attributes and aesthetic skills to enhance professional competency by updating and applying emerging trends and technology in the areas of clinical nutrition, dietetics, community nutrition and food science.

Skills:

PO5: Deliberate critically and apply appropriate contemporary Research techniques, resources and demonstrate skills, attitudes in development of novel food products.

PO6: Apply the concept of nutraceuticals in treating diet-related diseases and metabolic disorders, as well as bring forth cost-effective innovative health drinks and sport drinks, which are the need of the hour.

PO7: Face the global challenge of meeting the demand for skilled professionals in the area of nutrition, dietetics and food science by fostering entrepreneurial skills, and enabling the pursuit of higher education, research and career in the area of food science and nutrition.

PO8: Implement technical skills of health behavior, clinical judgement and decision making skills in validating the data of vulnerable groups, organoleptic evaluation, quantitative, qualitative evaluation of food products, evaluating the nutritional status of individuals, communities and their response to nutrition intervention.

Ethical and Social responsibility:

PO9: Develop management skills and entrepreneurial skills in the field of Food Science and Nutrition and the ability to work effectively and to live responsibly in a global context of cross-

cultural life and capability, to value human diversity and lead life of timeless learning and endless opportunities.

Programme Specific Outcomes – M Sc. Food Science and Nutrition

On successful completion of M Sc. Food Science and Nutrition program, the Post Graduate student will be able to

Intellectual Skills:

PSO 1: Obtain skills in the fields of food science and nutrition and to provide innovative solutions to problems related to the food processing industry, as well as the field of clinical nutrition.

Practical Skills:

PSO 2: To develop skill and necessary confidence to work in hospitals /food processing industries with the ultimate goal of ensuring safe food and good health.

PSO 3: Apply knowledge of advance Food science and Nutrition, to develop practical skills of management of dietary departments in various organizations and food production units.

Transferable Skills:

PSO 4: Apply the principles of advanced food science to produce innovative food products with value addition for commercial value to the benefit of the individual, firm and society honing the entrepreneur skills in students.

M.Sc., Food Science and Nutrition – Programme Structure

Programme Articulation Matrix

| Course Title | Course Code | Correlation with Programme Outcomes and Programme Specific Outcomes | | | | | | | | | | | | |
|---------------------------------|-------------|---|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| | | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PSO1 | PSO2 | PSO3 | PSO4 |
| Advanced Food Science | P21FS101 | H | H | H | H | - | - | L | - | L | H | H | M | H |
| Macronutrients & Micronutrients | P21FS102 | H | H | H | H | - | - | L | - | L | L | H | L | - |
| Nutritional Biochemistry | P21FS103 | L | L | H | - | - | H | L | - | L | L | - | - | - |
| Food Microbiology | P21FS104 | H | H | H | M | M | L | - | - | H | - | L | M | - |
| Advanced Food Science Practical | P21FS1P1 | H | M | H | M | L | - | L | L | L | H | L | H | L |
| Food Microbiology Practical | P21FS1P2 | H | H | H | M | M | L | - | - | H | - | L | M | - |
| Nutrition Through Life Span | P20FS205 | M | M | H | M | H | H | H | H | L | L | H | H | - |
| Therapeutic Nutrition | P21FS206 | - | M | H | H | H | H | M | H | H | H | H | H | - |

| | | | | | | | | | | | | | | |
|--|----------|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Community Nutrition and Public Health | P21FS07 | M | - | H | M | H | - | M | M | L | L | - | L | - |
| Nutraceuticals and Functional Foods | P21FS2:1 | L | M | L | L | - | H | - | - | - | M | - | - | L |
| Nutrition through life span practical | P21FS2P2 | M | M | H | M | H | H | H | H | L | L | H | H | - |
| Therapeutic Nutrition Practical | P21FS2P3 | - | M | H | H | M | M | H | L | H | H | H | M | - |
| Analytical Instrumentation | P21FS308 | L | L | - | H | - | - | - | - | L | H | M | | |
| Food Toxicology | P21FS309 | H | M | L | - | M | - | L | M | - | L | - | M | L |
| Research Methodology and Statistics | P21FS104 | L | - | H | L | H | - | H | M | - | M | - | - | M |
| Food product development and Food Processing | P21FS3:2 | H | H | M | L | H | - | - | H | L | H | M | M | H |
| Food Safety and Quality control | P21FS3:3 | L | H | - | L | - | - | L | - | M | L | L | - | - |
| Food Analysis practical | P21FS3P4 | M | H | L | - | - | H | - | - | L | H | M | H | M |
| Internship | P21FS3F2 | H | H | H | - | M | - | L | M | - | H | M | L | M |

| | | | | | | | | | | | | | | |
|----------------------------|----------|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Nutrition in Fitness | P20FS409 | L | M | H | M | - | H | M | M | H | L | - | L | - |
| Food Packaging | P20FS4:4 | L | H | - | M | L | - | L | M | H | L | - | - | - |
| Nutrition During Emergency | P20FS4:5 | L | L | M | H | - | - | L | M | H | L | M | - | - |

FOOD SCIENCE AND NUTRITION

| Sem. | Course | Course Title | Course code | Hours / week | Credits | MARKS | | |
|-----------|---------------------|--|-----------------------|--------------|---------|-----------|-----|-------|
| | | | | | | CIA | ESE | Total |
| I | Core-I | Advanced Food Science | P21FS101 | 6 | 4 | 25 | 75 | 100 |
| | Core-II | Macro and Micro Nutrients | P21FS102 | 6 | 4 | 25 | 75 | 100 |
| | Core-III | Nutritional Biochemistry | P21FS103 | 6 | 4 | 25 | 75 | 100 |
| | Core-IV | Food Microbiology | P21FS104 | 6 | 4 | 25 | 75 | 100 |
| | Core Practical – I | Advanced Food Science | P21FS1P1 | 3 | 3 | 40 | 60 | 100 |
| | Core Practical – II | Food Microbiology practical | P21FS1P2 | 3 | 3 | 40 | 60 | 100 |
| 30 | | | | | | 22 | | |
| II | Core-V | Nutrition Through Life Span | P21FS205 | 6 | 4 | 25 | 75 | 100 |
| | Core – VI | Therapeutic Nutrition | P21FS206 | 6 | 4 | 25 | 75 | 100 |
| | Core-VII | Community Nutrition and Public Health | P21FS207 | 5 | 4 | 25 | 75 | 100 |
| | Elective – I | Nutraceuticals and Functional Foods | P21FS2:1 | 5 | 4 | 25 | 75 | 100 |
| | Core Practical-III | Nutrition Through Life Span Practical | P21FS2P3 | 3 | 3 | 40 | 60 | 100 |
| | Core Practical-IV | Therapeutic Nutrition Practical | P21FS2P4 | 3 | 3 | 40 | 60 | 100 |
| | VLO | RI/MI | P17VL2:1/ P17VI2:2 | 2 | 2 | 25 | 75 | 100 |
| | Internship | Internship Hospitals | P21FS3F2 | - | 2 | --- | --- | 100 |
| 30 | | | | | | 26 | | |
| | Core – VIII | Analytical Instrumentation | P21FS308 | 6 | 4 | 25 | 75 | 100 |

| | | | | | | | | |
|---|------------------|--|----------|-----------|-----------|---------------------------|----|-----|
| III | Core – IX | Food Toxicology | P21FS309 | 6 | 4 | 25 | 75 | 100 |
| | Core-X | Research Methodology and Statistics | P21FS310 | 5 | 4 | 25 | 75 | 100 |
| | Elective – II | Food Product Development and Food Processing | P21FS3:2 | 5 | 4 | 25 | 75 | 100 |
| | Elective – III | Food Safety and Quality Control | P21FS3:3 | 5 | 4 | 25 | 75 | 100 |
| | Core Practical-V | Food Analysis Practical | P21FS3P5 | 3 | 3 | 25 | 75 | 100 |
| | Internship | Internship – Food Industry | P21FS3F2 | --- | 2 | --- | -- | 100 |
| | | | | 30 | 25 | | | |
| IV | Core XI | Nutrition In Fitness | P21FS411 | 6 | 4 | 25 | 75 | 100 |
| | Elective- IV | Food Packaging | P21FS4:4 | 5 | 4 | 25 | 75 | 100 |
| | Elective –V | Nutrition During Emergency | P21FS4:5 | 5 | 4 | 25 | 75 | 100 |
| | Core Project | Project | P21FS4PJ | 14 | 5 | -- | -- | 100 |
| | | | | 30 | 17 | | | |
| TOTAL CREDITS | | | | | 90 | | | |
| Core Theory : 11 Elective : 5 Value Education : 1 Core Practical : 5 Core Project : 1 | | | | | | Total Courses : 23 | | |
| • INTERNSHIP : OFF CAMPUS (Summer and ODD semester Vacation) | | | | | | | | |

CORE COURSE-I : ADVANCED FOOD SCIENCE

Semester : I

Code : P21FS101

Credits : 4

Total Hours : 60

1. Course Outcomes

On completion of this course the students will be able to:

| CO.No | Course Outcomes | Level | Unit |
|-------|--|-------|--------|
| CO1 | Illustrate the role of physico-chemical changes in food science for the formation of various compounds | K2 | I |
| CO2 | Identify the properties of various starch and sugars and quality of flour | K3 | II |
| CO3 | Evaluate the physico-chemical changes of vegetable and animal protein | K6 | III |
| CO4 | Evaluate various properties and changes of different fats and oils | K5 | IV |
| CO5 | Analyze the different types of pigments and physico-chemical changes of plant foods | K4 | V |
| CO6 | Determine the structural, functional and physico-chemical characterization of food components | K5 | I to V |

2. A. Syllabus

Unit I: Physio Chemical Changes in Foods

(10 Hours)

Physical properties of water- – Role of water in food systems, Bound water in Food products, Hydrogen ion concentration(pH), Solubility, Solutions, Crystallization, Emulsification, *Osmosis*, *Enzyme action (SS)*, Oxidation – reduction, Colloids – Stabilizations and properties, Denaturation and coagulation of proteins .,

Unit II: Starch and Sugars

(13 Hours)

- A. Components and characteristics of food starches, Swelling of starch granules, Gel formation, factors affecting gelatinization, Retrogradation, syneresis, effect of sugar, acid, fat and Surface Active Agents on starch Rheology of food dispersion foam structure formation and stabilization. Flour and Flours quality, **Science behind dough making techniques food additives, Aroma compounds etc.,**
- B. **Stages of sugar cookery (SS)**, Crystal formation, factors affecting, types of candies, Action of Acid, Alkalies and Enzymes

Unit III: Vegetable and Animal Protein

(12 Hours)

- A. Physiochemical properties of amino acids, structure, - Nutritional importance and functional properties of protein, Gluten Formation Effect of soaking, fermentation and germination.
- B. Action of Heat, Acid, Alkalies on vegetable and animal proteins – egg, milk, meat and fish.

Unit IV: Fats and Oils

(13 Hours)

- A. Physico – chemical properties of fats and Oils- Rancidity, Hydrogenation, winterization, decomposition of triglycerides, *Shortening power of Fats (SS)*
- B. Tests for evaluation of fat (melting point, smoke point, saponification value, acid value, iodine value, acetyl value, Reichart-Meissl number, tests for stability of oils and fats, etc.); Changes in Fats and Oils during heating and storage, Factors affecting fat absorption of foods

Unit V: Chemistry of pectin's, gums, pigments of plants and food additives (12 Hours)

- A. Pectin, phenolic components, vegetables enzymatic browning reactions in fruits and vegetables, preventive measures Volatile compounds from cooked vegetables, *Different types of Plant Pigments (SS)*, water and fat soluble pigments, Action of heat, acid and alkali on vegetable pigments, properties and active principles of spice and condiments.
- B. Food Additives: definition, functions and additives in food processing.

2. B. Topics for self-study

Advances in Dairy Ingredients-Advances in Fermented Foods and Beverages - Improving Quality, Technologies and Health Benefits-Advances in Flavours and Fragrances - From the Sensation to the Synthesis

2. C. Text Book:

1. Srilakshmi, M., Foodscience, New Age International (P) Ltd., Publishers 2010.
2. Brown. A. Understanding Food, Wadsworth, Thomson Learning Publications, 2000.
3. Mehas, K.Y., and Rodgers, S. L., Foodscience and You. Mcmillan Mcgraw Hill Company, 2000.
4. Owen R. Fennema ,2006, Food Chemistry , Academic Press.
5. P. Fellows, First published: 2000, Genres: Technology · Art
6. J. Fellows ISBN-13: 9781845692162 Edition: Woodhead Publishing Ltd Date of issue: 6 July 2009.

7. Brown, A.: Understanding Food-Principles and Preparation; 2nd edition, Thomson Wadsworth. 2004.
8. Potter, N. and Hotchkiss HJ, Food Science, 5th edition, CBS Publisher, 2007.

2. D. References:

1. Potter, N. and Hotchkiss, J.H. (1996), Food Sciences, Fifth edition, CBS publishers and Distributors, New Delhi.
2. Fennema OR. 1996. Food Chemistry. Marcel Dekker
3. Paul, P.C., and Palmer, H. H., Food Theory and Applications. John Wiley and Sons, New York, 2000 Revised Edition
4. Mahan, Kathleen L. Krause's Food, Nutrition and Diet Therapy, W.B. Saunders's, 11th Edition 2004.

2. E. Reference Link:

5. https://app.knovel.com/web/browse-a-subject-area.v/catid:216/cat_slug:food-science/

3. Specific Learning Outcomes (SLO)

| Unit / Section | Course Content | Learning Outcomes | Highest Bloom's Taxonomic Levels of Transaction |
|----------------|--|--|---|
| I | Physico Chemical Changes in Foods | | |
| 1.1 | Physical properties of water- Role of water in food systems, Bound water in Food products. | Explain the chemistry underlying the properties and reactions of various food components | K2 |
| | | Discuss the importance of water for stability and quality of foods. | K6 |
| | | Outline the relation of food stability with its water activity | K2 |
| | | Describe Water Activity and Reaction Rate | K3 |

| | | | |
|-----------|--|--|----|
| 1.2 | Hydrogen ion concentration (Ph), Solubility, Solutions, Crystallization. | Describe the chemical function and chemical interactions of food components. | K3 |
| | | Compare the interaction between water and ions | K2 |
| | | Illustrate reactions involved in processing and reactions with alkali | K2 |
| | | Analyze extensive denaturation affects certain functional properties like solubility and other related properties. | K4 |
| 1.3 | Emulsification, <i>Osmosis</i> , <i>Enzyme action (SS)</i> , Oxidation – reduction, Colloids – Stabilizations and properties, Denaturation and coagulation of proteins | Explain the theory of emulsification, role of emulsifying agents in food emulsions. | K2 |
| | | Outline the classification and Functions of Colloidal Systems in Food, Types of Colloidal System in Food, Stability. | K2 |
| | | Analyze the changes of denaturation and coagulation of protein. | K4 |
| II | Starch and Sugars | | |
| 2.1 | Components and characteristics of food starches, Swelling of starch granules | Identify the Structural Features of Starch Granules | K3 |
| | | Classify the enzymes and Their Action on Starch | K4 |
| 2.2 | Retrogradation, syneresis, Gel formation, factors affecting gelatinization | Demonstrate the structural Transitions and Related Physical Properties of Starch | K2 |

| | | | |
|-----|---|---|----|
| | | production | |
| | | List Starch Use in Foods, Properties and Applications | K4 |
| | | Evaluate the effects on sensory and nutritional quality, functional properties, and safety of foods. | K5 |
| 2.3 | Effect of sugar, acid, fat and Surface Active Agents on starch, Rheology of food dispersion foam structure formation and stabilization. | Outline the significance of the Maillard Reaction, production of flavour and off flavor | K2 |
| | | Demonstrate the palatability appearance and physical properties of the brown products. | K2 |
| | | Categorize the rheology of Colloidal and Non colloidal Food Dispersions | K4 |
| 2.4 | Flour and Flours quality, Science behind dough making techniques food additives, Aroma compounds etc., | Analyze various quality tests of flour | K4 |
| | | List the types of Flour, and additives used | K4 |
| | | Evaluate the consumption, nutrition and food safety of types of flour. | K5 |
| 2.5 | <i>Stages of sugar cookery (SS)</i> , Crystal formation, factors affecting, types of candies, Action of Acid, Alkalies and Enzymes | Identify the techniques, science and artistry behind the preparation of food products by using sugar. | K3 |

| | | | |
|------------|---|---|----|
| | | Analyze the enzyme catalyzed reactions involving hydrolysis and proteolysis | K4 |
| | | Demonstrate the application of proteolytic enzymes in foods | K2 |
| III | Vegetable and Animal Protein | | |
| 3.1 | A. Physiochemical properties of amino acids, structure, - Nutritional importance and functional properties of protein | Identify scientifically the changes occurring in food during processing, handling and storage | K3 |
| | | List the properties, Structure, Classification and Functions of Amino Acids | K4 |
| | | Identify the benefits, food sources and role of aminoacids | K3 |
| | | Outline the functional roles of food proteins in food systems | K2 |
| 3.2 | Gluten Formation, Effect of soaking, fermentation and germination. | Explain the types of gluten Importance and functions of gluten formation | K2 |
| | | Evaluate the major chemical reactions that occur during food preparation and storage | K5 |
| 3.3 | Action of Heat, Acid, Alkalies on vegetable and animal proteins – egg, milk, meat and fish. | Analyze the major chemical reactions that limit shelf life of various foods | K4 |
| | | Interpret the <u>prevention of undesirable changes</u> in vegetables and animal proteins | K5 |
| IV | Fats and Oils | | |
| 4.1 | Physico – chemical properties of fats and Oils- Rancidity, Hydrogeneation, winterization, decomposition | Illustrate the basic techniques of manufacturing /refining of oil and demonstrate the behaviour of oil at various | K2 |

| | | | |
|----------|---|--|----|
| | of triglycerides, Shortening power of Fats (SS) | temperatures. | |
| | | Outline the classification and chemical composition of edible fats and oils | K2 |
| | | Compare the chemical composition of fats of various species | K2 |
| | | Evaluate the factors and preventive measures of Autooxidation | K5 |
| | | Explain the refining, hydrogenation & winterization | K2 |
| 4.2 | Tests for evaluation of fat (melting point, smoke point, saponification value, acid value, iodine value, acetyl value, Reichart-Meissl number | Describe the effect of heating on fats & oils with respect to smoke point | K3 |
| 4.3 | Tests for stability of oils and fats, etc | Analyze Hydrolysis, oxidation and polymerization are due to the chemical reactions that take place during deep fat frying. | K4 |
| 4.4 | Changes in Fats and Oils during heating and storage, Factors affecting fat absorption of foods. | Demonstrate the reactions involved during deep frying of food | K2 |
| | | Illustrate the reactions are responsible for various physical and chemical changes in the frying oil | K2 |
| | | Analyze the behaviour of food during frying | K4 |
| V | Chemistry of pectin's, gums, pigments of plants and food additives | | |

| | | | |
|-----|--|--|----|
| 5.1 | Pectin, phenolic components, vegetables enzymatic browning reactions in fruits and vegetables, preventive measures Volatile compounds from cooked vegetables | Evaluate the post-harvest changes in fruits and vegetables | K5 |
| 5.2 | Different types of Plant Pigments (SS), water and fat soluble pigments | Compare the composition and nutritive value of different fruits and vegetables and their role in cookery | K5 |
| 5.3 | Action of heat, acid and alkali on vegetable pigments | Analyze the principles behind analytical techniques associated with food. | K4 |
| 5.4 | Properties and active principles of spice and condiments. | Summarize the significance and active principles, types and their uses of spices and condiments | K2 |
| 5.5 | Food Additives: definition, functions and additives in food processing. | Experiment with physical, sensory and chemical methods of food quality testing. | K3 |

4. Mapping scheme for PO, PSOs and COs
L-Low, M-Medium, H-High

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PSO1 | PSO2 | PSO3 | PSO4 |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| CO1 | H | H | H | H | L | L | - | H | M | H | L | H | L |
| CO2 | H | H | H | H | L | L | - | H | M | H | L | H | L |
| CO3 | H | H | H | H | L | L | - | H | M | H | L | H | L |
| CO4 | H | H | H | H | L | L | - | H | M | H | L | H | L |
| CO5 | H | H | H | H | L | L | - | H | M | H | L | H | L |
| CO6 | H | H | H | H | L | L | - | H | M | H | L | H | L |

5. COURSE ASSESSMENT METHODS

DIRECT

1. Continuous Assessment Test: T1, T2 (Theory & Practical Components):
Closed Book
2. Open Book Test.
3. Assignment, Group Presentation, Group Discussion, project
Report, Field Visit Report, Poster Presentation, Seminar,
Quiz (written).
4. Pre-Semester & End Semester Theory Examination

INDIRECT

1. Course end survey (Feedback)

Name of the Course Coordinator: Ms. Muneera .N

CORE COURSE-II : MACRONUTRIENTS & MICRONUTRIENTS

Semester : I
Credits : 4

Code : P21FS102
Total Hours : 60

1. Course outcomes

On completion of this course the students will be able to:

| CO.NO | Course outcomes | Level | Unit |
|-------|---|-------|------|
| CO1 | Identify macro and micronutrient and understand the energy metabolism and know about the carbohydrates and dietary fiber. | K4 | I |
| CO2 | Learn to critically evaluate the methodology and derivation of requirements for specific macro and micro nutrients | K5 | II |
| CO3 | Evaluate essential micro nutrients in food and their necessity in supporting human life and health. | K5 | II |
| CO4 | Analyse various disorders of nutrition among different age groups | K5 | III |
| CO5 | Evaluate nutrition information based on scientific reasoning and clinical knowledge acquired | K5 | IV |
| CO6 | Provide best nutrition based services for students and ultimately the entire society | K5 | V |

2. A. Syllabus

Unit I: Energy & Carbohydrate

(12 Hours)

A. Energy - Energy Content of Foods, Basal metabolism, Total Energy Expenditure, Thermogenic Effect, Energy balance Energy utilization in cells-Role of Mitochondria Energy metabolism during Physical Activity, CED and Obesity, Energy Requirements for Strenuous Physical Activity -Sports, Expeditions.

B. Carbohydrates and Fibre - Nutritional Importance of Carbohydrates. Review of Classification, Function, Concept of Glycemic Index and Glycemic Load ,Fibre – Classification, Components, Sources (SS) Role of Dietary Fibre in Human Nutrition Abnormalities in the Regulation of Glucose Homeostasis, Inherited Disorders of Carbohydrate Metabolism,, Role of Multiple Transportable Carbohydrates

Unit II: Proteins and Aminoacids:

(12 Hours)

A. Proteins - Functions and Classification, Sources, Digestion, Absorption and] Utilization of proteins Protein Turnover, Synthesis and Stores Computation of protein requirements through factorial method and balance study

B. Amino acids - Classification, Functions and Sources (SS), Evaluation of Protein Quality- Different methods based on albino rats and microbes – BV, DC, PER, NPR, NPU, PDCAAS, Supplementary value of Proteins, Novel Protein Foods, Role of specific proteins, their metabolites, transporters and inhibitors on specific body functions- growth, protection regulation, wound healing

Unit III: Fats and Lipids &Water

(12 Hours)

A. Fats - Classification, functions, Lipotropic factors, role of essential fatty acids, transport of lipids in blood. Lipid transformation in the liver deposition of fat in the body, Free radical formation and role of antioxidant enzymes in mammalian cells, Consequences of high and low fat intake.

B. Lipids - Recent trends in lipid nutrition- saturated poly unsaturated and mono-unsaturated and transfat, fat burners and replaces.

C. Water - Distribution of Water, Functions, Requirements, Sources, Water Balance (SS), Importance of Euhydration; Assessment of Hydration Status- Common indices Hazards of Hypo and Hyper Hydration with suitable examples

Unit IV: Vitamins

(12 Hours)

A. Fat soluble vitamins - A, D, E and K- History, structure, chemistry, physiological actions, absorption, transport, utilization, storage, excretion and methods of assay, biopotency, **Dietary sources (SS)** conversion of carotenes into vitamin A in human beings, recommended intakes, human deficiency and diagnosis, hyper vitaminosis, antivitaminis

B. Water soluble vitamins - Thiamine, riboflavin, niacin, vitamin B12, folic acid, pyridoxine, panthothenic acid, biotin, ascorbic acid and pseudovitaminis – Sources, functions,biochemical utilization and storage, losses in preparation and handling, recommended intakes of human deficiency, **diagnosis, assessment of availability hypervitaminosis, antivitaminis (SS)**

Unit V: Minerals

(12 Hours)

A. Macro Minerals- Calcium, Phosphorus, Sodium and Potassium

Dietary sources, functions, requirement, deficiency and toxicity, calcium - phosphorus ratio, absorption and utilization, Phosphates in blood, therapeutic uses of phosphates, calcium balance, Hypocalcemia and hypercalcemia, **Sodium and potassium balance (SS)**

B. Micro minerals-Iron, Iodine, Fluorine and Zinc - Dietary sources, functions, requirement, deficiency and toxicity, transport and utilization, effect of excess retention and deficiency (SS)

2. B. Topics for self-study

Micronutrient malnutrition: a public health problem, Food Fortification, Basic principle of food fortification, Role of macronutrients and micronutrients in DNA damage.

2. C. Text book(s):

1. Swaminathan, M., "Essentials of food and Nutrition", Vol I & II, Bappco Publishers, Madras 2000.
2. Srilakshmi. B., "Nutrition Science", New age International (p) ltd, publishers, 2004.

2. D. Reference:

1. Frances sizer and Ellie whitney, "Nutrition Concepts and Controversies", Thomson wadsworth Publisher, New York, 2006.
2. MangaleKango, "Normal Nutrition, Curing Diseases through Diet", 1st Edition, CBS publication, 2005.
3. Bonnie, Worthington – Roberts and Sue Rodwell Williams, "Nutrition throughout the lifecycle", 3rd edition, WCB/MC Graw Hill Publisher, New York, 1996.
4. Paul. S., "Text of Bio Nutrition Fundamental and Management", RBSA Publishers, 2003
5. Mahan, Kathleen L. Krause"s Food, Nutrition and Diet Therapy, W.B.Saunders"s, 11th Edition 2004.

2. E Reference Links:

6.https://www.who.int/nutrition/publications/guide_food_fortification_micronutrients.pdf

7.<https://www.edx.org/course/nutrition-and-health-micronutrients-and-malnutrition>

8. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5395264/>

3. Specific Learning Outcomes (SLO)

| Unit / Section | Course Content | Learning Outcomes | Highest Bloom's Taxonomic Levels of Transaction |
|----------------|---|--|---|
| I | Energy & Carbohydrate | | |
| 1.1 | A. Energy content of foods, Basal metabolism, Total Energy Expenditure | Define food energy. | K2 |
| | | Determine the energy content of foods. | K5 |
| | | Define basal metabolism and explain that affect basal metabolic rate. | K2 |
| | | Estimate your daily energy requirement. | K5 |
| | | Summarize why the amount of food we eat is not completely under our conscious control. | K5 |
| | | Measure the total energy expenditure. | K4 |
| 1.2 | Energy balance energy utilization in cells-Role of Mitochondria energy metabolism during physical activity, CED and Obesity, Energy requirements for strenuous physical activity – sports, Expeditions. | Explain the energy metabolism and ATP synthesis in human cells. | K2 |

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| | | Explain the process involved in muscle metabolism during aerobic exercise. | K2 |
| | | Describe the role of mitochondria in health and disease. | K2 |
| | | Determine the energy imbalance including the role of physical activity lead to weight gain and obesity. | K5 |
| | | Investigate the nutritional status of women in India and its relation to the prevalence of chronic energy deficiency (CED) and obesity. | K4 |
| | | Estimates energy requirements based on physical activity levels. | K5 |
| | | Compare and contrast the metabolic effects of sustained strenuous physical activity (sports). | K4 |
| | | Predict the energy requirements of the expedition. | K5 |
| 1.3 | Nutritional importance of carbohydrates. Review of classification, function, concept of Glycemic Index and Glycemic load. | Describe the nutritional importance of carbohydrates. | K2 |
| | | Define Glycemic index and glycemic load and determines health issues and their effect on diet-disease relationships. | K2 & K5 |
| | | Analyse the review of classification of Glycemic Index and Glycemic load. | K4 |
| | | Discuss the concept and function of glycemic index and glycemic load. | K4 |
| | | Differentiate the relationship between glycemic index and glycemic load. | K4 |

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| 1.4 | Fiber-Classification, components, sources (SS) Role of Dietary fibre in human nutrition | Define fiber with some examples | K2 |
| | | Classify the fiber based on soluble and insoluble fibres. | K3 |
| | | Discuss the components of fiber. | K2 |
| | | Identify the sources of dietary fiber. | K4 |
| | | Describe the role of dietary fibre in human nutrition. | K2 |
| 1.5 | Abnormalities in the regulation of glucose Homeostasis, Inherited Disorders of carbohydrate metabolism, Role of Multiple Transportable carbohydrates. | Examine the mechanism of glucose regulation. | K4 |
| | | Explain the biochemical basis of inherited disorders with their associate of carbohydrate metabolism. | K2 |
| | | Define multiple transportable carbohydrates. | K2 |
| | | Describe the major role of multiple transportable carbohydrates. | K2 |
| | | Investigate the main outcome of carbohydrate consumption during long duration or endurance exercise. | K4 |
| II | Proteins and Aminoacid | | |
| 2.1 | Proteins –Functions and classification, sources, Digestion, absorption and Utilization of proteins. | Define proteins. | K2 |

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| | | Classify proteins based on composition, functions and nutritional requirements. | K3 |
| | | List out the sources of proteins. | K2 |
| | | Explain the role of digestion, absorption of proteins. | K2 |
| | | Determines the concept of proteins utilization. | K5 |
| 2.2 | Protein Turnover, synthesis and stores computation of protein requirements through factorial method and balance study. | Define protein turnover | K2 |
| | | Assess the protein turnover in health and disease. | K4 |
| | | Determines the protein requirements through factorial method and balance study. | K5 |
| | | Estimates the various methods of protein requirements. | K5 |
| | | Distinguish the relationship between energy and protein requirements. | K4 |
| 2.3 | Classification, Functions and sources (SS). Evaluation of protein quality-Different methods based on albino rats and microbes- BV, DC, PER, NPR, NPU, and PDCAAS. | Explain about that the classification, functions and sources of amino acids. | K2 |
| | | Evaluate the protein quality. | K5 |
| | | Estimate the various methods based on albino rats and microbes. | K5 |
| | | Asses the biological value | K5 |
| | | Determination of Protein Efficiency Ratio (PER) and Net Protein Ration | K5 |

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| | | (NPR). | |
| | | Determination of Net Protein Utilization (NPU) | K5 |
| | | Estimate the protein digestibility corrected amino acid score (PDCAAS) | K5 |
| 2.4 | Supplementary value of proteins, Novel protein Foods, Role of specific proteins, their metabolites, transporters and inhibitors on specific body functions –growth, protection regulation, wound healing. | Measure the value of supplementary proteins in foods. | K4 |
| | | Analyse the novel protein foods. | K4 |
| | | Describe the specific role of proteins and their metabolites, transporters and inhibitors on specific body functions growth. | K2 |
| | | Explain about the specific proteins of protection and regulation | K2 |
| | | Explain about the contribution of nutrients in would healing. | K2 |
| III | Fats and Lipids & Water | | |
| 3.1 | Classifications, functions, lipotropic factors, role of essential fatty acids, transport of lipids in blood. | Define lipids | K2 |
| | | Illustrate the different types of lipids | K2 |
| | | Discuss the lipotropic factors. | K2 |
| | | Identify the role of essential fatty acids | K4 |

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| | | Describe the transport process of lipids in blood. | K2 |
| 3.2 | Lipid transformation in the liver deposition of fat in the body, Free radical formation and role of antioxidant enzymes in mammalian cells, consequences of high and low fat intake. | Describe the role of lipid transport and deposition process in our human body. | K2 |
| | | Distinguish the relationship between free radicals and antioxidants. | K4 |
| | | Investigate the effect of free radicals on cells. | K4 |
| | | Analyse the role of antioxidant enzymes in mammalian cells. | K4 |
| | | Correlate the consequences of high and low fat intake. | K5 |
| 3.3 | Recent trends in lipid nutrition –saturated poly unsaturated and monosaturated and trans - fat, Fat burners and replaces. | Evaluate the recent trends in lipid nutrition. | K5 |
| | | Elaborate about that the saturated poly unsaturated and monosaturated and trans fat. | K5 |
| | | Discuss the fat burners. | K2 |
| | | Find out the challenges of fat replaces. | K3 |
| 3.4 | Water-Distribution of water, Functions, Requirements, Sources, Water balance (SS), Importance of Euhydration; Assessment of Hydration status-Common indices Hazards of Hypo and Hyper | Define water. | K2 |

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| | hydration with suitable examples. | | |
| | | Explain the distribution of water. | K2 |
| | | Discuss about that the functions, requirements and sources of water. | K4 |
| | | Define water balance. | K2 |
| | | Determine the various methods of water balance. | K5 |
| | | Describe the importance of Euhydration. | K2 |
| | | Assess the status of hydration | K5 |
| | | Identify the common indices Hazards of Hypo and Hyper hydration with suitable examples. | K4 |
| IV | Vitamins | | |
| 4.1 | Fat soluble vitamins- A, D, E and K-History, structure, chemistry, physiological act utilization, storage, excretion and methods of assay. | Define fat soluble vitamins | K2 |
| | | Discuss the origin of fat soluble vitamins. | K4 |
| | | Identify the structure and chemistry of fat soluble vitamins. | K4 |
| | | Explain the physiological act of fat soluble vitamins. | K2 |
| | | Investigate the storage and excretion part of fat soluble vitamins. | K4 |
| | | Determine the various methods of assay of fat soluble vitamins. | K5 |

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| 4.2 | Dietary sources (SS) conversion of carotenes into vitamin A in human being deficiency and diagnosis, hyper vitaminosis, antivitamin. | Find out the dietary sources of vitamins. | K3 |
| | | Explain the role of the Vitamin A in human metabolic process. | K2 |
| V | Minerals: Macro Minerals-calcium, phosphorus, sodium and potassium. | | |
| 5.1 | Dietary sources, functions, requirement, deficiency and toxicity, calcium-phosphorus ratio, absorption and utilization, phosphates in blood, therapeutic uses of phosphates, calcium balance, Hypocalcaemia and hypercalcemia, sodium and potassium balance (SS) | Describe the biochemical and nutritional importance of minerals in human body. | K2 |
| | | List major dietary source of macro minerals. | K4 |
| | | Identify the nutrient requirements and discuss the significant functions of minerals in the body. | K4 |
| | | Describe the consequences of deficiency disease and toxicity of macro minerals. | K2 |
| | | Determine the calcium-phosphorus ratio. | K5 |
| | | Discuss about the absorption and utilization process of minerals in our human body. | K4 |
| | | Evaluate the level of phosphorus in the blood. | K5 |
| | | Outline the therapeutic uses of | K3 |

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| | | phosphates | |
| | | Define calcium balance and sodium potassium balance | K2 |
| | | Explain about the disorders of calcium. | K2 |
| 5.2 | Micro-minerals –Iron, Iodine, Fluorine and Zinc. Dietary sources, functions, requirement, deficiency and toxicity, transport and utilization, effect of excess retention and deficiency (SS). | List major dietary source of micro minerals. | K4 |
| | | Identify the functions of micro-minerals. | K4 |
| | | Examine the deficiency disease and toxicity level of micro minerals. | K4 |
| | | Describe the role of transport and utilization process of micro minerals. | K2 |
| | | Discuss the impact of excess intake of micro-mineral. | K5 |
| | | Evaluate the effect of micro-mineral retention. | K5 |
| | | Describe the roles of macro-micronutrients. | K2 |

4. Mapping scheme for PO, PSOs and COs
L-Low, M-Medium, H-High

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PSO1 | PSO2 | PSO3 | PSO4 |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| CO1 | L | L | M | - | - | - | - | - | L | L | - | L | L |
| CO2 | L | L | L | L | - | | - | L | - | L | L | L | L |

| | | | | | | | | | | | | | |
|------------|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO3 | L | M | H | - | - | - | - | - | L | - | - | - | - |
| CO4 | M | - | L | - | - | L | - | - | - | L | - | - | - |
| CO5 | L | L | M | L | - | L | - | L | - | M | L | - | - |
| CO6 | L | L | M | L | - | - | - | L | - | L | L | - | M |

5. COURSE ASSESSMENT METHODS

DIRECT

1. Continuous Assessment Test: T1, T2 (Theory & Practical Components):
Closed Book
2. Open Book Test.
3. Assignment, Group Presentation, Group Discussion, project
Report, Field Visit Report, Poster Presentation, Seminar,
Quiz (written).
4. Pre-Semester & End Semester Theory Examination

INDIRECT

1. Course end survey (Feedback)

Name of the Course Coordinator: Ms. Maheswari

CORE COURSE-III : NUTRITIONAL BIOCHEMISTRY

Semester : I
Credits : 4

Code : P21FS103
Total Hours : 60

1. Course outcomes

On completion of this course the students will be able to:

| Co .No | Course outcomes | Level | Unit |
|--------|--|-------|------|
| CO1 | Obtain in depth understanding of the biochemical reactions, major and metabolic pathway of carbohydrate | K5 | I |
| CO2 | Explain about digestion, absorption, disorders on lipid metabolism and their importance to human health | K5 | II |
| CO3 | Evaluate the inter-relationship between the amino acid, proteins and their metabolic pathways of detoxification | K4 | III |
| CO4 | Interpret the significance role of genetic material, structure, functions, molecular mechanism of nucleic acids and its biosynthesis | K5 | IV |
| CO5 | Introduce terminologies used in the study of enzymology and analyze the role of enzyme kinetics and inhibitors. | K5 | V |
| CO6 | Interpret the biochemical importance of the nutrient metabolism and their related disease conditions | K5 | V |

2. A Syllabus

Unit I: Carbohydrates

(12 Hours)

- A.** Introduction, Classification. Structure and Properties of monosaccharides (hexoses and pentoses). Reactions of monosaccharides – oxidation, reduction and reaction with hydrogen cyanide, hydroxyl amine and phenyl hydrazine. Oligosaccharides – Sucrose, maltose, lactose, isomaltose, cellobiose.
- B.** Homopolysaccharides - Structures of storage polysaccharides (Starch and glycogen). Heteropolysaccharides – Structures of Hyaluronic acid, Heparin and Chondroitin sulphate. Metabolism – Glycolysis, TCA cycle, HMP Shunt and energy production in the above pathways. Oxidative phosphorylation and Electron Transport Chain, Uronic acid pathway.

Unit II: Lipids**(12 Hours)**

Classification – Triglycerides (Fats), Phospholipids and other non phosphorylated lipids- cerebrosides, gangliosides, sulfolipids. Characterisation of fats. Rancidity of fats. Chemistry of Essential fatty acids. Metabolism – Oxidation of fatty acids, biosynthesis of fatty acids (palmitic acid).

Unit III: Aminoacids and Proteins**(12 Hours)**

Structure and classification of aminoacids. Classification of proteins – denaturation. Metabolism – phenyl alanine, tyrosine, tryptophan; metabolism of methionine, leucine, arginine. Urea cycle, ammonia circulation, ammonia transport to liver deamination, transamination, decarboxylation and urea formation.

Unit IV: Nucleic acids**(12 Hours)**

Composition and function. Structure and properties of DNA and RNA (t-RNA, m-RNA and r-RNA), minor RNA types. Metabolism – Biosynthesis and breakdown of purine nucleotides. Biosynthesis and breakdown of pyrimidine nucleotides. Defects in nucleic acid metabolism.

Unit V: Enzymes**(12 Hours)**

Classification of enzymes. IUB classification Enzyme kinetics – Michaelis Menten equation. Factors affecting enzyme activity (pH, temperature, substrate concentration and enzyme concentration). Enzyme inhibition – Competitive, Non- competitive and Uncompetitive (Kinetics).

2. B. Topics for Self study

Treatment of Metabolic syndrome by combination of physical activity and diet, Oxidation and reduction in the metabolism process and significance, Redox reaction and electron carrier in cellular respiration, Nutritional Genomics

2. C. Text Book(s):

1. Ambika Shanmugam, “Fundamentals of Biochemistry for Medical Students”, Seventh Edition, New age publishing Pvt.Ltd., New Delhi, 1986.

2. Deb.A.C., “Fundamentals of Bio chemistry”, 5th edition, New Central Book Agency (P) Ltd., 1992.
3. Sathyanarayana, U., Chakrapani, U., “Textbook of Biochemistry”. 3rd edition, Books and Allied (P) Ltd, Kolkata, 2010.

2. D. References:

1. Murray, R.K., Granner, D.K., Mayes, P.A. and Rodwell, V.W. (2003), Harper’s Illustrated Biochemistry, 26th edition, International Edition.
2. Deb, A.C. (2002), Fundamentals of Biochemistry, New Central Book Agency (P) Ltd.
3. Nelson, L. and Michael.M.Cox. (2005), Lehninger Principles of Biochemistry, 4th Edition, W.H. Freeman and Company, NewYork.
4. Palmer, T. (1995), Understanding enzymes, 4th Edition, Prentice Halls, Ellis Horwood, London.
5. Voet, D., Voet, G.J. and Pralt, W.C. (2002), Fundamentals of Biochemistry, Upgrade edition, John Wiley and Sons, Inc.
6. West, E.S., Todd, W.R., Mason, H.Sand and Van Brugge, T.J. (1966), Biochemistry, 4th edition, The Macmillan Company, London.

2.E. Reference Link

7. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1123385/>
8. <https://www.siirt.edu.tr/dosya/personel/beslenme-biyokimyasi-ders-kitabi-siirt-2018221143328398.pdf>
9. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4158967/>
10. file:///C:/Users/suriya/Downloads/2012Dutheil_NutrJ_TreatmentOfMetSbyCombinationOfPhysicalActivityDietNeedsAnOptimalProteinIntake.pdf

3. Specific Learning Outcomes (SLO)

| Unit / Section | Course Content | Learning Outcomes | Highest Bloom's Taxonomic Levels of Transaction |
|----------------|--|---|---|
| I | Carbohydrates | | |
| 1.1 | Introduction, Classification. Structure and properties of monosaccharides (hexoses and pentoses). | Define carbohydrates with chemical terms. | K3 |
| | | Describe the biochemical and nutritional importance of food carbohydrates. | K2 |
| | | Classify the different types of carbohydrates. | K2 |
| | | Describe the structural configuration of monosaccharides with special reference to glucose. | K2 |
| | | Discuss the physical and chemical properties of monosaccharides (hexoses and pentoses). | K4 |
| 1.2 | Reactions of monosaccharides-oxidation, reduction and reaction with hydrogen cyanide, hydroxyl amine and phenyl hydrazine. | Explain the chemical reactions of monosaccharides. | K2 |
| | | Identify and analysis the chemical reactions between group of hydrogen cyanide, hydroxyl amine and phenyl hydrazine with sugars molecules | K4 |
| | | Determine the products when a monosaccharide react with a reducing | K5 |

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| | | agent or with Benedict's agent. | |
| | | Differentiate between reducing and non-reducing sugars. | K4 |
| | | Discuss the importance of sugar derivatives of monosaccharides | K4 |
| 1.3 | Oligosaccharides-Sucrose, maltose, lactose, isomaltose, cellobiose. | Explain about oligosaccharides in detailed manner with some examples. | K2 |
| | | Identify and analysis the significance of oligosaccharide sugars. | K4 |
| | | Elaborate about the sucrose, maltose, lactose, isomaltose and cellobiose | K4 |
| | | Differentiate sucrose from either lactose or maltose | K4 |
| 1.4 | Homopolysaccharides –structure of storage polysaccharide (starch and glycogen) Heteropolysaccharides- Structures of Hyaluronic acid, Heparin and Chondroitin sulphate. | Defining polysaccharides and its types based on the sugar units. | K2 |
| | | Analysis the main structural difference between starch and glycogen. | K4 |
| | | Explain the structure and functions of homopolysaccharides and heteropolysaccharides with some examples. | K2 |
| | | Identify the structures of Hyaluronic acid, heparin and chondroitin sulphate with suitable examples. | K4 |
| 1.5 | Metabolism-Glycolysis, TCA cycle, HMP shunt and energy | Apply the knowledge obtained in understanding glycolysis pathway in | K3 |

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| | production in the above pathways. | production of energy | |
| | | Determine the main difference between glycolysis and gluconeogenesis. | K4 |
| | | Outline the sequence of reactions in the tricarboxylic acid (TCA) cycle and explain the purpose cycle. | K3 |
| | | Describe the mechanism of hexose monophosphate pathway and its role as a source of NADPH | K2 |
| 1.6 | Oxidative phosphorylation and electron transport chain, uronic acid pathway | Discuss the importance of high energy compounds, electron transport chain synthesis of ATP under aerobic and anaerobic conditions. | K2 |
| | | Describe the synthesis of uronic acid pathway | K2 |
| II | Lipids | | |
| 2.1 | Classification-Triglycerides (Fats), Phospholipids and other non-phosphorylated lipids- cerebrosides, gangleosides, sulfolipids. | Define lipids and discuss the significance role of lipids in our body. | K2 |
| | | Classify the types of lipids with some examples. | K2 |
| | | Discuss about that phospholipids and non-phosphorylated lipids. | K2 |
| | | Differentiate the tabular form cerebrosides and gangliosides | K4 |
| | | Explain the biological importance of sulfolipids. | K2 |
| 2.2 | Characterisation of fats. Rancidity of fats. Chemistry of Essential | List out the physical and chemical | K2 |

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| | fatty acids. | characterize of the fats | |
| | | Determine the most important factors affecting properties of lipid. | K5 |
| | | Identify the causes of rancidity occurs in fats. | K2 |
| | | Discuss the chemistry of essential fatty acids. | K4 |
| 2.3 | Metabolism-Oxidation of fatty acids, biosynthesis of fatty acids | Describe the metabolic pathway of lipid metabolism. | K2 |
| | | Explain and list the various methods by which fatty acids are oxidised in body. | K2 |
| | | Make use the source of energy for the activation of a fatty acid in β -Oxidation. | K3 |
| | | Describe the biosynthesis pathway of fatty acids. | K2 |
| | | Outline about short term and long term regulation of fatty acid synthesis | K2 |
| | | Analyse and list the various methods by which fatty acids can be synthesized in the body. | K4 |
| III | Aminoacids and Proteins | | |
| 3.1 | Structure and classification of aminoacids. Classification of proteins- denaturation | Explain the basics of structure of amino acids based on the polarity. | K2 |
| | | Classify the structure of amino acids | K2 |
| | | Classify the proteins. | K2 |
| | | Identify the types of attractive interactions that hold proteins in their most stable three structure | K4 |

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| | | Explain what happens when proteins are denatured and identify how a protein can be denatured. | K2 |
| 3.2. | Metabolism-Phenyl alanine, tyrosine, tryptophan; metabolism of methionine, leucine, arginine. | Discuss the metabolism of phenyl alanine and tyrosine. | K4 |
| | | Describe the metabolic pathway of methionine, leucine and arginine. | K2 |
| 3.3 | Urea cycle, ammonia circulation, ammonia transport to liver, deamination, transamination, decarboxylation and urea formation. | Explain the rationale of the urea cycle in ammonia excretion. | K2 |
| | | Explain the role of ammonia transport to liver, deamination, transamination reactions in amino acid synthesis. | K2 |
| | | List specific examples of ketoacid/amino acid transamination reactions (pyruvate/alanine, oxaloacetate/aspartate, alpha-ketoglutarate/glutamate), including the names of the enzymes | K2 |
| IV | Nucleic acids | | |
| 4.1 | Composition and function. Structure and properties of DNA and RNA (t-RNA, m-RNA and r-RNA), minor RNA types | Explain the molecular basics of nucleic acids. | K2 |
| | | Identify the composition and function of nucleic acids. | K2 |
| | | Integrate the terminology and defining structural features that distinguish different classes of nucleotide metabolites. | K5 |

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| | | Compare and contrast the structure of DNA and RNA | K4 |
| | | Discuss the structure and properties of RNA types (mRNA, tRNA and rRNA). | K4 |
| | | Different types of RNA and their functions. | |
| 4.2 | Metabolism- Biosynthesis and breakdown of purine nucleotides. Biosynthesis and breakdown of pyrimidine nucleotides. Defects in nucleic acid | Describe the biosynthesis of the purine and pyrimidine nucleotide with emphasis on the key regulated steps. | K2 |
| | | Compare and contrast the structure and biosynthesis of purines and pyrimidines, highlighting difference between de novo and salvage pathways. | K4 |
| | | Apply the knowledge of nucleic acid metabolic pathway for further research (disease conditions). | K5 |
| | | Describe the catabolism of purine nucleotides and the associated metabolic disorders. | K2 |
| | | Identify inborn errors of purine metabolism (such as deficiencies of HPRTase and adenosine deaminase) and compare and contrast their primary clinical presentations. | K4 |
| V | Enzymes | | |
| 5.1 | Classification of enzymes. IUB classification Enzyme kinetics- Michaelis Menton equation | Define and describe the roles of the enzyme-related terms. | K2 |
| | | Identify the general classification of enzymes. | K2 |

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| | | Classify enzymes based on the IUB nomenclatures with examples. | K3 |
| | | Define kinetics of enzyme reactions. | K2 |
| | | Explain Michaelis-Menton kinetics and be able to apply the Michaelis-Menton equation to calculate velocity, maximum velocity (V_{max}) and the Michaelis-Menton constant (K_m) | K2 |
| | | Explain how an enzyme functions as a catalyst in lowering the activation energy of reactions | K2 |
| 5.2 | Factors affecting enzyme activity (pH, temperature, substrate concentration and enzyme concentration). Enzyme inhibition-competitive, Non-Competitive and uncompetitive (kinetics) | Explain the factors affecting enzyme activity (pH, temperature, substrate concentration and enzyme concentration). | K2 |
| | | Define enzyme inhibition. | K2 |
| | | Identify and demonstrate the different types of enzyme inhibition. | K4 |
| | | Evaluate the differences between competitive versus non-competitive inhibitors. | K5 |
| | | Propose why some enzyme reactions are considered irreversible in the cell. | K5 |

4. Mapping scheme for PO, PSOs and COs

L-Low, M-Medium, H-High

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PSO1 | PSO2 | PSO3 | PSO4 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| CO1 | L | L | M | L | - | H | - | - | - | L | - | - | - |

At the end of the course, the students will be able to:

| CO. No | Course Outcomes | Level | Unit |
|--------|---|-------|---------|
| CO1 | Obtain a depth understanding on the scope of microbiology and the different culture techniques. | K2 | I |
| CO2 | Evaluate the physical and chemical methods involved in the detection of fermented foods.I | K3 | II |
| CO3 | Interpret the activity of food borne pathogens and toxins present in food. | K3 | II, III |
| CO4 | Analyse the microbiological quality standards and basic concepts of environmental microbiology. | K4 | IV |
| CO5 | Acquire knowledge on the industrial microbial products and diagnostic tools of medical microbiology | K5 | V |
| CO6 | Gain intense knowledge on the microbial culture and foods, detection methods and techniques involved. | K6 | V |

2.A. SYLLABUS

Unit- I Introduction to Microbiology:

- A. Introduction to Microbiology Structure, Growth and Multiplication of micro-organisms
Definition and History: Microscopy, General Morphology and Types of microorganisms
- B. Bacteria, Fungi, Algae, Yeast and Virus - Bacteriophage. Growth curve, batch and continuous culture, factors affecting growth: intrinsic factors, nutrient content, pH, redox potential, antimicrobial barrier and water activity; extrinsic factors: relative humidity, temperature and gaseous atmosphere.

UNIT-II- Microbial and Fermented foods

- A. **Microorganisms in Foods and methods for detection:** Fresh meat, Processed meat and poultry, Culture, Microscopic, and Sampling Method for detecting microbes, Physical, Chemical methods, Whole animal assays,
- B. Fermented Vegetables (olives, cucumbers), Beverage (cocoa and coffee); Bread, Idli,
- C. Microbiology of fermented milk – starter cultures, butter milk, cream, yoghurt, kafir, kumiss, acidophilus milk and cheese.

Unit-III: Food borne Diseases

- A. Bacterial food borne diseases (Staphylococcal intoxication, Botulism, Salmonellosis, Shigellosis, Enteropathogenic Escherichia Coli Diarrhoea, Clostridium Perfringens gastroenteritis, Bacillus cereus Gastroenteritis)
- B. Food Borne Viral Pathogens (Norwalk virus, Norovirus, Reovirus, Rotavirus, Astrovirus, Adenovirus, Parvovirus, Hepatitis A Virus)
- C. Food Borne Animal Parasites Protozoa –Giardiasis, Amebiasis, Toxoplasmosis, Sarcocystosis, Cryptosporidiosis. Cysticercosis /Taeniasis. Roundworm – Trichinosis, Anisakiasis.
- D. Mycotoxins: Aflatoxicosis, Deoxynivalenol Mycotoxicosis, Ergotism. Drug resistance - phenomena and mechanism

UNIT – IV Medical Microbiology:

A. Significance of Microbiology in Medicine, Classification of medically important microbes, Normal microbial flora of the human body: normal flora of skin, eye, throat, gastrointestinal tract and urogenital tract - Infections- Sources, types – opportunistic, nosocomial and community acquired infections - Mode of transmission, carriers and their types – investigation of epidemic diseases.

B. Diagnostic tools, antimicrobial agents diagnostic tests (ELISA, Immunofluorescence, Agglutination based tests, Complement fixation, PCR, DNA probes). Mechanism of action of important chemotherapeutic agents. Principles of drug resistance in bacteria.

UNIT-V- Environmental and Industrial Microbiology:

A. Basic concepts in Soil, air and water Microbiology, Introduction to food, dairy and industrial microbiology, use of various enzymes in industry and environment, GMO's, GEM's and use of recombinant DNA technology in Microbiology. Regulatory framework for GMO;s in India.

B. Microbial products of industrial value – raw materials, organism and industrial processes involved in the production of ethanol, vinegar, amylase, protease, glutamic acid. Recycling and disposal of industrial wastes through microbes.

2.B Topics for self study:

- Establishing the Endopeptidase-MS Method as a Screening Method for Botulinum Neurotoxins in Media and Foods - <https://www.ifsh.iit.edu/projects/food-microbiology-current-topics-investigation>

- <https://pubmed.ncbi.nlm.nih.gov/26642690/>
- Beneficial Bacteria - <https://askabiologist.asu.edu/beneficial-bacteria>
- Essential for life - <https://www.reactgroup.org/toolbox/understand/bacteria/bacteria-are-essential-for-human-life/>

2. C. REFERENCES

1. Microbial Biotechnology: Fundamentals of Applied Microbiology by Glazer & Nikaido, W.H. Freeman and Co., New York, 1995.
2. Modern Food Microbiology, 4th edition by J.M. Jay, Springer, 2006.
3. Fundamental Food Microbiology, 3rd edition by B. Ray., CRC press, 2006.
4. Food Microbiology: Fundamentals and Frontiers, 2nd edition by Michael P. Doyle, Larry R. Beuchat, Thomas J. Montville, ASM press, 2001.
5. Food Microbiology by M.R. Adams & M.O. Moss., Royal Society of Chemistry, 2000.
6. Food Microbiology by M.R. Adams, Royal Society of Chemistry, 2008.
7. Adams MR and Moss MO. (1995). Food Microbiology. 4th edition, New Age International (P) Limited Publishers, New Delhi, India.
8. Banwart JM. (1987). Basic Food Microbiology. 1st edition. CBS Publishers and Distributors, Delhi, India.
9. Davidson PM and Brannen AL. (1993). Antimicrobials in Foods. Marcel Dekker, New York.
10. Dillion VM and Board RG. (1996). Natural Antimicrobial Systems and Food Preservation. CAB International, Wallingford, Oxon.
11. Frazier WC and Westhoff DC. (1992). Food Microbiology. 3rd edition. Tata McGrawHill Publishing Company Ltd, New Delhi, India.
12. Gould GW. (1995). New Methods of Food Preservation. Blackie Academic and Professional, London.
13. Jay JM, Loessner MJ and Golden DA. (2005). Modern Food Microbiology. 7th edition, CBS Publishers and Distributors, Delhi, India.
14. Lund BM, Baird Parker AC, and Gould GW. (2000). The Microbiological Safety and Quality of Foods. Vol. 1-2, ASPEN Publication, Gaithersberg, MD.
15. Tortora GJ, Funke BR, and Case CL. (2008). Microbiology: An Introduction. 9th edition. Pearson Education.

3. Specific Learning Outcomes (SLO)

| Unit / Section | Course Content | Learning Outcomes | Highest Bloom's Taxonomic Levels of Transaction |
|----------------|--|--|---|
| I | Introduction to Microbiology | | |
| 1.1 | Introduction to Microbiology Structure, Growth and Multiplication of micro-organisms Definition and History: Microscopy, General Morphology and Types of microorganisms | Illustrate the history of Microscopy and Microbiology | K2 |
| | | List about the Types of microorganisms | K4 |
| | | Outline the Growth and Multiplication of micro-organisms | K2 |
| 1.2 | Bacteria, Fungi, Algae, Yeast and Virus - Bacteriophage. | Identify the basic shapes of bacteria | K3 |
| 1.3 | Growth curve, batch and continuous culture, factors affecting growth curve | Compare Batch and Continuous Culture | K4 |
| | | Explain about Growth Curve | K2 |
| | | Determine the factors affecting growth curve | K5 |

| | | | |
|-----|--|--|----|
| 1.4 | <p>Intrinsic factors: nutrient content, pH, redox potential, antimicrobial barrier and water activity;</p> <p>Extrinsic factors: relative humidity, temperature and gaseous atmosphere.</p> | List the Intrinsic Factors | K4 |
| | | List the Extrinsic Factors | K4 |
| | | Evaluate the antimicrobial Barrier | K5 |
| | | Evaluate the Relative humidity | K5 |
| II | Microbial and Fermented foods | | |
| 2.1 | <p>Microorganisms in Foods and methods for detection: Fresh meat, Processed meat and poultry, Culture, Microscopic, and Sampling Method for detecting microbes, Physical, Chemical methods, Whole animal assays,</p> | Identify the Microbes in Fresh and Processed meat | K3 |
| | | Identify the Microorganisms in Poultry | K3 |
| | | Explain the Sampling Method for detecting microbes | K2 |
| | | Illustrate the Physical and Chemical methods | K2 |

| | | | |
|------------|--|---|----|
| 2.2 | Fermented Vegetables (olives, cucumbers), Beverage (cocoa and coffee); Bread, Idli, Microbiology of fermented milk – starter cultures, butter milk, cream, yoghurt, kafil, kumiss, acidophilus milk and cheese. | Outline the microorganisms in Fermented Vegetables | K2 |
| | | Identify the microbes in Bread and Idli | K3 |
| | | Explain the Microbiology of fermented milk | K2 |
| | | List the Starter cultures used in the production of cultured Dairy products | K4 |
| | | Explain about acidophilus milk | K2 |
| | | Identify the culture in buttermilk. Explain it. | K3 |
| III | Food borne Diseases | | |
| 3.1 | Bacterial food borne diseases (Staphylococcal intoxication, Botulism, Salmonellosis, Shigellosis, Enteropathogenic Escherichia Coli Diarrhoea, Clostridium Perfringens gastroenteritis, Bacillus cereus Gastroenteritis) | Categorize the Bacterial food borne diseases | K4 |
| | | Analyze the Staphylococcal intoxication | K4 |

| | | | |
|-----------|---|--|----|
| 3.2 | <p>Food Borne Viral Pathogens (Norwalk virus, Norovirus, Reovirus, Rotavirus, Astrovirus, Adenovirus, Parvovirus, Hepatitis A Virus)</p> <p>Food Borne Animal Parasites Protozoa –Giardiasis, Amebiasis, Toxoplasmosis, Sarcocystosis, Cryptosporidiosis, Cysticercosis /Taeniasis, Roundworm – Trichinosis, Anisakiasis</p> | Identify the Food Borne Viral Pathogens and Food Borne Animal Parasites Protozoa | K3 |
| | | Explain Amoebiasis and Cryptosporidiosis | K2 |
| 3.3 | <p>Mycotoxins: Aflatoxicosis, Deoxynivalenol Mycotoxicosis, Ergotism. Drug resistance - phenomena and mechanism</p> | Discuss on Deoxynivalenol Mycotoxicosis | K6 |
| | | Analyze the Drug resistance - phenomena and mechanism | K4 |
| IV | Medical Microbiology | | |
| 4.1 | <p>Significance of Microbiology in Medicine, Classification of medically important microbes, Normal microbial flora of the human body: normal flora of skin, eye, throat, gastrointestinal tract and urogenital tract - Infections- Sources, types – opportunistic, nosocomial and community acquired infections - Mode of transmission, carriers and their types – investigation of epidemic</p> | Illustrate the Significance of Microbiology in Medicine | K2 |

| | | | |
|-----|--|--|----|
| | diseases. | | |
| | | <i>Evaluate</i> Normal microbial flora of the human body | K5 |
| | | List the types of infections | K4 |
| | | Determine the Mode of transmission of acquired infections | K5 |
| | | Identify the gastrointestinal tract and urogenital tract Infections | K3 |
| | | Classify the medically important microbes | K4 |
| | | Explain the opportunistic, nosocomial and community acquired infections | K2 |
| | | Categorize the Infections, Mode of transmission, carriers and their types | K4 |
| 4.2 | Diagnostic tools, antimicrobial agents diagnostic tests (ELISA, Immunofluorescence, Agglutination based tests, Complement fixation, PCR, DNA probes). Mechanism of action of important chemotherapeutic agents. Principles of drug resistance in bacteria. | Identify the Diagnostic tools and the Principles of drug resistance in bacteria. | K3 |

| | | | |
|-----|---|--|----|
| | | | |
| | | Demonstrate Mechanism of action of important chemotherapeutic agents | K2 |
| | | Demonstrate the antimicrobial agents diagnostic tests (ELISA, Immunofluorescence, Agglutination based tests, Complement fixation, PCR, DNA probes) | K2 |
| V | Environmental and Industrial Microbiology | | |
| 5.1 | Basic concepts in Soil, air and water Microbiology, Introduction to food, dairy and industrial microbiology, use of various enzymes in industry and environment, GMO's, GEM's and use of recombinant DNA technology in Microbiology. Regulatory framework for GMO;s in India. | Illustrate the Basic concepts in Soil, air and water Microbiology | K2 |
| | | Explain the use of various enzymes in industry and environment, GMO's | K2 |
| | | Identify the use of recombinant DNA technology in Microbiology | K3 |
| | | Determine the the Regulatory framework for GMO;s in India | K5 |
| 5.2 | Microbial products of industrial value – raw materials, organism | Identify the Microbial products of industrial value | K3 |

| | | | |
|-----|--|--|----|
| | and industrial processes involved in the production of ethanol, vinegar, amylase, protease, glutamic acid. | | |
| | | Outline the industrial processes involved in the production of ethanol | K2 |
| 5.3 | Recycling and disposal of industrial wastes through microbes. | Explain about disposal of industrial wastes through microbes | K2 |
| | | List the microbes used in the disposal of industrial wastes | K4 |

4. Mapping scheme

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PSO1 | PSO2 | PSO3 | PSO4 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| CO1 | H | H | - | M | - | L | - | H | L | H | H | - | L |
| CO2 | - | H | - | M | H | - | - | H | L | H | L | - | L |
| CO3 | H | H | - | M | - | - | L | H | L | H | L | - | L |
| CO4 | H | H | - | M | - | L | - | H | L | H | L | - | L |
| CO5 | - | M | M | M | - | - | - | H | L | H | L | - | L |
| CO6 | H | H | - | M | - | - | L | H | L | H | L | - | L |

L-Low, M-Medium, H-High

5. COURSE ASSESSMENT METHODS

DIRECT

1. Continuous Assessment Test: T1, T2 (Theory & Practical Components): Closed Book
2. Open Book Test.
3. Assignment, Group Presentation, Group Discussion, project Report, Field Visit Report, Poster Presentation, Seminar, Quiz (written).
4. Pre-Semester & End Semester Theory Examination

INDIRECT

1. Course end survey (Feedback)

Name of the Course Coordinator: Ms. Preethi S

CORE PRACTICAL -I : ADVANCED FOOD SCIENCE PRACTICAL
Semester : I **Code : P21FS1P1**
Credits : 3 **Total Hours : 45**

1. Course Outcomes

On completion of this course the students will be able to:

| CO.No | Course Outcomes | Level | Unit |
|-------|---|-------|------|
| CO1 | Explain the effect of heat on the consistency of various sweets | K2 | I |
| CO2 | Apply the principles of fat cookery and identify the factors affecting absorption of fat in foods | K3 | II |
| CO3 | Examine the effect of acid and alkali on the pulse cookery | K4 | III |

| | | | |
|-----|---|----|----|
| CO4 | Assess the role of various parameters such as pH and heat on the pigments present in vegetables | K5 | IV |
| CO5 | Determine the factors affecting the tenderness of meat and the role of heat in coagulation of egg and the factors that affect egg cookery | K5 | V |
| CO6 | Prepare variety of recipes using different methods of cooking, stages, effect of acid, alkali etc., | K6 | VI |

2. A. Syllabus

1. sugar cookery and Starches

(12 Hours)

- (i) Stages of sugar cookery, preparation of Fondant, Fudge, Caramel, Pulled toffees and brittles.
- (ii) Preparation of sugar syrups for various Indian traditional sweets
- (iii) Gelatinization of various starches, microscopic examination of starches, fermentation of batter in terms of volume and pH

2. Fat and Oils

(7 Hours)

- (i) Smoking temperature of fats and oils.
- (ii) Factors affecting fat absorption of deep fried foods

3. Pulses & Milk

(12 Hours)

- (i) Effect of soaking time and types of water on pulses
- (ii) Effect of cooking, acid and alkali on pulses
- (iii) Effect of germination on pulses
- (iv) Principles involved in the preparation of cheese
- (v) Setting of curds

4. Meat & Egg

(7 Hours)

- (i) Changes in cooking of meat, factors affecting the tenderness of meat
- (ii) Effect of cooking time on egg protein, coagulation of egg, preparation of Mayonnaise

5. Fruits and vegetables

(7 Hours)

- (i) Effect of acids, alkali and heat on vegetable pigments
- (ii) Determination of the strength of pectin in different fruits and vegetable extracts and Preparation of fruit jam and jelly
- (iii) Principles involved in the preparation of tomato soup, ketchup and sauce

2. B. Text Book(s):

- 1) Srilakshmi, M., Foodscience, New Age International (P) Ltd., Publishers, 2010.
- 2) Potter NN and Hotchkiss HJ, Food Science, 5 th edition, CBS Publishers, 2007.
- 3) Paul, P.C., and Palmer, H. H., Food Theory and Applications. John Wiley and Sons, Newyork, 2000.

2. C. Reference:

- 1) Brown. A. Understanding Food, Wadsworth, Thomson Learning Publications, 2000.
- 2) Mehas, K.Y., and Rodgers, S. L., Foodscience and You. McmillanMcgraw Hill Company, 2000.
- 3) Owen R. Fennema, Food Chemistry , Academic Press. 2006.

3. Specific Learning Outcomes (SLO)

| Unit / Section | Course Content | Learning Outcomes | Highest Bloom's Taxonomic Levels of Transaction |
|----------------|--|--|---|
| I | Sugar cookery | | |
| 1.1 | Stages of sugar cookery, preparation of Fondant, Fudge, Caramel, Pulled toffees and brittles | Analyze the factors affecting stages if stages of sugar cookery | K4 |
| | | Determine the appropriate temperature of the stages of sugar cookery | K5 |
| | | Develop variety of candies, toffees and brittles | K6 |
| | | Prepare fondant, fudge, caramel, toffees and brittles | K6 |
| 1.2 | Preparation of sugar syrups for various Indian traditional sweets | Categorize the different stages of sugar cookery | K4 |
| | | Analyze the factors affecting crystallization | K4 |
| | | Prepare Gulab jamun, Rassagulla, Ladoo | K6 |
| II | Starch cookery | | |
| 2.1 | Gelatinization of various | Illustrate the factors | K2 |

| | | | |
|------------|--|--|----|
| | starches | responsible for gelation | |
| | | Determine the gelatinization temperature of in different cereal flours | K5 |
| | | Prepare rice starch, ragi starch, tapioca starch and Arrowroot starch | K6 |
| 2.2 | Microscopic examination of starches | Identify the parts of a compound microscope | K3 |
| | | Examine the structure of starch microscopically | K4 |
| | | Rule on interference of other microbes under the microscope | K5 |
| 2.3 | Fermentation of batter in terms of volume and Ph | Categorize fermentation | K4 |
| | | Identify the Ph of the fermented food products | K3 |
| III | Fat and Oils | | |
| 3.1 | Factors affecting fat absorption of deep fried foods | Explain factors affecting fat absorption | K2 |
| | | Measure the amount of oil added to the preparation | K5 |
| | | Prepare deep fried foods | K6 |
| 3.2 | Smoking temperature of fats and oils | Classify the types of rancidity of fats and oils | K4 |
| | | Classify fats and oils based on their smoking temperature | K2 |
| | | Identify smoking temperature of different oils | K3 |
| | | Assume the factors affecting smoking temperature of fats and oils | K5 |

| IV | Pulses & Milk | | |
|-----|--|---|----|
| 4.1 | Effect of soaking time and types of water on pulses | Explain the anti-nutrients present in pulses | K2 |
| | | Choose the suitable type of water for cooking of pulses | K3 |
| | | Assess the effect of soaking and types of water on pulses | K5 |
| 4.2 | Effect of cooking, acid and alkali on pulses | Explain the factors affecting cooking quality of pulses | K2 |
| | | Summarize the effect of cooking on nutritional constituents of pulses | K2 |
| 4.3 | Effect of germination on pulses | Explain germination and the advantages of germination | K2 |
| | | Analyze the nutritional improvement on germinated pulses | K4 |
| 4.4 | Principles involved in the preparation of cheese Setting of curds | Classify the microbes facilitating fermentation | K4 |
| | | Classify cheese based on water content | K2 |
| | | Prepare cheese and set curd | K6 |
| V | Meat & Egg | | |
| 5.1 | Changes in cooking of meat, factors affecting the tenderness of meat | Summarize the factors affecting meat tenderness | K2 |
| | | Analyze the composition and nutritive value of meat | K4 |
| | | Determine the method of cooking of meat for desirable product | K5 |
| 5.2 | Effect of cooking time on egg protein, coagulation of egg, | Identify factors affecting coagulation | K3 |

| | | | |
|--|---------------------------|--|----|
| | preparation of Mayonnaise | of egg proteins | |
| | | Determine the quality of egg | K5 |
| | | Prepare and develop flavoured mayonnaise | K6 |

| | | | | | | | | | | | | | |
|--|------------|------------|------------|------------|------------|------------|------------|------------|------------|-------------|-------------|-------------|-------------|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PSO1 | PSO2 | PSO3 | PSO4 |
|--|------------|------------|------------|------------|------------|------------|------------|------------|------------|-------------|-------------|-------------|-------------|

| | | | |
|-----------|---|---|----|
| VI | Fruits and vegetables | | |
| 6.1 | Effect of acids, alkali and heat on vegetable pigments | Classify pigments based on colour developed during cooking | K2 |
| | | Categorize pigments based on the effect of acid, alkali and heat | K4 |
| | | Interpret the causes for pigments discoloration | K5 |
| 6.2 | Determination of the strength of pectin in different fruits and vegetable extracts and Preparation of fruit jam and jelly | Evaluate the strength of pectin to acquire desirable consistency of jam and jelly | K5 |
| | | Prepare fruit jam and jelly | K6 |
| 6.3 | Principles involved in the preparation of tomato soup, ketchup and sauce | Compare soup, sauce and ketchup and explain the principles in the preparation | K2 |
| | | Identify the appropriate class of food preservatives | K3 |
| | | Develop soup, sauce and ketchup using varieties of fruits | K6 |

4. Mapping scheme

L-Low, M-Medium, H-High

| | | | | | | | | | | | | | |
|------------|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | H | H | H | H | L | L | - | H | M | H | L | H | L |
| CO2 | H | H | H | H | L | L | - | H | M | H | L | H | L |
| CO3 | H | H | H | H | L | L | - | H | M | H | L | H | L |
| CO4 | H | H | H | H | L | L | - | H | M | H | L | H | L |
| CO5 | H | H | H | H | L | L | - | H | M | H | L | H | L |
| CO6 | H | H | H | H | L | L | - | H | M | H | L | H | L |

5. COURSE ASSESSMENT METHODS

DIRECT

1. Continuous Assessment Test: T1, T2 (Theory & Practical Components): Closed Book
2. Open Book Test.
3. Assignment, Group Presentation, Group Discussion, project Report, Field Visit Report, Poster Presentation, Seminar, Quiz (written).
4. Pre-Semester & End Semester Theory Examination

INDIRECT

1. Course end survey (Feedback)

Name of the Course Coordinator: Ms. Meera Muralitharan

Food Microbiology Practical

Course Practical- II

Semester- I

Credit – 3

1. COURSE OUTCOMES

Code – P21FS1P2

Total Hours – 45

At the end of the course, the students will be able to:

| CO. No | Course Outcomes | Level | Unit Covered |
|--------|---|-------|--------------|
| CO1 | Interpret various staining methods to identify the microbes in foods. | K2 | I |
| CO2 | Assess the role of microorganisms in fermentation. | K3 | II |
| CO3 | Evaluate the role of microorganisms in food spoilage and their effects. | K3 | II, III |
| CO4 | Illustrate the preparation of plating techniques | K4 | IV |
| CO5 | Compare various physical and chemical methods used in the control of microorganisms | K5 | V |
| CO6 | Cultivate and enumerate microorganisms from various food samples | K6 | V |

2.A. SYLLABUS

1. Sterilization of glassware and Equipments

- 1.1 Sterilization by dry heat
- 1.2 Sterilization by moist heat
- 1.3 Sterilization by filtration

2. Staining methods

- 2.1 Preparation of smear
- 2.2 Simple staining
- 2.3 Gram's staining method

3. Cultivation of micro-organism

- 3.1 Types of culture
- 3.2 Incubation of culture
- 3.3 Method of inoculation

4. Plate culture

- 4.1 Preparation of plate for streaking
- 4.2 Streak plates: Separation of mixed culture

5. Determination of Number of viable organisms in a sample

- 5.1 Colony Count method
- 5.2 Dilution Tube count method
- 5.3 Dye reduction method

6. Microbial examination of food

- 6.1 Sampling procedure
- 6.2 Detection of *clostridium welchii* in water
- 6.3 Microscopic examination of milk
- 6.4 Microscopic examination of canned foods
- 6.5 Microscopic examination of fruit juices and squash
- 6.6 Microscopic examination of bread

2. B. References:

1. Microbial Biotechnology by Glazer AN & Nikaido H., 2nd Ed., Cambridge University Press, 2007
2. Biotechnology: A text Book of Industrial Microbiology by Crueger W, Crueger A, 2nd Ed., Sinauer associates, Inc.1990
3. Biotechnology: Food Fermentation Microbiology, Biochemistry and Technology. Volume 2 by Joshi.
4. Essentials of Food Microbiology. Edited by John Garbult. Arnold International Students Edition.

5. Adams MR and Moss MO. Food microbiology, New Age international (P) Ltd., New Delhi.2006.

6. Chris Bell, Paul Neaves, Anthony P. Williams. Food Microbiology and Laboratory Practicals 2nd edition, Blackwell Scientific Publishers, UK. 2006.

7. Choudhary NL. Food Processing and Biotechnology Applications, Oxford Press, New Delhi.2012.

8. Frazier WC and Westhoff DC. Food Microbiology, Sixth edition, Tata McGraw-Hill Publishing Ltd., New Delhi. 2005.

9. Sinha and Sharma. Food Microbiology, Oxford Book Company, New Delhi. 2012.

10. Varun Mehta. Food Biotechnology, Campus Books International, New Delhi. 2006.

11. Vijaya Ramesh K. Food Microbiology, MJP Publishers. 2007.

12. Lund BM, Baird Parker AC and Gould GW. The Microbiological Safety and Quality of foods. Vol. 1-2, ASPEN Publication, Gaithersberg, MD. 2000.

3. Specific Learning outcomes (SLO)

| Unit / Section | Course Content | Learning Outcomes | Highest Bloom's Taxonomic Levels of Transaction |
|----------------|--|---|---|
| I | Sterilization of glassware and Equipments | | |
| 1.1 | Sterilization by dry heat | Identify the killing of microorganism by temperature | K3 |
| 1.2 | Sterilization by moist heat | Examine the killing of microbes by steam | K4 |
| 1.3 | Sterilization by filtration | Determine the removal of microorganism by using solution | K5 |
| II | Staining methods | | |
| 2.1 | Preparation of smear | Develop culture media for various microorganisms. | K6 |
| 2.2 | Simple staining | Identify the category of bacteria using staining technique. | K3 |
| 2.3 | Gram staining | Estimate the | |

| | | | |
|------------|--|--|----|
| | | positive and negative bacteria using staining technique | K5 |
| III | Cultivation of micro-organism | | |
| 3.1 | Types of culture | Estimation of Pure culture techniques (Spread plate, Streak plate, pour plate methods) | K5 |
| 3.2 | Incubation of culture | Examine the incubation period of various microbes | K4 |
| 3.3 | Method of inoculation | Analyse the inoculation of loops and needles | K4 |
| IV | Plate Culture | | |
| 4.1 | Preparation of plate for streaking | Develop various streaking methods on the surface of a agar plate | K6 |
| 4.2 | Streak plates: Separation of mixed culture | Identify the different sizes and shapes from streaked colonies | K3 |
| V | Determination of Number of viable organisms in a sample | | |
| 5.1 | Colony Count method | Estimate the number of viable aerobic bacteria per g or mL of product | K6 |
| 5.2 | Dilution Tube count method | Analyze the coliforms present in water | K4 |
| 5.3 | Dye reduction method | Identify the bacterial contamination of food | K3 |
| VI | Microbial examination of food | | |
| 6.1 | Sampling procedure | Demonstrate the sampling procedures in different food commodities | K2 |
| 6.2 | Detection of <i>clostridium welchii</i> in water | Identify the count of bacteria present in water | K3 |
| 6.3 | Microscopic examination of milk | Estimate the Direct Microscopic Count (DMC) from given sample | K5 |
| 6.4 | Microscopic examination of canned foods | Examine the type of bacteria present in canned food sample | K4 |
| 6.5 | Microscopic examination of fruit juices and squash | Determine the type of microbes present in | K5 |

| | | | |
|------------|----------------------------------|--|----|
| | | perishable samples | |
| 6.6 | Microscopic examination of bread | Estimate the count of bread mold present in the sample | K5 |

4. Mapping scheme for PO, PSOs and COs

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PSO1 | PSO2 | PSO3 | PSO4 |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| CO1 | H | H | - | M | - | L | - | H | L | H | H | - | L |
| CO2 | - | H | - | M | H | - | - | H | L | H | L | - | L |
| CO3 | H | H | - | M | - | - | L | H | L | H | L | - | L |
| CO4 | H | H | - | M | - | L | - | H | L | H | L | - | L |
| CO5 | - | M | M | M | - | - | - | H | L | H | L | - | L |
| CO6 | H | H | - | M | - | - | L | H | L | H | L | - | L |

Low-L Medium-M High-H

5. COURSE ASSESSMENT METHOD

DIRECT

1. Continuous Assessment Test: T1, T2 (Theory & Practical Components): Closed Book
2. Open Book Test.
3. Assignment, Group Presentation, Group Discussion, project Report, Field Visit Report, Poster Presentation, Seminar, Quiz (written).
4. Pre-Semester & End Semester Theory Examination

INDIRECT

1. Course end survey (Feedback)

Name of the Course Coordinator: Ms. Preethi S

Core paper V -NUTRITION THROUGH LIFE SPAN

Credit – 4

Course Code: P21FS205

Semester – II

Total Hours: 60

1. Course Outcomes

On completion of this course the students will be able to:

| CO.No | Course Outcomes | Level | Unit |
|-------|---|-------|------|
| CO1 | Identify the correlation between nutrition and health | K3 | I |
| CO2 | Explain on the nutritional needs pertaining to different stages of life | K2 | II |
| CO3 | Analyze the physiological changes on various stages of life and coping up with their daily dietary requirements | K4 | III |
| CO4 | Assess the various stages of a woman's life and her nutritional needs during each stage | K4 | IV |
| CO5 | Develop the diet plan for each stage of life according to the guidelines for dietary needs | K3 | V |
| CO6 | Plan best nutrition based services for students and ultimately the entire society | K3 | V |

2. A. Syllabus

Unit I: Assessment of Nutritional Status & Meal planning

(12 Hours)

- A. Assessing the food and nutritional problems in the community methods available for the individual and community- direct methods Indirect methods, assessment of ecological factors techniques of diet and nutritional surveys *computer assistance for consolidation and documentation of data(SS)*
- B. **Meal Planning** - Basic principles of meal planning, balanced diet, RDA, food allowance for different age groups, factors affecting meal planning.

Unit II: Pregnancy & Lactation

(12 Hours)

- A. **Pregnancy** - Stages of gestation, weight gain, complications of pregnancy physiological adjustments, nutritional problems and dietary management, Importance of nutrition during and prior to pregnancy and dietary allowances.

- B.** Lactation- Physiology of lactation, hormonal control and reflex action, efficiency of milk production, problems of breast feeding, nutritional composition of breast milk, galactogogues, dietary modification and allowances.

Unit III: Infancy and Pre-school children

(12 Hours)

- A. Infancy-** nutritional status of infants, premature infant and their feeding, breast feeding , growth and development, superiority of breast milk, advantages of breast feeding, comparison of human milk with cow's milk, artificial feeding, milestones in development formula feeding, weaning and supplementary foods, problems in weaning, nutrition related health problems- diarrhoea, under nutrition, over nutrition/ obesity, preterm infants.
- B. Nutrition During Early And Late Childhood And Adolescence -** Growth and development of preschool children- nutrition and cognitive development, prevalence of malnutrition in preschool age, eating habits, feeding programmes for preschool children, factors affecting nutritional status and nutritional problems during preschool children.

Unit IV: School age and adolescence

(12 Hours)

Food habits and nutritional requirements, packed lunch. Dietary allowances (SS), school lunch programme, nutrition during adolescence - changes in growth and development, hormonal influences, psychological problems, disordered eating behaviour, nutritional problems, changes needed to prevent malnutrition

Unit V: Adult and Geriatric Nutrition

(12 Hours)

- A. Nutrition in adulthood** – Physiological changes, Nutrition and work efficiency reference man and reference women, activity classification, body composition, nutritional requirements of an adult man and women.
- B. Geriatrics -** definition of changes in body composition, Physiological changes in aging Clinical, psycho-social and economical factors affecting eating behaviour, social situation, institutionalization, common health problems (SS), Nutritional requirements, modification in diet, feeding old people.

2. B. Topics for self-study

Current and future healthcare professionals and community health workers, with an overarching goal to promote optimal health utilizing adequate nutrition throughout the human lifespan-Food Composition-Nutrition Assistance program.

2. C. Text book(s):

1. Mahtab, S, Bamji, Kamala Krishnasamy, G.N.V. Brahmam, Text Book of Human Nutrition, Third Edition, Oxford and IBH Publishing Co. P. Ltd., New Delhi, 2012.
2. Srilakshmi, B., Dietetics, New Age International (P) Ltd., New Delhi, 2013.
3. Swaminathan, M., Advanced Textbook on Food and Nutrition, Vol. 1, Second Edition, Bangalore Printing and Publishing Co. Ltd., Bangalore, 2012.

2. D. Reference books:

1. Dietary Guidelines for Indians, ICMR, National Institute of Nutrition, Hyderabad, 2013.
2. Gopalan, C. Rama Sastri B.V. and Balasubramanian, Nutritive Value of Indian Foods, NIN, ICMR, Hyderabad, 2014.
3. Krause, M.V. and Hunscher, M.A., Food, Nutrition and Diet Therapy, 14th Edition, W.B. Saunders

2. E. Reference Link:

4. <https://extension.ucsd.edu/courses-and-programs/nutrition-throughout-the-lifecycle>
5. <https://www.nal.usda.gov/fnic/lifecycle-nutrition>

3. Specific Learning Outcomes (SLO)

| Unit / Section | Course Content | Learning Outcomes | Highest Bloom's Taxonomic Levels of Transaction |
|----------------|---|--|---|
| I | Assessment of Nutritional Status and Meal planning | | |
| 1.1 | Assessing the food and nutritional problems in the community methods available for the individual and community- direct methods | Classify the various types of methods to assess for individual | K3 |

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| | Indirect methods, | | |
| 1.2 | assessment of ecological factors techniques of diet and nutritional surveys | Analyze the of different techniques used in assessments of nutritional survey | K4 |
| 1.3 | computer assistance for consolidation and documentation of data(SS) | Explain the computer assistance for consolidation and documentation of data(SS) | K5 |
| | | Compare the anthropometry assessment and clinical assessment for nutritional problems. | K5 |
| 1.4 | Meal Planning | | |
| | Basic principles of meal planning, balanced diet, RDA, food allowance for different age groups, factors affecting meal planning. | Define and explain balanced diet | K2 |
| | | Apply the food exchange list. How are they used in planning a diets? | K3 |
| | | Classify the reference women and reference men | K3 |
| | | Analyze the different types of method used for deriving RDA | K4 |
| | | Distinguish the concepts of food requirements in all age groups. | K5 |
| | | Discuss in detail the steps involved in planning a menu | K5 |
| | | Determinations of food choice involved in economical, physical and social | K5 |
| II | Pregnancy and Lactation | | |
| 2.1 | A. Pregnancy- Stages of gestation, weight gain, complications of pregnancy | Classify the various stages of gestation periods. | K3 |
| | | Combine the complete RDA for a pregnant women who is in first to last trimester of pregnancy | K4 |
| | | Discuss the complications of pregnancy. | K5 |
| 2.2 | Physiological adjustments, | List out the physiological changes | K2 |

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| | nutritional problems and dietary management, | during pregnancy | |
| | | Analyze the complications including multiples, fetal growth abnormalities and infections in pregnancy. | K4 |
| | | Explain the medical disorders in pregnancy including hypertensive disorders, diabetes and epilepsy | K2 |
| | | Discuss nutritional anemia in pregnancy period. Measures should taken to prevent it. | K5 |
| 2.3 | Importance of nutrition during and prior to pregnancy and dietary allowances. | Importance of nutrition during pregnancy periods | K5 |
| | | Suggest the dietary modification and dietary requirements during pregnancy periods | K5 |
| | | Plan a day's menu for pregnant women. | |
| 2.4 | B. Lactation – Physiology of lactation, hormonal control and reflex action, efficiency of milk production | Explain the role of hormones in milk production. | K2 |
| | | Describe the process of physiology of lactation. | K3 |
| | | Analyze the efficiency of milk production in lactating period. | |
| | | Explain the flow charts for failure to thrive while breast fed. | K2 |
| 2.5 | Problems of breast feeding, nutritional composition of breast milk, galactogogues, | Describe the nutritional problems of breast feeding | K2 |
| | | Discuss ICMR RDA for a lactating mother who delivered the child eight months ago | K5 |
| | | Importance of nutritional composition of breast milk | K5 |
| | | Explain lactogogues | K2 |
| 2.6 | Dietary modification and allowances. | Inspite of breast feeding the infant does not thrive. explain | K5 |

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| | | Formulate the dietary supplements for lactating mother | K6 |
| III | Infancy and Pre-school children | | |
| 3.1 | A. Infancy - Nutritional status of infants, premature infant and their feeding, breast feeding , growth and development | Classify the different stages of infancy | K2 |
| | | Make use of the RDA of an infant aged of eight months | K3 |
| | | Explain the various growth and development of infancy | K2 |
| 3.2 | Superiority of breast milk, advantages of breast feeding, comparison of human milk with cow's milk, artificial feeding, milestones in development formula feeding, | Compare the nutritive value of human milk with cow's milk | K5 |
| | | Analyze the advantages of artificial feeding. | K4 |
| | | Give the nutritional importance of baby and explain problems involved in feeding them | K5 |
| | | Discuss the Lactobacillus Bifidus factor | K5 |
| | | Importance of milestones in development formula feeding, | K5 |
| 3.3 | Weaning and supplementary foods, problems in weaning, nutrition related health problems- diarrhoea, under nutrition, over nutrition/ obesity, preterm infants. | Define weaning and give the schedule for it. | |
| | | Apply the need for introducing weaning foods to an infant's diet. | K3 |
| | | Develop the method of preparing any one low cost weaning food. | K5 |
| | | Explain the problems of weaning and discuss any one in detail. | K2 |

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| | | Analyze on colostrums. Bring out the difference between fore milk and hindmilk | K4 |
| 3.4 | B. Nutrition During Early And Late Childhood - Growth and development of preschool children- nutrition and cognitive development, | Explain the nutritional importance during pre-school | K2 |
| | | Apply the growth chart on pre-school children | K3 |
| | | Categorize the growth and development of preschool children | K4 |
| | | Compare the nutrition and cognitive development. | K5 |
| | | Discuss the factors affecting the nutritional status of children | K5 |
| 3.5 | Prevalence of malnutrition in preschool age, eating habits, feeding programmes for preschool children, | Relate in nutritional problems in children | K2 |
| | | Describe in detail the three stages of treatment of PEM | K2 |
| | | Identify the nutritional requirements of PEM child and explain the sequences of dietary treatment | K4 |
| | | Plan a day's diet for a 4 year old child from a low income group | K5 |
| | | Suggest five recipes rich in vitamin A suitable for a pre-school child. | K5 |
| | | Explain the role of ICDS in alleviating malnutrition | K2 |
| 3.6 | Factors affecting nutritional status and nutritional problems during preschool children. | Discuss about poverty may not be only the reason for malnutrition during pre school age. What are the other reasons? | K5 |
| | | Evaluate the factors affecting the nutritional status of children | K5 |
| IV | School age and adolescence | | |
| | Nutrition during school age | Compare the nutritional requirements | K3 |

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| | and adolescence - changes in growth and development, hormonal influences, psychological problems, disordered eating behaviour, nutritional problems, changes needed to prevent malnutrition | of 7-9 year old and 10-12 year old school children | |
| | | Analyze the points to be considered in planning diet for school children | K4 |
| | | Explain the role of MID-DAY meal programme in alleviating malnutrition. | K2 |
| | | Compare the different types of feeding programmes of India | K4 |
| | | Assess the causes of obesity in school going children | K5 |
| | | Plan a packed lunch for a 12 year old boy | K5 |
| | | Distinguish the nutritional problems of Indian and Western adolescents. | K5 |
| | | Give the nutritional importance of adolescents | K5 |
| | | Explain the eating disorder such as anorexia and bulimia nervosa | K2 |
| | | Plan a days diet of an adolescent girl suffering from nutritional anemia | K5 |
| | | Suggest the points to be consider in planning a menu for adolescents period. | K5 |
| V | Adult and Geriatric Nutrition | | |
| 5.1 | Nutrition in adulthood – Physiological changes, Nutrition and work Efficiency reference man and reference women, activity classification, body composition, nutritional requirements of an adult man and women. | Classify the Indian reference men and women | K3 |
| | | Give the RDA suggested by ICMR for a male and female executives | K5 |
| | | List out the importance of including millets in the diet | K5 |
| | | Compare the cost and nutritive value | K4 |

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| | | of low cost balanced diet. | |
| | | Classifications of vegetarian diet for adults | K4 |
| | | Suggest the dietary guidelines for adult | K5 |
| 5.2 | definition of changes in body composition, Physiological changes in aging Clinical, psycho-social and economical factors affecting eating behaviour, social situation, institutionalization, common health problems (SS), Nutritional requirements, modification in diet, feeding old people. | Define geriatrics | K2 |
| | | Illustrate the reasons for malnutrition during ageing? | K2 |
| | | Importance of calcium and fiber during old age | K5 |
| | | Analyze the degenerative diseases be prevented during geriatrics | K4 |
| | | Explain the importance of antioxidants during ageing. | K2 |
| | | Discuss the modifications of calorie requirements during old age | K5 |
| | | Plan a day's menu for a 60 year old clerk for your choices. | K3 |

4. Mapping scheme

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PSO1 | PSO2 | PSO3 | PSO4 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| CO1 | M | L | H | M | H | H | H | H | L | L | H | H | - |
| CO2 | H | M | H | M | H | H | H | H | L | L | H | H | - |
| CO3 | M | H | H | M | H | H | H | H | L | L | H | H | - |
| CO4 | M | H | H | M | H | H | H | H | L | L | H | H | - |
| CO5 | M | M | H | M | H | H | H | H | L | L | H | H | - |
| CO6 | M | M | H | M | H | H | H | H | L | L | H | H | - |

L-Low, M-Medium, H-High

5. COURSE ASSESSMENT METHOD

DIRECT

1. Continuous Assessment Test: T1, T2 (Theory & Practical Components): Closed Book
2. Open Book Test.
3. Assignment, Group Presentation, Group Discussion, project Report, Field Visit Report, Poster Presentation, Seminar, Quiz (written).
4. Pre-Semester & End Semester Theory Examination

INDIRECT

1. Course end survey (Feedback)

Name of the Course Coordinator: PREETHI S

COURSE CORE-VI : THERAPEUTIC NUTRITION

Semester : II

Code : P21FS206

Credits : 4

Total Hours : 60

1. Course Outcomes

On completion of this course the students will be able to:

| CO.No | Course Outcomes | Level | Unit |
|-------|---|-------|------|
| CO1 | List the role of dietician and explain various diets based on the therapeutic conditions | K2 | I |
| CO2 | Identify principles of diet and recommend therapeutic diets based on the severity of the condition | K3 | II |
| CO3 | Analyze the patho-physiological changes in the body during disease conditions | K4 | III |
| CO4 | Assess the nutritional requirements of patients individually and recommend diets according to their needs | K5 | IV |
| CO5 | Explain the aetiology, symptoms, risk factors and dietary management of different disease conditions | K5 | V |
| CO6 | Modify regular diets with therapeutic diets according to different conditions | K6 | VI |

2. A. Syllabus

UNIT I: Dietitian & Hospital Diet

(12 Hours)

- (i) Role of dietitian in the hospital and community- Types of dietitian, education and personal qualifications- Professional ethics and obligations Feeding the patients – Psychology of feeding the patients, assessment of patient's needs.
- (ii) Routine hospital diets- regular diet, soft diet, full fluid diet, clear fluid diet Special feeding methods- Parenteral and enteral nutrition Diet for nutritional deficiency disorders- etiology, types, symptoms and dietary modifications for PEM, anaemia, Vitamin A deficiency

Unit II: Diet in fevers and gastro intestinal system

(12 Hours)

- (i) **Fever:** Pathogenesis, aetiology, types, symptoms, treatment and dietary modification for Febrile conditions- acute, chronic and recurrent fevers typhoid, influenza, rheumatic fever, tuberculosis, malaria and poliomyelitis.

- (ii) **Gastro intestinal system:** complications, prevention and recent advances in nutritional management of GIT Disorders
 - a) Gastritis _ Types, dietary modification
 - b) Peptic ulcer, etiology, symptoms, dietary modification
 - c) Ulcerative colitis symptom, dietary treatment
 - d) Sprue types, dietary consideration

Unit III: Disease of liver, gall bladder & CVD

(12 Hours)

- (i) **Liver:** Types of liver disease, symptoms, causes, principles of diet and dietary modification-of Fatty liver,Jaundice ,Hepatitis ,Hepatic coma, Cirrhosis, Cholecystitis- Cholelithiasis. Pancreatic disorders: etiology, pathogenesis and nutritional care
- (ii) **Cardiovascular diseases:** Pathogenesis, aetiology, types, symptoms, treatment and dietary modification for cardio vascular disorders- hypertension, atherosclerosis, hyperlipidemia, hypercholesterolemia,acute and chronic cardiac diseases, congestive cardiac failure

Unit IV: Renal diseases & Allergies

(12 Hours)

- (i) **Renal diseases:**
 - a) Classification of renal disease.
 - b) Glomerulonephritis- Acute and chronic- symptoms and dietetic treatment
 - c) Nephrosis symptoms and principles of nutritional care.
 - d) Renal failure- Acute and chronic renal failure, dialysis.
- (ii) **Allergies:** food allergy and intolerance – mechanism, factors influencing, symptoms, tests for allergy, nutritional care and elimination diet.

Unit V: DM, Cancer, HIV & AIDS

(12 Hours)

- (i) **Diabetes Mellitus:** Symptoms , types and diagnoses , dietary management and meal management, Hypoglycemic agents and insulin, complications of diabetes
- (ii) **Pulmonary diseases:** bronco pulmonary disease, asthma, respiratory failure, Nutritional care and requirement for major burns.
- (iii) **Cancer:** Cancer -Classification, risk factors, symptoms, general systemic reactions, nutritional problems of cancer therapy, nutritional requirement and diet modifications

- (iv) **HIV and AIDS:** aetiology, signs and symptoms, stages, diagnosis and diet modifications

2. B. Topics for Self-study

Integration of nutrition into paediatric care, Reading of nutrition facts label, Haemopoetic diseases and Neurological diseases.

2. C. Text Book(s):

- 1) Swaminathan M. Essentials of Food and Nutrition, Vol. I & II Ganesh and Company, Madras, 1995.
- 2) Srilakshmi, B, Dietetics, New Age International, New Delhi, 2002.
- 3) Gopalan , C. Ramasastri, B.V. and Balasubramaniam, S.C. Nutritive value of Indian Foods National Institute of Nutrition, Hyderabad, 2010.

2. D. Reference:

- 1) Krause M.V. Horsch M.A. Food Nutrition and Diet Therapy W.B. Saunders Company, Philadelphia, 1993.
- 2) William's Basic Nutrition and Diet Therapy, Staci Nix, RS, C.V. Muusby Camp. Saint, Lowin, 2012.
- 3) Cooper Et. al, Nutrition in health and disease 4th edition, Pitman Medical Publishing Co. 1963.

2. E. Reference links:

4. <https://books.google.co.in/books?id=4l-k64BD-MIC&printsec=frontcover#v=onepage&q&f=false>
5. https://www.google.co.in/books/edition/Therapeutic_Nutrition/IJAkBAAQBAJ?hl=en&gbpv=1&dq=therapeutic+nutrition+books&printsec=frontcover

3. Specific Learning Outcomes (SLO)

| Unit / Section | Course Content | Learning Outcomes | Highest Bloom's Taxonomic Levels of Transaction |
|----------------|---|--|---|
| I | Dietician & Hospital Diet | | |
| 1.1 | Role of dietician in the hospital and community- Types of dietician, education and personal qualifications- Professional ethics and obligations | List the responsibilities of a dietician | K1 |
| | | Classify the types of dietician | K2 |
| | | Demonstrate professionalism and ethical behaviour in all | K2 |

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| | | areas of practice | |
| 1.2 | Feeding the patients – Psychology of feeding the patients, assessment of patient’s needs. | Develop practical skills in feeding and <u>management</u> of different age groups | K3 |
| | | Asses the needs and modify the diet for patient’s | K5 |
| 1.3 | hospital diets- regular diet, soft diet, full fluid diet, clear fluid diet | Choose appropriate diet for suitable therapeutic condition | K3 |
| | | Distinguish types of hospital diet | K4 |
| | | Develop diet based on therapeutic condition of the patient | K6 |
| 1.4 | Special feeding methods- Parenteral and enteral nutrition | Compare the special feeding methods | K2 |
| | | Analyze the appropriate feeding method for suitable condition | K4 |
| | | Formulate diet for patients under parenteral feeding method | K6 |
| 1.5 | nutritional deficiency disorders- etiology, types, symptoms and dietary modifications for PEM, anaemia, Vitamin A deficiency | Illustrate nutritional deficiency disorders | K2 |
| | | Construct home gardening methods to prevent disease | K3 |
| | | Assess pathophysiology, risk factors and clinical manifestation of diseases | K5 |
| | | Recommend dietary modification to suit the disease condition | K5 |
| II | Diet in fevers and gastro intestinal system | | |
| 2.1 | FEVER : Pathogenesis, aetiology, types, symptoms, treatment | Outline the etiology, incidence, nature, clinical symptoms and treatment of the condition | K2 |
| | | Examine clinical manifestations of the disease condition | K4 |
| 2.2 | Dietary modification for | Identify and Categorize the | K3, K4 |

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| | Febrile conditions- acute, chronic and recurrent fevers typhoid, influenza, rheumatic fever, tuberculosis, malaria and poliomyelitis. | febrile condition based on symptoms | |
| | | Analyze the nutrient requirement of the patients | K4 |
| | | Evaluate the condition using modified diets | K5 |
| 2.3 | Gastro intestinal system : complications, prevention | List the complications in Gastro Intestinal system | K1 |
| | | Asses the preventive measures to avoid complications | K5 |
| 2.4 | Recent advances in nutritional management of GIT Disorders a) Gastritis - Types, dietary modification b) Peptic ulcer, etiology, symptoms, dietary modification c) Ulcerative colitis symptom, dietary treatment d) Sprue types, dietary consideration | Interpret the types of therapeutic modifications with respect to consistency, frequency of meals, methods of cooking | K2 |
| | | Analyze and Distinguish the types of gastro intestinal disorders | K4 |
| | | Asses nutritional status and Recommend suitable therapeutic diets for the disorder | K5 |
| III | Disease of liver , gall bladder & CVD | | |
| 3.1 | LIVER-Types of liver disease, symptoms, causes, principles of diet and dietary modification-of Fatty liver, Jaundice ,Hepatitis ,Hepatic coma ,Cirrhosis, Cholecystitis- Cholelithiases. | Compare types of liver disease | K2 |
| | | Apply principles of diet and plan suitable modification in dietary pattern | K3 |
| | | Catergorize liver disease based on the symptoms | K4 |
| | | Influence behavioral change through nutrition counselling | K5 |

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| | | to the patients and clients | |
| 3.2 | Pancreatic disorders: etiology, pathogenesis and nutritional care | Illustrate cause and effect of pancreatic disorders | K2 |
| | | Identify suitable nutritional care to combat pancreatic disorders | K3 |
| | | Analyze the nutritional status of the patients with pancreatic disorders | K4 |
| 3.3 | Cardiovascular diseases : Pathogenesis, aetiology, types, symptoms, treatment | List the types and symptoms of cardiovascular disease | K1 |
| | | Categorize treatment based on the type of cardiovascular disease | K4 |
| | | Determine the causes for cardiovascular disease | K5 |
| 3.4 | dietary modification for cardiovascular disorders- hypertension, atherosclerosis, hyperlipidemia, hypercholesterolemia, acute and chronic cardiac diseases, congestive cardiac failure | Influence dietary modification using nutrition counselling method | K5 |
| | | Evaluate normal and therapeutic nutritional needs of the patient | K5 |
| | | Estimate the fat requirement for the types of cardiovascular disease | K5 |
| | | Formulate tailor-made diets based on the severity of the condition | K6 |
| IV | Renal diseases & Allergies | | |
| 4.1 | Renal diseases a) Classification of renal disease. b) Glomerulonephritis- Acute and chronic- symptoms and dietetic treatment c) Nephrosis symptoms and principles of nutritional care. d) Renal failure- Acute and | Classify the types of renal diseases | K2 |

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| | chronic renal failure, dialysis. | | |
| | | Apply principles of diet in modification of dietary pattern | K3 |
| | | Identify suitable nutritional care methods to combat the condition | K3 |
| | | Discover the recent advancements in treating the condition | K5 |
| | | Examine the nutritional status of the patients | K5 |
| 4.2 | Allergies – food allergy and intolerance – mechanism, factors influencing, symptoms, tests for allergy, nutritional care and elimination diet. | List the foods causing allergic symptoms | K1 |
| | | Explain the hormones responsible in inducing the allergic condition | K2 |
| | | Select appropriate nutritional care to alleviate the symptoms | K3 |
| | | Analyze the food allergy management and prevention plans | K4 |
| | | Distinguish food allergy and intolerance | K4 |
| V | DM, Cancer, HIV & AIDS | | |
| 5.1 | Diabetes Mellitus- Symptoms , types and diagnoses , dietary management and meal management, Hypoglycemic agents and insulin , complications of diabetes | Define Diabetes Mellitus and List the types of diabetes mellitus | K1 |
| | | Outline the diagnostic methods to screen the condition | K2 |
| | | Identify other disorders associated with the metabolic syndrome | K3 |
| | | Formulate plans for maximizing wellness and prevention of chronic disease | K6 |

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| 5.2 | Pulmonary diseases- bronco pulmonary disease, asthma, respiratory failure, Nutritional care and requirement for major burns. | Explain the structure of lungs and Contrast the types of pulmonary disease | K2 |
| | | Plan tailor-made diets to provide nutritional support | K3 |
| | | Asses the needs of the patient with burns and support using therapeutic nutrition | K5 |
| 5.3 | Cancer - Cancer - Classification, risk factors, symptoms, general systemic reactions, nutritional problems of cancer therapy, nutritional requirement and diet modifications | Classify the types and explain the symptoms of cancer | K2 |
| | | Influence health behaviour change using nutrition counseling techniques | K5 |
| | | Determine the risk factor and nutritional problems in cancer treatment | K5 |
| 5.4 | HIV and AIDS - aetiology, signs and symptoms, stages, diagnosis and diet modifications | Explain the relationship between diseases and disorders | K2 |
| | | Identify the cause of HIV and AIDS and select suitable dietary modification to support nutritionally | K3 |
| | | Assess pathophysiology, risk factors and clinical manifestation of diseases related to nutrition. | K5 |
| | | Recommend palliative care to support the infected individuals | K5 |

4. Mapping scheme

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PSO1 | PSO2 | PSO3 | PSO4 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| CO1 | - | - | H | H | M | H | M | L | H | H | H | M | - |
| CO2 | - | H | H | H | L | H | H | H | H | H | M | H | - |
| CO3 | - | M | H | M | M | - | H | H | - | H | M | M | - |
| CO4 | - | M | H | H | H | M | H | H | - | H | M | H | - |
| CO5 | - | H | H | M | M | - | L | L | - | L | L | M | - |
| CO6 | - | M | H | H | H | H | H | H | H | H | H | H | - |

L-Low, M-Medium, H-High

5. COURSE ASSESSMENT METHOD

DIRECT

1. Continuous Assessment Test: T1, T2 (Theory & Practical Components): Closed Book
2. Open Book Test.
3. Assignment, Group Presentation, Group Discussion, project Report, Field Visit Report, Poster Presentation, Seminar, Quiz (written).
4. Pre-Semester & End Semester Theory Examination

INDIRECT

1. Course end survey (Feedback)

Name of the Course Coordinator: ROSELIN C

CORE COURSE-VII : COMMUNITY NUTRITION AND PUBLIC HEALTH
Semester : III **Code : P21FS207**
Credits :4 **Total Hours : 60**

1. Course outcome

On completion of this course the students will be able to:

| CO.N0 | Course outcomes | Level | Unit |
|--------------|---|--------------|-------------|
| CO1 | Develop ideas to improve health and nutrition in the community. | K5 | I |
| CO2 | Predict the reasons for malnutrition and improve the health status of affected individuals | K5 | II |
| CO3 | Categorise the role of various agencies like National and International organizations for the welfare of individuals | K5 | III |
| CO4 | Assess the epidemiology of communicable disease at community level. | K5 | IV |
| CO5 | Evaluate the current programmes of nutrition monitoring and surveillance systems in India | K5 | V |
| CO6 | Assess the methods burden of malnutrition in a community, nutritional programmes adopted by various national and international agencies engaged in the battle against malnutrition and related issues | K5 | V |

2. A. Syllabus

Unit I: Nutrition and National Development, Ecology of Malnutrition, Strategies To Overcome Malnutrition (12 Hours)

- A.** History of malnutrition in India- factors leading to malnutrition; Measures to overcome malnutrition. Relation of nutrition to national development; Consequences of malnutrition; IMR, NMR, MMR and prevalence of common nutritional problems- PEM, Vitamin A Deficiency Diseases, Anaemia, Iodine Deficiency Disorders and Fluorosis.
- B. Nutritional Assessment:** Methods of assessment of Nutritional status –Primary and secondary methods, Direct assessment - Diet survey, anthropometry, clinical and biochemical estimation. Indirect assessment - Food balance sheet,

Unit II: National, International And Voluntary Organizations To Combat Malnutrition

(12 Hours)

- A. National organization – ICAR, ICMR, SCWB, SSWB, NNMB, NIN, CFTRI, DFRL, NIPCCID and NFI;
- B. International Organizations - WHO, FAO, UNICEF, World Bank, FFHC, WFP; Voluntary organizations – Global Alliance for Improved Nutrition(GAIN),
- C. Micronutrient Initiatives, CARE, CRS, AFPRO, IDA; Concepts of Community Health care of the community.
- D. Nutrition Intervention programmes - Nutritious Noon Meal Programme. ICDS.

Unit III: Advanced Nutritional Programmein India

(12 Hours)

- A. Indhradhanush, AnemiaMuktBharat, PoshanAbhiyan, National Oral Health Programme (Nohp), JananiSurakshaYojana, PradhanMantriMatruVandanaYojana (PMMVY), Scheme For Adolescent Girls (SAG) Of MWCD
- B. National Health Mission (NHM), Swachh-Bharat Mission, PradhanMantriSwasthyaSurakshaYojana, JananiShishuSurakshaKaryakaram, E-Pds, Eat Right India movement by FSSAI.

Unit III: Nutrition Education

(12 Hours)

- A. Meaning, nature and importance of Nutrition education to the community and lessons to be taught (SS), Training workers in nutrition education programmes Methods of education when to teach, whom to teach
- B. Use of computers to impart nutrition education Organization of Nutrition education programmes.National Nutrition policy

Unit IV: Epidemiology Of Communicable Diseases

(12 Hours)

- A. Definition of epidemiology - causes, signs and symptoms, epidemic and endemic diseases, treatment and prevention of communicable diseases, respiratory infections, intestinal infections, Other infections- dengue, filariasis.
- B. Types of immunity- active, passive and herd-group protection. Immunization agents- vaccines, immunoglobulins, *Immunization schedules* - Active- National and WHO Expanded Programme on Immunization- Universal Passive, Combined, Chemoprophylaxis, non-specific measures .

Unit V: Nutrition Monitoring And Nutrition Surveillance System

(12 Hours)

- A. Nutrition monitoring-objectives of nutrition monitoring, current programmes of nutrition monitoring in India.
- B. Nutrition surveillance system– objectives of nutrition surveillance system, use of nutrition surveillance system, infrastructure of nutrition surveillance system, key indicators of successful nutritional surveillance programme.
- C. Computerization for monitoring and surveillance.

2. B. Topics for Self study

Community Nutrition in recent research; Nutrition self-efficacy assessment: designing and psychometric evaluation in a community-dwelling elderly population; experiential cooking and Nutrition Education Program.

2. C. References

1. Park A. (2007), Park's Textbook of Preventive and Social Medicine XIX Edition M/S Banarasidas, Bharat Publishers, 1167, Prem Nagar, Jabalpur, 428 001(India)
2. Bamji M.S, PrahladRao N, Reddy V (2004). Textbook of Human Nutrition II Edition, Oxford and PBH Publishing Co. Pvt. Ltd , New Delhi
3. Bhatt D.P (2008), Health Education, KhelSahitya Kendra, New Delhi
4. Gibney MJ, Margetts BM, Kearney JM, Arab L (2004) Public Health Nutrition Blackwell Publishing Co. UK
5. Swaminathan M (2007), Essentials of Food and Nutrition. An Advanced Textbook Vol.I, The Bangalore Printing and Publishing Co. Ltd, Bangalore.

2. DReference Links

6. <https://jhpn.biomedcentral.com/articles/10.1186/s41043-019-0203-3>
7. <https://idl-bnc-idrc.dspacedirect.org/bitstream/handle/10625/5191/IDL-5191.pdf?sequence=1>
8. <file:///C:/Users/suriya/Downloads/1-s2.0-S1499404616307138-main.pdf>

3. Specific Learning outcomes (SLO)

| Unit / Section | Course Content | Learning Outcomes | Highest Bloom's Taxonomic Levels of Transaction |
|----------------|---|--|---|
| I | Nutrition and National Development , Ecology of Malnutrition, strategies to overcome Malnutrition | | |
| | History of malnutrition in India-factors leading to malnutrition; Measures to overcome malnutrition. Relation of nutrition to national development; consequences of malnutrition. | Explain the origin of malnutrition in India. | K2 |
| | | Identify the factors affecting malnutrition in India. | K4 |
| | | Determine the control measures of malnutrition. | K5 |
| | | Identify the consequences of malnutrition. | K4 |
| | | Analyse the relationship between nutrition development and consequences of malnutrition. | K4 |
| 1.2 | A. IMR, NMR, MMR and prevalence of common nutrition problems-PEM, Vitamin A Deficiency diseases, Anaemia, Iodine Deficiency Disorders and Fluorosis. | Define infant mortality rate, Neonate mortality rate and Maternal mortality rate. | K2 |

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| | | Determine the ratio of IMR, NMR and NMR | K5 |
| | | Find out the common nutrition problems. | K3 |
| | | Examine the causes and find the preventive measures of protein energy malnutrition. | K3 |
| | | Describe the consequences and preventative measures of vitamin A deficiency. | K2 |
| | | Explain the specific strategies and control measures of iodine deficiency disorders and fluorosis. | K2 |
| 1.3 | B. Nutritional Assessment: Methods of assessment of Nutritional status –Primary and secondary methods, Direct assessment - Diet survey, anthropometry, clinical and biochemical estimation. Indirect assessment - Food balance sheet. | Determine the various assessment methods of nutritional status. | K5 |
| | | Discuss the primary and secondary methods of nutritional status. | K2 |
| | | Classify the various methods used for assess the nutritional status. | K3 |
| | | Distinguish between A, B, C and D methods of assessment. | K4 |
| | | Compare the diet survey and anthropometry assessment | K4 |

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| | | Discuss the clinical and biochemical method of assessment. | K2 |
| | | Analyze the relationship between nutritional status of the individuals and various parameters. | K4 |
| | | Discuss the food balance sheet | K2 |
| II | National, International And Voluntary Organizations To Combat Malnutrition | | |
| 2.1 | A. National organization – ICAR, ICMR, SCWB, SSWB, NNMB, NIN, CFTRI, DFRL, NIPCCID and NFI; | Explain about that the national organization. | K2 |
| | | List out the role of national organizations | K3 |
| | | Categorize the various national programmes in health related. | K4 |
| | | Explain the role of following agencies in combating malnutrition SCMB, NNM, SSWB and NFI. | K2 |
| | | Apply the knowledge of ICMR , CFTRI , NIN and ICAR | K4 |
| | | Discuss the National institute of public cooperation and child development. | K2 |
| | | Explain the role and functions of national nutrition monitoring bureau. | K2 |
| | | Define NFI and Explain its objectives and projects it has under taken. | K2 |
| | | Discuss the Defence food research laboratory, Mysore. | K2 |

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| | | Explain the contributions of NIN | K2 |
| 2.2 | B. International Organizations - WHO, FAO, UNICEF, World Bank, FFHC, WFP; Voluntary organizations – Global Alliance for Improved Nutrition(GAIN), | Explain the functions of international organizations. | K2 |
| | | Compare the WHO and FAO and their roles and functions. | K4 |
| | | Discuss the world Bank. | K2 |
| | | Discuss the achievements of UNICEF in relation to nutrition. | K2 |
| | | Differentiate the relationship between the FFHC and WEP. | K4 |
| | | Describe the role and functions of global of alliance for improved nutrition (GAIN) | K2 |
| 2.3 | C. Micronutrient Initiatives, CARE, CRS, AFPRO, IDA; Concepts of Community Health care of the community. | Describe the functions of micronutrient initiatives | K2 |
| | | Discuss CARE | K2 |
| | | Assess the role of AFPRO, CRS and IDA organizations to combat malnutrition. | K5 |
| | | Explain the concepts of community health care in community level. | K2 |
| 2.4 | D. Nutrition Intervention programmes - Nutritious Noon Meal Programme. ICDS. | Assess the nutrition intervention programmes in India. | K5 |
| | | Analyze the methods and scope of nutrition interventions. | K4 |

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| | | Discuss the nutritious noon meal programme | K2 |
| | | Explain the role of ICDS. | K2 |
| | | Discuss objectives and identify the components of ICDS. | K4 |
| | | Identify the beneficiaries of ICDS program. | K4 |
| III | Advanced Nutritional Programme in India | | |
| 3.1 | Indhradhanush, Anemia Muktbharat, Poshan Abhiyan, National Oral Health Programme (Nohp), JananiSurakshaYojana, PradhanMantriMatruVandanaYojana (PMMVY), Scheme For Adolescent Girls (SAG) Of MWCD, | Assess the advanced nutritional programme in India. | K5 |
| | | Investigate the goals of the Indhradhanush. | K4 |
| | | Identify the main cause of Anemia Muktbharat scheme. | K4 |
| | National Health Mission (NHM), Swachh-Bharat Mission, Pradhan MantriSwasthya Suraksha Yojana, JananiShishuSurakshaKaryakaram , E-Pds, Eat Right India movement by FSSAI. | Explain the major role of Poshan Abhiyan scheme towards a malnutrition free India. | K2 |
| | | Discuss about that the National Oral health programme. | K2 |
| | | Describe the major impact of Janani Suraksha Yojana scheme. | K2 |
| | | Identify the maternal benefits of Pradhan Mantri MatruVandana Yojana (PMMVY). | K4 |

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| | | Examine the advantage of Adolescent girls under the Ministry of Women and child Development. | K3 |
| | | Analysis the main goals of National Health Mission (NHM). | K4 |
| | | Assess the impact of Swachh-Bharat Mission | K5 |
| | | Evaluate the achievement of swachh Bharat Mission. | K5 |
| | | Discuss the schemes of Pradhan MantriSwasthya Suraksha Yojana and Janani Shishu Suraksha Karyakaram. | K2 |
| | | Define E-pds. | K2 |
| | | Find out the significance of Eat Right India movement by FSSAI. | K2 |
| 3.2 | Nutrition Education A. Meaning, nature and importance of Nutrition education to the community and lessons to be taught (SS), Training workers in nutrition education programmes Methods of education when to teach, whom to teach, | Define Nutrition education. | K2 |
| | | Discuss the importance and awareness of nutrition education in our community. | K2 |
| | | Assess the guidance and strategies for giving training community health workers about nutrition education programmes. | K5 |
| | | Find out the methods of nutrition education in community level. | K3 |
| | B. Use of computers to impart nutrition education Organization of Nutrition education | Explain the utilization of computers to impart nutrition education. | K2 |

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| | programmes. National Nutrition policy | | |
| | | Discuss the important role of organization of nutrition education programmes. | K2 |
| IV | Epidemiology of Communicable Diseases | | |
| 4.1 | A. Definition of epidemiology - causes, signs and symptoms, epidemic and endemic diseases, treatment and prevention of communicable diseases, respiratory infections, intestinal infections, Other infections- dengue, filariasis. | Define Communicable diseases | K2 |
| | | Examine the causes, signs and symptoms of communicable diseases. | K4 |
| | | Assess the epidemic and endemic of communicable diseases. | K5 |
| | | Discuss about that treatment and preventive measures of communicable diseases. | K2 |
| | | List the respiratory and intestinal infections. | K3 |
| | | Describe the prevention and control of respiratory infections. | K2 |
| | | Describe the epidemiology and control of Dengue and fiariasis infections. | K2 |
| 4.2 | Types of immunity- active, passive and herd-group protection. Immunization agents- vaccines, immunoglobulins, Immunization schedules - Active-National and WHO Expanded Programme on Immunization- Universal Passive, Combined, | Discuss the various types of immunity | K2 |

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| | Chemoprophylaxis, non-specific measures | | |
| | | Define immunization and immunization schedule. | K2 |
| | | Examine the various immunization agent. | K4 |
| | | Explain the important functions of expanded programmes on immunization. | K2 |
| | | Define Chemoprophylaxis | K2 |
| | | Discuss in detail about the combined chemoprophylaxis vaccines. | K2 |
| V | Nutrition Monitoring and Nutrition Surveillance System | | |
| 5.1 | Nutrition monitoring-objectives of nutrition monitoring, current programmes of nutrition monitoring in India. | Identify the main objectives and components of nutrition monitoring. | K4 |
| | | Assess the current programmes of nutrition monitoring in India. | K5 |
| 5.2 | B. Nutrition surveillance system– objectives of nutrition surveillance system, use of nutrition surveillance system, infrastructure of nutrition surveillance system, key indicators of successful nutritional surveillance programme. | Find out the objectives of nutrition surveillance. | K3 |
| | | Uses of nutrition surveillance system. | K3 |
| | | Classify the two main infrastructure systems in India that could provide a useful delivery mechanism for NSS. | K3 |

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| | | Discuss the key indicators that could be critical for successful nutrition surveillance programme. | K2 |
| 5.3 | C. Computerization for monitoring and surveillance. | Evaluate the computerized monitoring and surveillance of public health information. | K5 |
| | | Distinguish between the monitoring and surveillance system. | K4 |

4. Mapping scheme

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PSO1 | PSO2 | PSO3 | PSO4 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| CO1 | L | - | M | M | H | - | M | M | L | L | - | L | - |
| CO2 | M | - | H | M | H | - | L | L | - | L | - | - | - |
| CO3 | - | - | H | M | L | - | H | L | - | L | - | L | - |
| CO4 | - | - | L | M | M | - | L | M | - | L | - | - | - |
| CO5 | - | - | M | M | L | - | L | L | - | - | - | - | - |
| CO6 | - | - | M | M | M | - | L | L | - | - | - | L | - |

L-Low, M-Medium, H-High

5. COURSE ASSESSMENT METHOD

DIRECT

1. Continuous Assessment Test: T1, T2 (Theory & Practical Components): Closed Book
2. Open Book Test.
3. Assignment, Group Presentation, Group Discussion, project Report, Field Visit Report, Poster Presentation, Seminar, Quiz (written).
4. Pre-Semester & End Semester Theory Examination

INDIRECT

1. Course end survey (Feedback)

Name of the Course Coordinator: MUNEERA NAZEER

ELECTIVE – I : NUTRACEUTICALS AND FUNCTIONAL FOODS

Semester : II
Credits : 4

Code : P21FS2:1
Total Hours : 50

1. Course outcomes

On completion of this course the students will be able to:

| CO.NO | Course outcomes | Level | Unit |
|-------|--|-------|------|
| CO1 | Describe the components of nutraceuticals and functional food | K4 | I |
| CO2 | Assess the role of antioxidants and phytochemicals in health and prevention of diseases | K5 | II |
| CO3 | Apply the effects of prebiotics and probiotics and formulate some innovative foods | K5 | II |
| CO4 | Evaluate the role of commercial nutraceuticals and functional foods in the community | K5 | III |
| CO5 | Interpret the related recent trends in the market and to know implications of functional foods with respect to ethical and social issues | K5 | IV |
| CO6 | Interpret the potential role of nutraceuticals, functional foods and dietary supplements for their health promotion. | K5 | V |

2. Syllabus

Unit I: Nutraceuticals and functional Foods

(10 Hours)

Definition, concept. Classification of nutraceuticals and functional foods, The importance of nutraceuticals is expanding globally in terms of scientific services, legal aspects, and marketing strategies for health promotion, reduction of disease geographical position and cultural heritage, sources of nutraceuticals, Regulations regarding the quality and safety of nutraceuticals.

Unit II: Nutraceuticals & phytochemicals

(10 Hours)

Natural occurrence of certain phytochemicals- Antioxidants and flavonoids: omega – 3 fatty acids, carotenoids, dietary fiber, phytoestrogens; glucosinates; organosulphur compounds. Standards for health claims, Process of developing -preclinical &

clinical studies. Health benefits to reduce the risk of chronic diseases, dietary supplements, fortified dairy products, and citrus fruits, and vitamins, minerals, herbals, milk, and cereals.

Unit III: Innovative and fortified food

(10 Hours)

Probiotics, prebiotics- definition, Characteristics, type's role of human body, importance of human nutrition, Health benefits, GMO-definition, types, benefits GM food, list GM foods- Soybeans, corn, rice, tomato, and cotton, Importance of GM food, regulations related GM foods.

Unit IV: Nutraceutical Formulations and Challenges

(10 Hours)

Important role in future therapeutic developments-(phytomedicines/nutraceuticals/food supplements/conventional drugs) bioavailability. Nutraceutical formulation's and challenges, stability and safety evaluation, bio accessibility and factors affecting bio accessibility, Bio active of functional foods and Nutraceutical.

Unit V: Nutraceuticals in disease

(10 Hours)

- A.** Nutraceuticals in disease prevention-and risk factors for coronary heart diseases, Diet and coronary heart diseases relationship, probiotics, prebiotics and omega 3 fatty acids for prevention of coronary heart diseases; Prevalence and causes of obesity,
- B.** Foods and cancers: anti-tumour action of phytochemicals, antioxidants and dietary fibres role of nutraceuticals in health and disease management – diabetes mellitus, cancer; non-essential nutrients as dietary supplements, FOSHU foods.

2. B. Topics for Self-study

Current trends and future perspectives on functional foods and nutraceuticals; Microencapsulation of Probiotic Bacteria; Scope and approach of phytonutrients; Bioaccessibility of Phytonutrients

2. C. Text Book(s):

1. Min-Tze Liong , “Beneficial Microorganisms in Food and nutraceuticals, Microbiology Monographs, ISSN 978-3-319-23177-8 (eBook)

Reference Links:

<https://pubmed.ncbi.nlm.nih.gov/12400637/>

<https://www.sciencedirect.com/science/article/abs/pii/S0924224419307186>

2.D. Text Book(s):

1. Wildman, Robert. Nutraceuticals and Functional Foods, second edition. Taylor and Francis Group. 2007.
2. Gibson GR & William CM. Functional Foods - Concept to Product. 2000.
3. Goldberg I. Functional Foods: Designer Foods, Pharma Foods. 1994.
4. Brigelius-Flohé, J & Joost HG. Nutritional Genomics: Impact on Health and Disease. Wiley VCH. 2006.
5. Cupp J & Tracy TS. Dietary Supplements: Toxicology and Clinical Pharmacology. Humana Press. 2003.
6. Galanakis C, Nutraceutical and Functional Food Components: Effects of Innovativerocessing Techniques. Academic Press (2017).
7. Robert EC, Handbook of Nutraceuticals and Functional Foods. CRC Press (2006).

2.E. Reference Links:

8. <https://pubmed.ncbi.nlm.nih.gov/12400637/>

9. <https://www.sciencedirect.com/science/article/abs/pii/S0924224419307186>

3. Specific Learning outcome (SLO)

| Unit / Section | Course Content | Learning Outcomes | Highest Bloom’s Taxonomic Levels of Transaction |
|----------------|--|--|---|
| I | Nutraceuticals and functional foods | | |
| 1.1 | Definition, concept. Classification of nutraceuticals and functional foods. | Define nutraceuticals and functional food. | K2 |

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|-----|--|---|----|
| | | Describe the concept of nutraceuticals and functional food. | K2 |
| | | Classify the nutraceuticals based on the natural source, pharmacological condition and chemical constituent. | K3 |
| | | Classify the various types functional foods | K2 |
| | | Differentiate the similarities between functional foods and nutraceuticals. | K4 |
| 1.2 | The importance of nutraceuticals is expanding globally in terms of scientific services, legal aspects, and marketing strategies for health promotion, reduction of disease geographical position and cultural heritage | Investigate the importance of global demand of nutraceutical in terms of scientific services and legal aspects. | K4 |
| | | Interpret the role of functional food security in global health. | K2 |
| | | Analysis the methods of marketing strategies for health promotion. | K4 |
| | | Identify the geographical position of disease (reduction) and cultural heritage. | K4 |
| | | Analysis the current concept and prospects of herbal nutraceutical. | K4 |
| 1.3 | Sources of nutraceuticals, Regulations regarding the quality and safety of nutraceuticals. | Discuss the sources of nutraceuticals. | K2 |
| | | Explain the regulations regards with quality and safety aspects of nutraceuticals. | K2 |

| II | Nutraceuticals and phytochemicals | | |
|------|---|--|----|
| 2.1 | Natural occurrence of certain phytochemicals-Antioxidants and flavonoids, carotenoids, dietary fiber, phytoestrogens; glucosinates'; organosulphur compounds. | Discuss the significance role of phytochemicals. | K2 |
| | | Distinguish foods that are rich in phytochemicals. | K4 |
| | | Compare and contrast about the natural phytochemicals and phytonutrients. | K4 |
| | | Define and discuss about that the antioxidants and flavonoids content. | K2 |
| | | Elaborate about that the carotenoids, dietary fibre, phytoestrogens, glucosinates and organosulphur compounds. | K5 |
| | | Analysis the relationship between the antioxidant and phytochemicals. | K4 |
| 2.2. | Standards for health claims, Processing of developing- preclinical and amp; clinical studies. | Analyze the standards of health claims. | K4 |
| | | Discuss about that processing of developing preclinical and amp | K2 |
| | | Identify the clinical studies which is applicable to health care | K4 |
| | | Differentiate between preclinical , amp and clinical | K4 |
| 2.3. | Health benefits to reduce risk of chronic disease, dietary supplements, fortified dairy products and citrus fruits, and vitamins, minerals, herbals, | Identify the healthy diet to reduce the risk of chronic diseases. | K4 |

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| | milk and cereals. | | |
| | | Describe the relationship between food, food component or dietary supplement and reduced risk or health related condition. | K2 |
| | | Describe the significance of health benefits of dietary supplements. | K2 |
| | | Analyse the benefits of fortified dairy products and citrus fruits. | K4 |
| | | Assess the amount and variety of vitamins and minerals related to health conditions. | K5 |
| | | Describe the role of nutraceuticals in health and how they are different from functional foods and dietary supplements. | K2 |
| | | Determine the characteristics of nutraceuticals and discuss strategic designs of nutraceutical delivery systems. | K5 |
| | | Describe the health benefits of herbals, milk and cereals. | K2 |
| III | Innovative and fortified food | | |
| 3.1 | Probiotics, prebiotics- definition, characteristics, types role of human body, importance of human nutrition, health benefits. | Define probiotics and prebiotics with some examples. | K2 |
| | | Summarize the characteristics of probiotics and prebiotics. | K2 |
| | | Analyse the types and important role of probiotics and prebiotics in our human body. | K4 |
| | | Discuss about the importance of human nutrition. | K2 |

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| | | Describe the health benefits of probiotics and prebiotics. | K2 |
| 3.2 | GMO-definition, types benefits GM food, list GM foods- Soyabeans, corn, rice, tomato and cotton, Importance of GM food, regulations related GM foods. | Define Genetically modified foods (GMO) | K2 |
| | | Classify the different types of GMO | K2 |
| | | Discuss about the health benefits of GMO | K5 |
| | | List out the GMO food list. | K2 |
| | | Analyse the importance of GM foods. | K4 |
| | | Identify the regulation of GM foods. | K4 |
| IV | Nutraceutical formulations and challenges | | |
| 4.1 | Important role in future therapeutic developments- (phytomedicines/nutraceuticals/food/ supplements/conventional drugs) bioavailability. | Explain about the important role in future therapeutic developments. | K2 |
| | | Evaluate the various health care products. | K5 |
| | | Examine the impact of nutraceuticals. | K4 |
| | | Analyse the current trend and future prospective nutraceuticals in health promotion. | K4 |
| | | Discuss about the bioavailability of food supplements /conventional drugs. | K2 |
| 4.2 | Nutraceutical formulation's and challenges, stability, Bio active of functional foods and | Discuss about that the nutraceuticals formulations and challenges. | K2 |

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| | Nutraceutical. | | |
| | | Explain the stability aspects of nutraceutical formulations. | K2 |
| | | Explain about that the important of bioactive components in specific groups of functional foods and or nutraceuticals that are responsible for the health benefits they offer. | K2 |
| | | Describe the different formulations of functional foods and nutraceutical products and identifies the most popular and successful ones. | K2 |
| | | Identify the bioactive foods and ingredients for health. | K4 |
| V | Nutraceuticals in disease | | |
| 5.1 | Nutraceuticals in disease prevention and risk factors for coronary heart diseases, Diet and coronary heart diseases relationship, probiotics , prebiotics and omega 3 fatty acids for prevention of coronary heart diseases; Prevalence and causes of obesity. | Analysis the role of nutraceuticals in human health. | K4 |
| | | Apply the knowledge of nutraceuticals for improving cardiovascular health disease condition. | K3 |
| | | Identify the major causes of CHD. | K4 |
| | | Investigate the risk factors associated with CHD. | K4 |
| | | Determine the preventive measures of nutraceuticals in diseases condition (CHD). | K5 |
| | | Relate with the impact of functional foods for CV health. | K5 |

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| | | Compare and contrast relationship between the diet and coronary heart disease. | K4 |
| | | Determine the prevalence, consequences and causes of obesity in nutraceuticals aspects. | K5 |
| 5.2 | Foods and cancers: anti-tumour action of phytochemicals, antioxidants and dietary fibres role of nutraceuticals in health and disease management- diabetes mellitus cancer; non-essential nutrients as dietary supplements, FOSHU foods. | Identify at least one condition or disease for which research suggests eating phytochemical rich foods may decrease risk. | K4 |
| | | Assess limitations of current research regarding phytochemicals and disease. | K5 |
| | | Provide clients and patients with recommendations for consuming phytochemical-rich foods. | K5 |
| | | Determine the major role of antitumor action in phytochemicals foods. | K5 |
| | | Describe the role of antioxidants and dietary fibres in health and disease management. | K2 |
| | | Explain about the non-essential nutrients as dietary supplements and relate with their health issues. | K2 |
| | | Define FOSHU foods | K2 |
| | | Describe the regulations of functional foods and benefits for Foods for specialized Health Use (FOSHU) | K2 |
| | | Discuss about the importance of human nutrition. | K2 |

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| | | Describe the health benefits of probiotics and prebiotics. | K2 |
| 3.2 | GMO-definition, types benefits GM food, list GM foods- Soyabeans, corn, rice, tomato and cotton, Importance of GM food, regulations related GM foods. | Define Genetically modified foods (GMO) | K2 |
| | | Classify the different types of GMO | K2 |
| | | Discuss about the health benefits of GMO | K5 |
| | | List out the GMO food list. | K2 |
| | | Analyse the importance of GM foods. | K4 |
| | | Identify the regulation of GM foods. | K4 |
| IV | Nutraceutical formulations and challenges | | |
| 4.1 | Important role in future therapeutic developments- (phytomedicines/nutraceuticals/ food/ supplements/conventional drugs) bioavailability. | Explain about the important role in future therapeutic developments. | K2 |
| | | Evaluate the various health care products. | K5 |
| | | Examine the impact of nutraceuticals. | K4 |
| | | Analyse the current trend and future prospective nutraceuticals in health promotion. | K4 |
| | | Discuss about the bioavailability of food supplements /conventional drugs. | K2 |
| 4.2 | Nutraceutical formulation's and challenges, stability, Bio active of functional foods and | Discuss about that the nutraceuticals formulations and challenges. | K2 |

| | | | |
|----------|--|--|----|
| | Nutraceutical. | | |
| | | Explain the stability aspects of nutraceutical formulations. | K2 |
| | | Explain about that the important of bioactive components in specific groups of functional foods and or nutraceuticals that are responsible for the health benefits they offer. | K2 |
| | | Describe the different formulations of functional foods and nutraceutical products and identifies the most popular and successful ones. | K2 |
| | | Identify the bioactive foods and ingredients for health. | K4 |
| V | Nutraceuticals in disease | | |
| 5.1 | Nutraceuticals in disease prevention and risk factors for coronary heart diseases, Diet and coronary heart diseases relationship, probiotics , prebiotics and omega 3 fatty acids for prevention of coronary heart diseases; Prevalence and causes of obesity. | Analysis the role of nutraceuticals in human health. | K4 |
| | | Apply the knowledge of nutraceuticals for improving cardiovascular health disease condition. | K3 |
| | | Identify the major causes of CHD. | K4 |
| | | Investigate the risk factors associated with CHD. | K4 |
| | | Determine the preventive measures of nutraceuticals in diseases condition (CHD). | K5 |
| | | Relate with the impact of functional foods for CV health. | K5 |

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| | | Compare and contrast relationship between the diet and coronary heart disease. | K4 |
| | | Determine the prevalence, consequences and causes of obesity in nutraceuticals aspects. | K5 |
| 5.2 | Foods and cancers: anti-tumour action of phytochemicals, antioxidants and dietary fibres role of nutraceuticals in health and disease management- diabetes mellitus cancer; non-essential nutrients as dietary supplements, FOSHU foods. | Identify at least one condition or disease for which research suggests eating phytochemical rich foods may decrease risk. | K4 |
| | | Assess limitations of current research regarding phytochemicals and disease. | K5 |
| | | Provide clients and patients with recommendations for consuming phytochemical-rich foods. | K5 |
| | | Determine the major role of antitumor action in phytochemicals foods. | K5 |
| | | Describe the role of antioxidants and dietary fibres in health and disease management. | K2 |
| | | Explain about the non-essential nutrients as dietary supplements and relate with their health issues. | K2 |
| | | Define FOSHU foods | K2 |
| | | Describe the regulations of functional foods and benefits for Foods for specialized Health Use (FOSHU) | K2 |

4. Mapping scheme

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PSO1 | PSO2 | PSO3 | PSO4 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| CO1 | L | L | L | L | - | L | - | - | - | L | - | - | - |
| CO2 | L | L | - | - | - | H | - | - | - | L | - | - | - |
| CO3 | L | L | L | L | - | L | - | - | - | L | - | - | M |
| CO4 | - | L | - | - | L | M | - | - | - | L | - | - | - |
| CO5 | - | M | - | - | - | M | - | - | - | L | - | - | - |
| CO6 | L | L | L | - | - | H | - | - | - | M | - | - | - |

L-Low, M-Medium, H-High

5. COURSE ASSESSMENT METHOD

DIRECT

1. Continuous Assessment Test: T1, T2 (Theory & Practical Components): Closed Book
2. Open Book Test.
3. Assignment, Group Presentation, Group Discussion, project Report, Field Visit Report, Poster Presentation, Seminar, Quiz (written).
4. Pre-Semester & End Semester Theory Examination

INDIRECT

1. Course end survey (Feedback)

Name of the Course Coordinator: BHAGYA R

CORE PRACTICAL-III : NUTRITION THROUGH LIFE SPAN PRACTICAL

Semester : II

Code : P21FS2P3

Credits : 3

Total Hours : 45

1. Course Outcomes

On completion of this course the students will be able to:

| CO.No | Course Outcomes | Level | Unit |
|-------|--|-------|------|
| CO1 | Explain the critical nutritional factors that contribute to healthy growth, development and functional capacity throughout life | K2 | I |
| CO2 | Plan a nutritional requirements of women before and during pregnancy and lactation, discuss strategies to overcome nutrition-related problems | K3 | II |
| CO3 | Identify the physiological, cultural and behavioural factors that determine nutrition requirements from infancy to adulthood | K3 | III |
| CO4 | Apply the knowledge obtained about the various physical changes that take place during adolescence and plan diet to prevent conditions such as anaemia and PCOD | K3 | IV |
| CO5 | Explain the conditions associated with ageing and their nutritional implications, discuss successful dietary interventions to stabilize physiological decline and enhance physical and mental resilience | K2 | V |

2. A. Syllabus

1. Planning, nutritive value calculation and preparation of meals for

- a) Pregnancy
- b) Lactation
- c) Infancy- weaning foods, Infant Formula, Lactose free diet
- d) Pre-school children
- e) School going children- packed lunch
- f) Adolescence – Anemia , PCOD
- g) Geriatric nutrition

2. B. Topic for the Self-study

Essential Nutrition Actions And Key Contact Points For Improving Women's Nutrition-
Micronutrient Needs At Different Stages In Life-Indicators Of Adequate Women's Nutrition-
Interventions To Break The Malnutrition Cycle: Infancy Through Adolescence

2. C. Reference books:

1. M. Swaminathan “Principles of Nutrition and Dietetics”, New age international, 1993
2. Srilakshmi.B., “Dietetics”, 6th Edition, New Age Publication, New Delhi, 2013

2. E. Reference Link:

3. <https://motherchildnutrition.org/nutrition-protection-promotion/pdf/mcn-womens-nutrition-training-of-trainers-module.pdf>

3. Specific Learning Outcomes (SLO)

| Unit / Section | Course Content | Learning Outcomes | Highest Bloom's Taxonomic Levels of Transaction |
|----------------|--|--|---|
| I | 1. Planning, nutritive value calculation and preparation of meals for Pregnancy and Lactation | | |
| 1.1 | a) Pregnancy | Outline the ICMR allowance for protein, energy and calcium for a pregnant women | K2 |
| | | Identify the complete RDA for a pregnant women | K3 |
| | | Plan and prepare the balanced diet for pregnant women | K6 |
| 1.2 | b) Lactation | Identify the reasons for the increased energy and protein requirements for a lactating woman | K3 |
| | | Explain about the lactogogues | K2 |
| | | Plan and prepare the menu for lactating mother | K6 |

| | | | |
|-----|--|---|----|
| 1.3 | c) Infancy - weaning foods, Infant Formula, Lactose free diet | List the RDA of an infant aged 8months | K4 |
| | | Compare the nutritive value of human milk with cow's milk | K4 |
| | | Explain the nutritional importance during infancy | K2 |
| 1.4 | d) Pre-school children | Plan and prepare a menu for a 5year old child | K6 |
| | | Plan a day's diet for a 4year old child from a low income group | K6 |
| | | List the factors to be considered in planning a diet for a preschooler | K4 |
| 1.5 | e) School going children-packed lunch | Identify the RDA for 11year old girl | K3 |
| | | Compare the nutritional requirements of 7-9 year old and 10-12year old | K4 |
| | | Explain the points to be considered in planning diets for school children | K2 |
| 1.6 | f) Adolescence – Anemia , PCOD | Plan a day's diet for an adolescent girl suffering from nutritional anaemia | K6 |
| | | Identify the RDA of a 16-year old boy | K3 |

| | | | |
|-----|-------------------------------|--|----|
| | | Explain the common nutrient deficiencies in adolescents | K2 |
| 1.7 | g) Geriatric nutrition | Plan a modified diet for geriatrics and special needs | K6 |
| | | Outline the modifications of calorie requirement during old age | K2 |
| | | List out the importance of calcium and fibre in the diet of geriatrics | K4 |

4. Mapping scheme

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PSO1 | PSO2 | PSO3 | PSO4 |
|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|-------------|-------------|-------------|-------------|
| CO1 | M | L | H | M | H | H | H | H | L | L | H | H | - |
| CO2 | H | M | H | M | H | H | H | H | L | L | H | H | - |
| CO3 | M | H | H | M | H | H | H | H | L | L | H | H | - |
| CO4 | M | H | H | M | H | H | H | H | L | L | H | H | - |
| CO5 | M | M | H | M | H | H | H | H | L | L | H | H | - |
| CO6 | M | M | H | M | H | H | H | H | L | L | H | H | - |

L-Low, M-Medium, H-High

5. COURSE ASSESSMENT METHOD

DIRECT

1. Continuous Assessment Test: T1, T2 (Theory & Practical Components): Closed Book
2. Open Book Test.
3. Assignment, Group Presentation, Group Discussion, project Report, Field Visit Report, Poster Presentation, Seminar, Quiz (written).

4. Pre-Semester & End Semester Theory Examination

INDIRECT

1. Course end survey (Feedback)

Name of the Course Coordinator: PREETHI S

CORE PRACTICAL IV : THERAPEUTIC NUTRITION PRACTICAL
Semester : II **Code : P21FS2P4**
Credits : 3 **Total Hours : 45**

1. Course Outcomes

On completion of this course the students will be able to:

| CO.No | Course Outcomes | Level | Unit |
|-------|--|-------|-------|
| CO1 | Compare nutritive value of various foods and prepare diets | K4 | I, II |
| CO2 | Analyze the epidemiology of various diseases and plan therapeutic diets based on the condition | K4 | II |
| CO3 | Assess the needs of the patient and plan tailor-made diet | K5 | II |
| CO4 | Distinguish normal diet and therapeutic diets | K4 | II |
| CO5 | Plan and execute diet for various conditions of the patients | K6 | II |
| CO6 | Compare deviations in the requirement of nutrients for various disorders and diseases | K4 | II |

2. A. Syllabus

- 1) Preparation of clear and full liquid diets and soft diet
- 2) Planning and preparing diets for:
 - a) Diabetes mellitus
 - b) Cardio Vascular disorders- atherosclerosis and hypertension
 - c) Diet for liver disease- jaundice, cirrhosis
 - d) Diet for nephritis, renal failure, acute and chronic
 - e) Diet for cancer and HIV patient
 - f) Allergic condition
 - g) Ketogenic diet
 - h) Paleo diet

2. B. Text Book(s):

- 1) Swaminathan M. Essentials of Food and Nutrition, Vol. I & II Ganesh and Company, Madras, 1995.
- 2) Srilakshmi, B, Dietetics, New Age International, New Delhi, 2002.
- 3) Gopalan , C. Ramasastry, B.V. and Balasubramaniam, S.C. Nutritive value of Indian Foods National Institute of Nutrition, Hyderabad, 2010.

2. C. Reference:

- 1) Krause M.V. Horsch M.A. Food Nutrition and Diet Therapy W.B. Saunders Company, Philadelphia, 1993.
- 2) William's Basic Nutrition and Diet Therapy, Staci Nix, RS, C.V. Muusby Camp. Saint, Lowin, 2012.
- 3) Cooper Et. al, Nutrition in health and disease 4th edition, Pitman Medical Publishing Co. 1963.

3. Specific Learning Outcomes (SLO)

| Unit / Section | Course Content | Learning Outcomes | Highest Bloom's Taxonomic Levels of Transaction |
|-----------------------|---|---|--|
| I | Preparation of clear and full liquid diets and soft diet | Measure the quantity of the diet | K5 |
| | | Asses the condition to support nutritionally | K5 |
| | | Test the consistency of the diet | K6 |
| II | Planning and preparing diets for: Diabetes mellitus | Plan the suitable diet and select the method of preparation | K3 |
| | | Contrast on blood glucose level in fasting and Post Prandial (PP) | K2 |
| | | Apply principles of diet and identify the suitable foods using food exchange table | K3 |
| III | Planning and preparing diets for: Cardio Vascular disorders – atherosclerosis and hypertension | Analyze the biochemical parameters for Cardiovascular disease and associated predisposing factors | K4 |
| | | Plan and prepare a low-fat and low-sodium diet | K6 |
| IV | Planning and preparing diets for: Diet for liver disease- jaundice, cirrhosis | Compare the clinical and biochemical effects liver disease | K5 |
| | | Plan and prepare Low-fat diet for Jaundice and Liver Cirrhosis | K6 |

| | | | |
|-----|---|--|----|
| V | Planning and preparing diets for: Diet for nephritis, renal failure, acute and chronic | Analyze the routine hospital diet for renal diseases | K4 |
| | | Plan and prepare Low-protein diet | K6 |
| VI | Planning and preparing diets for: Diet for cancer and HIV patient | Contrast the aetiology of cancer and HIV | K2 |
| | | Combine nutritional and palliative support | K6 |
| | | Plan and prepare High-protein and High-energy diets for cancer and HIV | K6 |
| VII | Planning and preparing diets for: Allergic condition Ketogenic diet Paleo diet | Explain the factors inducing allergic reactions | K2 |
| | | Analyze the role of histamine in developing allergic reactions | K4 |
| | | Assess the types of diet in alleviating symptoms of metabolic syndrome | K5 |
| | | Plan and prepare High-fat and Low-carbohydrate diets | K6 |

4. Mapping scheme

L-Low, M-Medium, H-High

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PSO1 | PSO2 | PSO3 | PSO4 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| CO1 | - | - | H | H | M | H | M | L | H | H | H | M | - |
| CO2 | - | H | H | H | L | H | H | H | H | H | M | H | - |
| CO3 | - | M | H | M | M | - | H | H | - | H | M | M | - |
| CO4 | - | M | H | H | H | M | H | H | - | H | M | H | - |
| CO5 | - | H | H | M | M | - | L | L | - | L | L | M | - |
| CO6 | - | M | H | H | H | H | H | H | H | H | H | H | - |

SUBJECT COORDINATOR ROSELIN C

CORE COURSE- VIII : ANALYTICAL INSTRUMENTATION

Semester : III
Credits : 4

Code : P21FS308
Total Hours : 60

1. Course outcomes

On completion of this course the students will be able to:

| CO.No | Course outcomes | Level | Unit |
|-------|---|-------|------|
| CO1 | Apply the knowledge obtained to choose the appropriate instrument and technique for food analysis | K5 | I |
| CO2 | Assess the role of chromatography and spectrometry in food analysis | K5 | II |
| CO3 | Study the importance of advanced chromatography and electrophoresis techniques | K4 | III |
| CO4 | Elaborate the principle behind the functioning of fluorimetry and flame photometry | K5 | IV |
| CO5 | Analyze the methods and types of radioactive isotopes and their functions. | K5 | V |
| CO6 | Assess the usage of various analytical techniques for quality of food analysis. | K5 | V |

2. Syllabus

Unit I: Analytical Instrumentation and Spectroscopic Techniques (16 Hours)

Need for analysis and instrumentation, Selecting an appropriate instrumental technique, criteria for selecting a technique, Limit of Detection (LOD) and Limit of Quantification (LOQ) Colorimetry, Spectrophotometry-definition and derivation of Lambert-Beer's Law, Atomic-Absorption Spectroscopy (AAS), Inductively Coupled Plasma – Optical Emission Spectrophotometry (ICP- OES/MS), *Nuclear Magnetic Resonance Spectroscopy (NM)(SS)*, Fourier Transform Infrared Spectroscopy (FT-IR) - Principle, Instrumentation and Applications

Unit II: Chromatographic Techniques (14 Hours)

Basics and Classification of Chromatography- Adsorption, partition, size exclusion, ion-exchange, affinity Gas Chromatography, Liquid Chromatography - Instrumentation,

Sampling Techniques and Applications, Applications of HPLC, Comparison of HPLC and GC

Unit III: Advanced Chromatographic Techniques and Electrophoresis (16 Hours)

Thin Layer Chromatography, High Performance Thin Layer Chromatography (HPTLC), Hyphenated Techniques - Gas Chromatography-Mass Spectrometry (GC-MS), Liquid Chromatography-Mass Spectrometry (LC-MS), Principles and procedure of electrophoresis – *Paper and Agar Electrophoresis*(SS) Moving boundary electrophoresis, PAGE

Unit IV: Fluorimetry and Flame Photometry (12 Hours)

Theory of fluorescence (SS) and instrumentation, Instrumentation in Flame Photometry- oxidant, fuel, filter, detector, amplifier, applications

Unit V: Measurement of Radioactivity (12 Hours)

Radio active isotopes (SS) Methods and Types Radioactive Counters- gas and liquid Scintillation- uses, applications and safety

2. B. Topics for Self-studies

Diverse food based applications of NMR, UV spectroscopy –Principle, Instrumentation, Applications, Ultra-sonication, Application and Processes of ultra-sonication.

2. C. Reference Books

1. A. Frank, Settle, Editor, “Handbook of Instrumental Techniques for Analytical chemistry”, ISBN 0-13-177338-0.
2. S.M Knopkar, Basic concepts of Analytical Chemistry,” Basic concepts of Analytical Chemistry. New Age International (P) Ltd., Publishers
3. R S Khandpur, Handbook of Analytical Instruments, 3rd editions.
Skoog, Holler, Crouch. “Principles of Instrumental Analysis “, Seventh Editions.

2. D. Reference Links

4. <https://www.foodandnutritionjournal.org/vol04nospl-issue-conf-october-2016/nuclear-magnetic-resonance-spectroscopy-applications-in-foods/>

5. <https://microbenotes.com/uv-spectroscopy-principle-instrumentation-applications/>

6. <https://www.hielscher.com/technolo.htm>

3. Specific Learning outcomes (SLO)

| Unit / Section | Course Content | Learning Outcomes | Highest Bloom's Taxonomic Levels of Transaction |
|-----------------------|--|---|--|
| I | Analytical Instrumentation and Spectroscopic Techniques | | |
| 1.1 | Need for analysis and instrumentation, selecting an appropriate instrumental technique, criteria for selecting a technique, Limit of Detection (LOD) and Limit of Quantification (LOQ) | Identify the importance of analytical instruments. | K4 |
| | | Analyse the instrumental methods of analysis. | K4 |
| | | Select the appropriate analytical method for a particular food analysis. | K3 |
| | | Describe and explain the function and method of operation of a range of analytical instruments. | K2 |
| | | Explain the criteria used in selecting appropriate techniques. | K2 |
| | | Determine the Limit of detection (LOD) and Limit of quantification (LOQ) | K5 |
| 1.2 | Colorimetry, Spectrophotometry- definition and derivation of Lambert-Beer's Law, Atomic Absorption Spectroscopy (AAS), Inductively | Define colorimetry and spectrophotometry | K2 |

| | | | |
|-----------|--|--|----|
| | Coupled Plasma- Optical Emission Spectrophotometry (ICP-OES/MS). | | |
| | | Find out the general principle of colorimetry and spectrophotometry | K3 |
| | | Determine the derivation of Beer Lambert Law. | K5 |
| | | Explain the principle of Atomic absorption spectroscopy (AAS) | K2 |
| | | Describe the inductively coupled plasma optical emission spectroscopy | K2 |
| | | Difference between ICP MS and ICP-OES. | K4 |
| 1.3 | Nuclear Magnetic Resonance Spectroscopy (NM)(SS), Fourier Transform Infrared Spectroscopy (FT-IR)-Principle, Instrumentation and Applications | Discuss the principle of NMR spectroscopy. | K2 |
| | | Describe instrumentation working process of NMR spectroscopy. | K2 |
| | | Identify the applications of NMR spectroscopy. | K4 |
| | | Explain the basic principle of FT-IR spectroscopy | K2 |
| | | Discuss the instrumentation and applications of FTIR spectroscopy. | K2 |
| II | Chromatographic Techniques | | |
| 2.1 | Basics and classification of chromatography-Adsorption, partition, size exclusion, ion-exchange, affinity, Gas chromatography, liquid chromatography, - Instrumentation, sampling techniques and applications. | Define basic information on chromatography and separation science and the relationship between these important fields. | K2 |

| | | | |
|------------|--|---|----|
| | Applications of HPLC, Comparison of HPLC and GC. | | |
| | | Classify the chromatography techniques. | K3 |
| | | Identify the principles involved in various modes of chromatography. | K4 |
| | | Describe the role of chromatography and separation science in various fields. | K2 |
| | | Distinguish between adsorption and partition chromatography. | K4 |
| | | Elaborate the instrumentation process of size exclusion chromatography. | K5 |
| | | Describe the set up and process of gas and liquid chromatography. | K2 |
| | | Make use of different applications of gas and liquid chromatography. | K3 |
| | | Explain the HPLC instrumentation techniques and its applications. | K2 |
| | | Compare and contrast between HPLC and GC chromatography | K4 |
| III | Advanced Chromatographic Techniques and Electrophoresis | | |
| 3.1 | Thin layer Chromatography, High Performance Thin Layer Chromatography(HPTLC), Hyphenated Techniques-Gas Chromatography-Mass spectrometry (GC-MS), Liquid chromatography-Mass Spectrometry (LC-MS), Principles and procedure of electrophoresis-Paper and Agar Electrophoresis (SS) Moving boundary electrophoresis, PAGE | Describe the importance of advanced chromatographic techniques. | K2 |

| | | | |
|-----------|---|---|----|
| | | Differentiate between TLC and HPTLC | K4 |
| | | Compare the advantages and limitations of TLC and HPTLC. | K4 |
| | | List the different hyphenated techniques. | K2 |
| | | Analyse the role of gas and liquid chromatography | K4 |
| | | Distinguish between LCMS and GCMS | K4 |
| | | Define and types of electrophoresis | K2 |
| | | Apply the principle and techniques for paper and agar electrophoresis of particular food sample analysis. | K3 |
| | | Investigate the electrophoresis method of instrument Procedure. | K4 |
| | | Explain the basic principle and procedure for moving boundary electrophoresis. | K2 |
| | | Identify the principles and method of Polyacrlamide gel electrophoresis techniques. | K4 |
| IV | Fluorimetry and Flame Photometry | | |
| 4.1 | Theory of fluorescence (SS) and instrumentation. Instrumentation in Flame Photometry-oxidant, fuel, filter, detector, amplifier and applications. | Discuss the fundamental theory of fluorescence and instrumentation. | K2 |
| | | Describe the working principle of Flame Photometry. | K2 |
| | | Explain the process of instrumentation in flame photometry-oxidant. | K2 |

| | | | |
|----------|--|---|----|
| | | Categorize the components of flame photometry. | K4 |
| | | Elaborate the important applications of flame photometry. | K5 |
| V | Measurement of Radioactivity | | |
| 5.1 | Radioactive isotopes (SS) Methods and types. Radioactive Counters –gas and liquid scintillation-uses, applications and safety. | Define Radioactive isotopes. | K2 |
| | | Classify types of radioactive isotopes. | K3 |
| | | List the different methods of radioactive isotopes. | K4 |
| | | Discuss the radioactive counters. | K2 |
| | | Determine the Measurement of radiation and isotope quantitation. | K5 |
| | | Describe about that the gas and Liquid scintillation. | K2 |
| | | Differentiate between the scintillation and Geiger counter. | K4 |
| | | Analyse the uses, applications and safety measures of radioactive counters. | K4 |

4. Mapping scheme

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PSO1 | PSO2 | PSO3 | PSO4 |
|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|-------------|-------------|-------------|-------------|
| CO1 | L | L | - | - | - | - | - | - | L | H | M | - | - |
| CO2 | L | - | - | M | - | - | - | - | L | H | M | - | - |
| CO3 | L | - | - | L | - | - | - | - | L | H | L | - | - |

| | | | | | | | | | | | | | |
|------------|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO4 | L | - | - | H | - | - | - | - | L | M | M | - | - |
| CO5 | L | - | - | M | - | - | - | - | - | L | L | - | - |
| CO6 | L | - | - | L | - | - | - | - | - | L | H | - | - |

L-Low, M-Medium, H-High

5. COURSE ASSESSMENT METHOD

DIRECT

1. Continuous Assessment Test: T1, T2 (Theory & Practical Components): Closed Book
2. Open Book Test.
3. Assignment, Group Presentation, Group Discussion, project Report, Field Visit Report, Poster Presentation, Seminar, Quiz (written).
4. Pre-Semester & End Semester Theory Examination

INDIRECT

1. Course end survey (Feedback)

Name of the Course Coordinator: Ms. Maheswari K

CORE COURSE- IX- Food Toxicology

Semester : III

Credits :4

Code : P21FS309

Total Hours : 60

1. Course Outcome

On completion of the course the students will be able to:

| CO.No | Course Outcomes | Level | Unit |
|-------|--|-------|------|
| CO1 | Classify toxins based on its source and explain mechanism of toxicity | K4 | I |
| CO2 | Analyze how the food additives are acting as toxicants | K4 | II |
| CO3 | Determine the types of toxicants and its effect | K5 | III |
| CO4 | Evaluate the safety and risk of toxicants | K5 | IV |
| CO5 | Discuss the metabolism of xenobiotics | K6 | V |
| CO6 | Compile the types of toxicants, safety and evaluation aspects and its metabolism in the human body | K6 | VI |

2. A. Syllabus:

Unit I – Introduction to Food Toxicology

- 1.1 Principles of toxicology – Definition, Classification, Characteristics and Dosage
- 1.2 Determination of Food toxicants
- 1.3 Naturally occurring toxins – Plant and Animal origin, Microbial origin (Endotoxin and Exotoxin) and Sea food origin
- 1.4 Microbial Toxins in contamination of food products
- 1.5 Mechanism of Toxicity

Unit II –Food additives as Toxicants

- 2.1 Traditional Food toxicants – General principles, colorants, artificial sweetener, preservatives, antioxidants and glutamate
- 2.2 Functional additives – General principles, drug interaction

- 2.3 Toxicants formed during food processing – nitrosamine, acrylamide, benzene and heterocyclic amine and aromatic hydrocarbon

Unit III – Environmental toxins and drug residues in food

- 3.1 Environmental toxins - Fungicide and pesticide residues in foods
- 3.2 Drug residues - Heavy metal and their health impact, Use of veterinary drugs (malachite green in fish and beta agonists in pork) and Dioxins and related compounds in food
- 3.3 Radioactive contamination of food, Food adulteration and potential toxicity of food adulterants

Unit IV – Toxicological safety and Risk analysis

- 4.1 General principles and Epidemiological studies
- 4.2 Toxicity tests for hazard characterization in foods
- 4.3 Evaluation of toxicity – Risk and benefit
- 4.4 Evaluation based on dietary and health condition
- 4.5 Biomarker research on toxins

Unit V – Xenobiotics

- 5.1 Entry and absorption of foreign compounds – Digestive tract, lungs and skin
- 5.2 Bioaccumulation of Xenobiotics
- 5.3 Metabolism – Influence of diet on metabolism, Induction and Exhibition of metabolic enzymes
- 5.4 Elimination of xenobiotics – Kidneys, Liver, Intestine and Lungs

2. B. Topics for Self-study

- 1 Food allergies and sensitivity
- 2 Non-nutrient antioxidants in food
- 3 Potential benefits of Transgenic plants
- 4 Antioxidants and chemical carcinogens

3. Specific Learning Outcomes (SLO)

| Unit / Section | Course Content | Learning Outcomes | Highest Bloom's Taxonomic Levels of Transaction |
|----------------|---|---|---|
| I | Introduction to Food Toxicology | | |
| 1.1 | Principles of toxicology – Definition, Classification, Characteristics and Dosage | Illustrate the principles of toxicology | K2 |
| | | List about the characteristics and dosage of toxicology | K4 |
| | | Outline the classification of toxicology | K2 |
| 1.2 | Determination of Food toxicants | Analyze the food toxicants | K4 |
| 1.3 | Naturally occurring toxins – Plant and Animal origin, Microbial origin (Endotoxin and Exotoxin) and Sea food origin | Outline the different types of naturally occurring toxins | K2 |
| | | Compare the endotoxin and exotoxin of microbial origin toxin | K4 |
| | | Determine the natural toxins present in food of plant and animal origin | K5 |

| | | | |
|-----------|---|--|----|
| | | Discuss the toxins present in sea food origin | K6 |
| 1.4 | Microbial Toxins in contamination of food products | Explain about the microbial toxins | K2 |
| | | Analyze the microbial toxins that contaminate the food products | K4 |
| 1.5 | Mechanism of Toxicity | Explain the mechanism of toxicity | K4 |
| II | Food additives as Toxicants | | |
| 2.1 | Traditional Food toxicants – General principles, colorants, artificial sweetener, preservatives, antioxidants and glutamate | Outline the traditional food toxicants | K3 |
| | | Illustrate the general consideration on the toxicity of antioxidants | K2 |
| | | Explain the effects of artificial sweetener and colorants in food | K4 |
| | | Analyze the food additives and preservatives are toxic to food | K4 |
| 2.2 | Functional additives – General principles, drug interaction | Outline the general principles of functional additives | K2 |

| | | | |
|------------|--|---|----|
| | | Explain the additive drug interaction | K3 |
| 2.3 | Toxicants formed during food processing – nitrosamine, acrylamide, benzene and heterocyclic amine and aromatic hydrocarbon | Determine the toxicants formed during food processing | K5 |
| | | List the points to be considered during food processing to prevent from toxicants | K4 |
| | | Explain the carcinogenic effects of heterocyclic amine | K2 |
| | | Identify the negative effects of toxicity formed during food processing | K3 |
| III | Environmental toxins and drug residues in food | | |
| 3.1 | Environmental toxins - Fungicide and pesticide residues in foods | Categorize the Fungicide and pesticide residues in foods | K4 |
| | | Analyze the Environmental toxins | K4 |
| 3.2 | Drug residues - Heavy metal and their health impact, Use of veterinary drugs (malachite green in fish and beta agonists in pork) and Dioxins and related compounds in food | Identify the malachite green in fish and beta agonists in pork | K3 |
| | | Explain the Heavy metal and their health impact | K2 |
| 3.3 | Radioactive contamination of food, Food adulteration and potential toxicity of food adulterants | Discuss on Radioactive contamination of food | K6 |

| | | | |
|-----------|---|--|----|
| | | Analyze the Food adulteration and potential toxicity of food adulterants | K4 |
| IV | Toxicological safety and Risk analysis | | |
| 4.1 | General principles and Epidemiological studies | Illustrate the general principles of toxicology | K2 |
| | | Determine the epidemiological study of toxicology | K5 |
| 4.2 | Toxicity tests for hazard characterization in foods | Identify the toxicity tests for hazards in foods | K3 |
| | | Illustrate the hazard characterization in foods | K2 |
| 4.3 | Evaluation of toxicity – Risk and benefit | Evaluate the risk of toxicity | K5 |
| | | Determine the risk-benefit consideration in toxicology | K5 |
| 4.4 | Evaluation based on dietary and health condition | Explain the evaluation based on dietary and health condition | K2 |
| | | Identify the toxicity assessment in health condition | K3 |
| 4.5 | Biomarker research on toxins | Discuss the biomarker research on toxins | K6 |
| V | Xenobiotics | | |
| 5.1 | Entry and absorption of foreign | Discuss about the term xenobiotics | K6 |

| | | | |
|-----|---|---|----|
| | compounds – Digestive tract, lungs and skin | | |
| | | Illustrate the Entry and absorption of foreign compounds in Digestive tract | K2 |
| | | Explain the Entry and absorption of foreign compounds in lungs and skin | K3 |
| 5.2 | Bioaccumulation of Xenobiotics | Outline the Bioaccumulation of Xenobiotics | K3 |
| 5.3 | Metabolism – Influence of diet on metabolism, Induction and Exhibition of metabolic enzymes | Determine the Influence of diet on metabolism | K5 |
| | | Identify the Induction and Exhibition of metabolic enzymes | K3 |
| 5.4 | Elimination of xenobiotics – Kidneys, Liver, Intestine and Lungs | Outline the elimination of xenobiotics in Kidneys | K2 |
| | | Explain about the exclusion of xenobiotics in Liver | K2 |
| | | Discuss about the removal of xenobiotics in intestine | K6 |
| | | Explain the elimination of xenobiotics in lungs | K2 |

4. Mapping scheme

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PSO1 | PSO2 | PSO3 | PSO4 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| CO1 | H | - | L | M | - | L | - | M | L | L | - | L | - |
| CO2 | H | - | L | - | - | H | L | M | - | H | L | M | - |
| CO3 | H | - | L | M | M | H | M | M | M | L | - | M | - |
| CO4 | H | - | - | - | - | M | - | - | L | M | L | M | H |
| CO5 | L | - | M | - | - | M | - | L | - | - | - | - | - |
| CO6 | H | L | L | M | - | H | - | M | - | L | - | L | - |

Low-L Medium-M High-H

5. COURSE ASSESSMENT METHOD

DIRECT

1. Continuous Assessment Test: T1, T2 (Theory & Practical Components): Closed Book
2. Open Book Test.
3. Assignment, Group Presentation, Group Discussion, project Report, Field Visit Report, Poster Presentation, Seminar, Quiz (written).
4. Pre-Semester & End Semester Theory Examination

INDIRECT

1. Course end survey (Feedback)

Name of the Course Coordinator:

CORE COURSE- X : RESEARCH METHODOLOGY and STATISTICS

Semester : III

Code : P21FS310

Credits : 4

Total Hours : 60

1. Course Outcomes

On completion of this course the students will be able to:

| CO.No | Course Outcomes | Level | Unit |
|--------------|--|--------------|-------------|
| CO1 | Classify and explain the types of Research, research design and sampling techniques | K4 | I |
| CO2 | Identify suitable method of data collection and select data for processing, editing and coding | K3 | II |
| CO3 | Simplify data in terms of tabulation, diagrammatic representations etc., | K4 | III |
| CO4 | Determine mean, median, and mode values to interpret the results | K5 | IV |
| CO5 | Test hypothesis using appropriate statistical tools | K6 | V |
| CO6 | Rule on the types of research, methods of data collection, organization and representation of data, research design and statistical inferences in research studies | K6 | VI |

2. A. Syllabus

Unit I: Introduction to Research, Types of Research and Research Design (12 Hours)

Definition ,objectives and characteristic of research , Types of Research and research design- Basic , applied , action , evaluation and experimental Surveys- Descriptive , diagnostic and exploratory ,Basic components of research design, Sampling design- Probability and non probability sampling methods

Unit II: Data and Tools of Data Collection**(12 Hours)**

Methods of data collection- Primary and secondary data and data sources , data processing and analysis strategies and tools ,Interview schedules and questionnaires ,Interviews and type of Interviews ,Pre-testing and pilot study, Editing and coding of data

Unit III: Organization and Representation of Data, Report writing**(12 Hours)**

Classification- qualitative, Quantitative- frequency distribution, discrete and continuous
Tabulation of data- parts of a table, preparation of blank tables, Diagrammatic – One dimensional diagrams, two dimensional diagrams, pictogram and cartographs, Graphical-
Frequency graphs- line , polygon, curve, histogram Cumulative frequency graphs - ogives
General structure of scientific reports includes-Different types of scientific documents-
journal articles, books, thesis, conference and project reports.

Unit IV: Mean, median, mode and their applications**(12 Hours)**

Measures of dispersion- standard deviation, coefficient of variation, percentiles and percentile ranks
Correlation coefficient and its interpretation, Rank correlation.
Association of attributes , contingency table, basic software application like Ms- Excel, SPSS in doing basic statistical evaluation, Management Tools for PLAGIARISM – Pro Writing Aid, Quetext, EduBirdie and PDS(plagiarism detection system)

Unit V: Probability and Tests of Significance**(12 Hours)**

Rules of probability and its applications, Normal, binomial, their properties, importance of these distributions in research studies, Large and small sample tests – “t”, F and chi square tests ANOVA and applications

2.B. Topics for Self-study

Construction of hypothesis, The role of statistics in research, Ethics in evaluation process, Concepts of validity and reliability.

2.C. Text Book(s):

- 2) Kothari.G.R. Research Methodology, Methods and Techniques, Wiley Eastern Limited, New Delhi, 2004
- 3) Gupta.S.P. Statistical Methods, Sultan Chand & Sons, New Delhi, 2002
- 4) Gosh.B.N. Scientific Methods and Social Research Sterling Publishers Pvt.Ltd. New Delhi, 2015

- 5) Devadas.R.P. A Handbook on methodology of Research, Sri Ramakrishna Vidyalaya, Coimbatore, 2000

2.D. Reference:

- 1) Gurumani N, Scientific thesis writing and paper presentation, MJP Publishers, 2010.
- 2) Vijayalakshmi G, Research methods. MJP Publishers, 2009.
- 3) Kulbir Singh Sidhu, Methodology of Research in Education Sterling Publishers Pvt. Ltd., New Delhi, 2006.

2.E. Reference Link:

4. http://www.sociology.kpi.ua/wp-content/uploads/2014/06/Ranjit_Kumar_Research_Methodology_A_Step-by-Step_G.pdf

3. Specific Learning Outcomes (SLO)

| Unit / Section | Course Content | Learning Outcomes | Highest Bloom's Taxonomic Levels of Transaction |
|-----------------------|--|--|--|
| I | Introduction to Research , Types of Research and Research Design | | |
| 1.1 | Definition ,objectives and characteristic of research | Define, recognize and identify the qualities of research | K1 |
| 1.2 | Types of Research and research design- Basic, applied, action, evaluation and experimental Surveys- Descriptive, diagnostic and exploratory | Outline the types of research | K2 |
| | | Classify and compare the types of research | K4 |
| | | Apply experimental survey in community nutrition | K3 |
| 1.3 | Basic components of research design | List the components of research design | K1 |

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| | | Analyze the components of research design | K4 |
| | | Criticize the components of research design | K5 |
| 1.4 | Sampling design- Probability and non probability sampling methods | Describe the types of sampling design | K1 |
| | | Classify and Compare the sampling methods | K4 |
| | | Identify an appropriate sampling technique | K3 |
| II | Data and Tools of Data Collection | | |
| 2.1 | Methods of data collection- Primary and secondary data and data sources | Identify the source of data | K3 |
| | | Classify method of data collection | K4 |
| | | Select suitable method of data collection | K3 |
| 2.2 | Data processing and analysis strategies and tools | Identify the methods of data processing | K3 |
| | | Design the tool for data collection | K6 |
| 2.3 | Interview schedules and questionnaires | Identify the tool for data collection | K3 |
| | | Distinguish schedules and questionnaire | K4 |
| | | Develop a model schedule or questionnaire | K6 |
| 2.4 | Interviews and type of Interviews | Explain the types of interviews | K2 |

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|------------|---|---|----|
| | | Analyze the suitable type of interview for the study | K4 |
| 2.5 | Pre-testing and pilot study | Categorize the sample | K4 |
| | | Recommend for further study | K5 |
| | | Justify the conclusion of the existing studies | K5 |
| 2.6 | Editing and coding of data | Select the technique for editing and coding of data | K3 |
| III | Organization and Representation of Data , Report writing | | |
| 3.1 | Classification- qualitative, Quantitative- frequency distribution, discrete and continuous | Classify the methods of data collection | K4 |
| 3.2 | Tabulation of data- parts of a table, preparation of blank tables | Determine the parts of tables | K4 |
| | | Categorize data under appropriate components of the table | K4 |
| | | Construct a blank table | K6 |
| 3.3 | Diagrammatic – One dimensional diagrams, two dimensional diagrams, pictogram and cartographs | Analyze the pictorial presentation of data | K4 |
| | | Construct a sample diagrammatic representation of data | K6 |
| 3.4 | Graphical- Frequency graphs- line, polygon, curve, histogram Cumulative frequency graphs- ogives | List the type of graphical presentation | K1 |
| | | Identify suitable graphical presentation | K3 |

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| | | Construct graphical representation of data | K6 |
| 3.5 | General structure of scientific reports includes-Different types of scientific documents-journal articles, books, thesis, conference and project reports | Explain the importance of report writing | K2 |
| | | Classify the types of reports | K4 |
| | | Compare the reports based on the type of study | K4 |
| I V | Mean, median, mode and their applications | | |
| 4.1 | Measures of dispersion- standard deviation, coefficient of variation, percentiles and percentile ranks. | Analyze the data using statistical techniques | K4 |
| 4.2 | Correlation coefficient and its interpretation, Rank correlation | Analyze the variation in the collected data | K4 |
| 4.3 | Association of attributes , contingency table, basic software application like Ms- Excel, SPSS in doing basic statistical evaluation | Select appropriate application for statistical evaluation | K3 |
| | | Examine suitable application for statistical inferences | K5 |
| 4.4 | Management Tools for PLAGIARISM –ProWritingAid, Quetext, EduBirdieand PDS(plagiarism detection system) | Paraphrase the truthfulness of research work | K2 |
| | | Justify uniqueness of research using different tools for plagiarism | K5 |

| V | Probability and Tests of Significance | | |
|-----|---|--|----|
| 5.1 | Rules of probability and its applications | Apply rules of probability in research work | K3 |
| 5.2 | Normal, binomial, their properties, importance of these distributions in research studies | Analyze different distribution of probabilities in research studies | K4 |
| | | Explain the importance of distributions in research studies | K2 |
| 5.3 | Large and small sample tests -t*, F and chi square tests ANOVA and applications | List the types of tests to interpret result using statistical techniques | K1 |
| | | Apply suitable tests to interpret the result | K3 |

4. Mapping scheme

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PSO1 | PSO2 | PSO3 | PSO4 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| CO1 | L | - | H | - | M | - | - | - | L | M | M | L | L |
| CO2 | - | - | M | - | H | - | - | - | - | - | - | - | L |
| CO3 | - | - | M | - | H | M | L | - | - | - | - | - | H |
| CO4 | - | - | H | - | H | H | H | M | - | M | M | - | M |
| CO5 | - | - | H | - | H | H | H | H | - | - | - | - | M |
| CO6 | L | - | H | - | H | H | L | L | - | - | - | L | M |

L-Low, M-Medium, H-High

5. COURSE ASSESSMENT METHOD

DIRECT

1. Continuous Assessment Test: T1, T2 (Theory & Practical Components): Closed Book
2. Open Book Test.
3. Assignment, Group Presentation, Group Discussion, project Report, Field Visit Report, Poster Presentation, Seminar, Quiz (written).
4. Pre-Semester & End Semester Theory Examination

INDIRECT

1. Course end survey (Feedback)

Name of the Course Coordinator:

ELECTIVE COURSE-II : FOOD PRODUCT DEVELOPMENT AND FOOD PROCESSING

Semester : III

Credits : 4

Code : P21FS3:2

Total Hours : 50

1. Course Outcomes

On completion of this course the students will be able to:

| CO.No | Course Outcomes | Level | Unit |
|--------------|--|--------------|-------------|
| CO1 | List the sequence of actions involved in the development a food product | K4 | I |
| CO2 | Identify the various methods of development of a new food product | K3 | II |
| CO3 | Evaluate the safety measures which should be followed by developing a new product | K5 | III |
| CO4 | Analyse the importance of processing of foods and the steps involved in food processing | K4 | IV |
| CO5 | Assess the effect of food additives and preservatives on foods | K5 | V |
| CO6 | Determine about the various food process and developing new products in order to stay healthy and satisfy consumer demand. | K5 | V |

2. A. Syllabus

Unit I: Introduction of Food product development

(10 Hours)

Basic principles of food product development, Sensory properties of food and their role in product development, Concept of product development Formulation and evaluation of recipes at laboratory level, Product life cycle, Creating brand value for the Product.

Unit II: Methods of food product

(10 Hours)

A. Bulk food preparation for food institutions and enterprises: servings, nutritive value and costing. Evaluation of food: objective and subjective method, selection and training of judges, development of score card and analysis of data.

B. Consumer evaluation: development of schedule and data analysis. Packaging material, types for different products. Food labelling.

Unit III: Safety and regulations

(10 Hours)

Food safety issues in food product development, food quality regulations and standards, quality control in HACCP. Product formation and development for general and therapeutic use.

Unit IV:

(10 Hours)

Food Processing- Definition, principles of food processing, Effect of processing on physicochemical characteristics, Classification of food processing- Primary, secondary and tertiary food processing, importance of food processing including thermal, radiation, refrigeration, freezing and dehydration. Principles of using electromagnetic radiation in food processing-ionizing radiations and non ionizing radiations, advantages and disadvantages, nutrient losses of food processing,

Unit V:

(10 Hours)

Technologies underlying in mutual supplementation, enrichment and fortification, fermentation, malting and germination Quality control in food industry: raw material, finished products. Processing technologies for convenience and processed foods Food additives; Definition, types and functions, permissible limits and safety aspects. Chemical Preservatives- type I and type II.

2.C. Topics for the self-study

Product Development: Scale of new product development in market place, concept generation, consumer testing, quality function deployment. Research and Development process. Trends and new techniques in processing, for example extrusion, sous vide, high pressure, electrical and magnetic fields, light pulses, minimal processing, home meal replacements, hurdle technology. Food ingredients and their functions.

2. D. Reference:

1. Jacqueline H. Beckley, M. Michele Foley Elizabeth J. Topp & J. C. Huang Witoon Prinyawiwatkul (2007). Accelerating New Food Product Design and Development. Blackwell Publishing Company. IFT Press. USA
2. Howard R. Moskowitz, I. Sam Saguy & Tim Straus (2009). An Integrated Approach to New Food Product Development. Taylor and Francis Group, LLC. USA
3. Mary Earle and Richard Earle (2008). Case studies in food product development Wood head Publishing Limited and CRC Press LLC. USA
4. Creating New Foods. The Product Developer's Guide: Marie D. Earle and Richard L. Earle (2001). Chadwick House Group Ltd. New Zealand.
5. David H. Lyon, Mariko A. Francombe, Terry A. Hasdell and Ken Lawson (1992). Guidelines for sensory analysis in food product development and quality control. Chapman & Hall, 2-6 Boundary Row, London.
6. Rao, Chandra Gopala (2006). Essentials of food process engineering. B.S. Publications.
7. Khatkar, Bhupendra Singh ed (2007). Food science and technology. Daya Publishing House.
8. Singh, N.P (2007). Fruit and vegetable preservation. Oxford Book Company.

9. Ahluwalia, Vikas (2007). Food processing.Paragon International Publishers.
10. Sivasankar,B (2005). Food processing and preservation. Prentice - Hall of India

2. E. Reference Link:

11. <https://www.adelaide.edu.au/course-outlines/004631/1/sem-2/>

3. Specific Learning Outcomes (SLO)

| Unit / Section | Course Content | Learning Outcomes | Highest Bloom's Taxonomic Levels of Transaction |
|-----------------------|--|---|--|
| I | Introduction of Food product development | | |
| 1.1 | Basic principles of food product development, Sensory properties of food and their role in product development, Concept of product development | List the steps in food product development | K4 |
| | | Explain the importance of research, sensory evaluation and consumer testing. | K2 |
| | | Explain the stages of food product developmet | K2 |
| 1.2 | Formulation and evaluation of recipes at laboratory level | Determine about bulk food preparation for food institutions and enterprises: servings, nutritive value and costing. | K5 |
| 1.3 | Product life cycle, Creating brand value for the Product. | Develop the Life cycle of a product | K3 |
| | | Outline the essentials of a food brand | K2 |

| | | | |
|-----------|---|---|----|
| | | List the steps to create a new specialty food brand | K4 |
| II | Methods of food product | | |
| 2.1 | Bulk food preparation for food institutions and enterprises: servings, nutritive value and costing. | Explain bulk food production | K2 |
| | | Categorize the bulk food production | K4 |
| | | List the salient features of bulk food production | K4 |
| | | Outline the equipments required for bulk food production and service | K2 |
| | | Explain the factors to be kept in mind while compiling a menu. | K2 |
| | | Illustrate the importance of Food cost control | K2 |
| | | List the elements of costing | K4 |
| | | Identify the essentials of food cost control | K3 |
| | | Explain the measures to control food cost | K2 |
| 2.2 | Evaluation of food: objective and subjective method, | Discuss the advantages and disadvantages of sensory and objective evaluation. | K6 |

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|------------|---|---|----|
| | | Outline the points to be considered in conducting objective evaluation of food | K2 |
| 2.3 | Selection and training of judges, development of score card and analysis of data. | Outline the process by which select and train a taste panel | K2 |
| | | Explain the importance of score card in sensory evaluation | K2 |
| | | Develop a score card for an experiment might conduct in the laboratory | K3 |
| 2.4 | Consumer evaluation: development of schedule and data analysis. | Develop an evaluation card for consumer to evaluate newly introduced food product | K3 |
| | | Demonstrate tests for acceptability of a new product | K2 |
| 2.5 | Packaging material, types for different products. Food labelling. | List the purposes of packaging | K4 |
| | | Outline the Objectives of packaging label | K2 |
| | | Explain the types of packaging | K2 |
| | | Identify the labels and symbols used on packages | K3 |
| | | Explain about the package development considerations | K2 |
| III | Safety and regulations | | |

| | | | |
|-----------|--|---|----|
| 3.1 | Food safety issues in food product development, food quality regulations and standards,. | Identify the causes of accidents | K3 |
| | | Organize the safety procedure | K3 |
| | | Organize the safety training | K3 |
| | | Explain the enforcement of safety | K2 |
| | | List the legal responsibilities of a food service manager | K4 |
| | | Outline the Labour laws | K2 |
| | | Discuss on the role of consumers in maintaining standards | K6 |
| 3.2 | Quality control in HACCP. | Explain the Importance of HACCP | K2 |
| 3.3 | Product formation and development for general and therapeutic use | Explain the product development process | K2 |
| | | List the therapeutic products | K4 |
| IV | Food Processing | | |
| 4.1 | Definition, principles of food processing, Effect of processing on physicochemical characteristics | Identify the purpose of food processing | K3 |

| | | | |
|-----|--|---|----|
| | | Outline the types of food processing | K2 |
| | | Evaluate the effect of food processing method on food quality | K5 |
| | | Evaluate the effect of food processing method on nutritional properties of food | K5 |
| 4.2 | Classification of food processing- Primary, secondary and tertiary food processing | Categorize the classification of food processing industries | K4 |
| | | Outline the food classification systems based on the food processing | K2 |
| 4.3 | Importance of food processing including thermal, radiation, refrigeration, freezing and dehydration. | List the Importance of food processing industries in India | K4 |
| | | Discuss the Importance of food processing and preservation | K6 |
| 4.4 | Principles of using electromagnetic radiation in food processing- ionizing radiations and non ionizing radiations, advantages and disadvantages, nutrient losses of food processing, | Elaborate on Food preservation by irradiation | K6 |
| | | Evaluate the effect of irradiation technology on nutritional quality | K5 |
| V | | | |
| 5.1 | Technologies underlying in mutual supplementation, enrichment and fortification, fermentation, malting and germination | Explain the Conventional food processing technologies | K2 |

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|-----|---|--|----|
| | | Explain the Advanced food processing technologies | K2 |
| 5.2 | Quality control in food industry: raw material, finished products. Processing technologies for convenience and processed foods | Discuss on the Importance of quality control in food processing industry | K6 |
| | | Evaluate the quality control process in food processing | K5 |
| 5.3 | Food additives; Definition, types and functions, permissible limits and safety aspects. Chemical Preservatives- type I and type II. | Explain the role of food additives | K2 |
| | | Explain on Nutritive additives | K2 |

4. Mapping scheme

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PSO1 | PSO2 | PSO3 | PSO4 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| CO1 | H | - | - | L | M | H | - | M | L | H | H | - | H |
| CO2 | H | - | - | L | M | H | - | M | L | H | H | - | H |
| CO3 | H | - | - | L | M | H | - | M | L | H | H | - | H |
| CO4 | H | - | - | L | M | H | - | M | L | H | H | - | H |
| CO5 | H | - | - | L | M | H | - | M | L | H | H | - | H |
| CO6 | H | - | - | L | M | H | - | M | L | H | H | - | H |

L-Low, M-Medium, H-High

5. COURSE ASSESSMENT METHOD

DIRECT

1. Continuous Assessment Test: T1, T2 (Theory & Practical Components): Closed Book
2. Open Book Test.
3. Assignment, Group Presentation, Group Discussion, project Report, Field Visit Report, Poster Presentation, Seminar, Quiz (written).
4. Pre-Semester & End Semester Theory Examination

INDIRECT

1. Course end survey (Feedback)

Name of the Course Coordinator: Ms. Bavithra

ELECTIVE-III : FOOD SAFETY AND QUALITY CONTROL

Semester : III

Code : P21FS3:3

Credits : 4

Total Hours : 50

1. Course Outcomes

On completion of this course the students will be able to:

| CO.No | Course Outcomes | Level | Unit |
|-------|--|-------|------|
| CO1 | Explain the importance of food safety in the processing industry | K2 | I |
| CO2 | Identify the concepts of food labeling | K3 | II |
| CO3 | Compare the effects of various contaminations on different food commodities | K2 | III |
| CO4 | List the various food safety programs | K4 | IV |
| CO5 | Analyze various hazard analysis techniques and differentiate biological and chemical hazards | K4 | V |
| CO6 | Determine an overall idea about quality control and food safety regulations in India | K5 | |
| CO7 | Explain the importance of food safety in the processing industry | K2 | I |

2. Syllabus

Unit I: Food safety concept

(10 Hours)

- A. Importance of food safety in the food processing industry Risk classification, National and international food regulatory agencies
- B. Food contaminants and adulterants: Food toxins – Mycotoxins – aflatoxins, aspergillus and penicillium species, Mushroom poisoning sea food toxins. Other toxins- Naturally occurring in foods lathyrins, haemagglutinins, goitrogens.
- C. Food adulterations and food standards : adulterations- Definition, common food adulterants : Test for detecting food adulterants ,contamination with toxic minerals, pesticides and insecticides : Effects of food adulterants and contamination, measures to control food adulterants .Prevention of food adulterants act.

Unit II: Food Safety Programs

(10 Hours)

A. Definitions and importance, Good Manufacturing Practices (GMPs), Pest Control Program, Facility Maintenance, Personal Hygiene, Supplier Control, Sanitary Design of Equipment and Infrastructure, Procedures for Raw Material Reception, Storage and Finished Product Loading.

B. Sanitation Program. (Sanitation Standard Operating Procedures (SSOPs)), B. Product Identification, Tracking and Recalling Program, Preventive Equipment Maintenance Program, Education and Training Program.

Unit III: Hazard Analysis and Risk Assessment

(10 Hours)

A. Physical hazards (metals, glass, etc), Chemical hazards (food additive toxicology, natural toxins, pesticides, antibiotics, hormones, heavy metals and packaging components), Biological hazards (epidemiology of biological pathogens: virus, bacteria and fungi)

B. Evaluation of the severity of a hazard Controlling Food Hazards .Hazard Analysis Critical Control Point (HACCP) system.

Unit IV: Food Hygiene Programs

(10 Hours)

A. Training programs, Infrastructure, Personal habits, Hygiene verification, Water in the food industry, Water sources, Water uses, Water quality, Treatments, Cleaning and sanitation, Cleaning agents, Sanitizing agents, Equipment and systems.

B. Waste management in food industry – food recovery hierarchy, source reduction and reuse, animal feeding, recycling, composting, fermentation, landfills, incineration and land application

Unit V: Food safety regulation in India

(10 Hours)

A. An overview of Food Regulation in India; Food Laws and Regulations; Structure, organization and duties of regulatory system; Duties and responsibilities of food business operator; Registration and Licensing process and requirements;

B. Labelling of Food Products; Traceability; Import and Export of Foods; Liability for Defective Products; Food safety management systems and certifications; Regulation of special category Foods: Regulation of Irradiated foods;

C. General food laws and food safety regulations, (i) international food standard and Codex Alimentarous, (ii) AGMARK & BIS (iii) FSSAI (iv) HACCP.

2.B. Topics for the self-study

Sensometrics for Food Quality control-Food and Nutrition Services Quality Control Management Program-Quality assurance and halal control points for the food industry-Radiation Dosimetry for Quality Control of Food Preservation and Disinfestation

Reference Link: <https://worldwidescience.org/topicpages/f/food+quality+control.html>

2.C. Text books:

1. Food Safety and standards Act 2006, Rules 2011, Regulations, 2011, 10th Edition, ILBCO India, Indian Law Book Company, 2013
2. Early, R. (1995): Guide to Quality Management Systems for the Food Industry, Blackie, Academic and professional, London.
3. Gould, W.A and Gould, R.W. (1998). Total Quality Assurance for the Food Industries, CTI Publications Inc. Baltimore.
4. Pomeraz, Y. and MeLoari, C.E. (1996): Food Analyasis: Theory and Practice, CBS publishers and Distributor, New Delhi.
5. Bryan, F.L. (1992): Hazard Analysis Critical Control Point Evaluations A Guide to Identifying Hazards and Assessing Risks Associated with Food Preparation and Storage. World Health Organisation, Geneva.
6. Kirk, R.S and Sawyer, R. (1991): Pearson's Composition and Analysis of Foods, Longman Scientific and Technical. 9th Edition, England.
7. FAO (1980): Manuals of Food Quality Control. 2-Additives Contaminants Techniques, Rome.
8. FSSAI, FSIS, EU and FAO website for updates

3. Specific Learning Outcome (SLO)

| Unit / Section | Course Content | Learning Outcomes | Highest Bloom's Taxonomic Levels of Transaction |
|----------------|--|--|---|
| I | Food safety concept | | |
| 1.1 | Importance of food safety in the food processing industry Risk classification, National and international food regulatory agencies. | Outline the responsibilities of Food Safety system | K2 |
| | | Explain the Development of National Food Safety System | K2 |
| | | List the objectives of Food Safety Studies | K4 |
| | | Illustrate Safe Food Production with Minimum and Judicious Use of Pesticides | K2 |
| 1.2 | Food contaminants Food toxins –Mycotoxins – aflatoxins, aspergillus and pencillium species, Mushroom poisoning sea food toxins. | List the Regulations for Food Toxins | K4 |

| | | | |
|-----------|---|---|----|
| | Other toxins- Naturally occurring in foods lathyrogens,haemagglutinins, goitrogens. | Analyze the Risk assessments of toxins in food | K4 |
| | | Identify the Sources, Signs and symptoms, Treatment and prevention | K3 |
| 1.3 | Food adulterants- Food adulterations and food standards : adulterations- Definition, common food adulterants | Classify the Types of food adulterants and harmful effects | K4 |
| | | Categorize the Different food items and their adulterants | K4 |
| | Test for detecting food adulterants, contamination with toxic minerals, pesticides and insecticides : Effects of food adulterants and contamination, measures to control food adulterants Prevention of food adulterants act. | Analyze the Different food articles and adulterant detection techniques for them | K4 |
| | | Identify the Effects of Food adulterants on Humans | K3 |
| | | Explain the Impacts of adulteration, Safety measures and prevention of adulteration | K2 |
| II | Food Safety Programs | | |
| 2.1 | Definitions and importance, Good Manufacturing Practices (GMPs), Pest Control Program, | Evaluate the Implementation of GMPs | K5 |

| | | | |
|-----|--|--|----|
| | Facility Maintenance | | |
| | | Determine the Common Prerequisite Programs | K5 |
| | | Explain the Pest Control, Facility and Building Design, Equipment and Preventive Maintenance | K2 |
| 2.2 | Personal Hygiene, Supplier Control, Sanitary Design of Equipment and Infrastructure, | Summarize the Individual chemical hygiene responsibilities | K2 |
| | | Outline the Purpose, scope and applications, Roles and Responsibilities | K2 |
| | | Illustrate the Lab safety equipments, Personal protective equipments | K2 |
| 2.3 | Procedures for Raw Material Reception, Storage and Finished Product Loading. | Demonstrate the Hygiene and quality of raw materials and ingredients | K2 |
| | | Categorize the Procurement of raw materials and ingredients | K4 |
| | | Identify the Requisite conditions for the transport, storage and preservation of raw materials and ingredients | K3 |
| 2.4 | Sanitation Program. (Sanitation Standard Operating Procedures (SSOPs). | Demonstrate the Sanitation Principles and Food Handling Practices | K2 |
| | | Apply the Manufacturing Controls and Essential Operations, Personal | K3 |

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|------------|---|--|----|
| | | Cleanliness and Conduct | |
| | | Evaluate the General Protection from Contamination, Sanitary Facilities, General Sanitary Design | K5 |
| 2.5 | Product Identification, Tracking and Recalling Program, Preventive Equipment Maintenance Program, Education and Training Program. | Explain FAO's work on traceability and recalls | K2 |
| | | Illustrate the Product Recalls/Market Withdrawals; Regulatory Compliance | K2 |
| | | Identify the Market Access; Public Health Trace-backs; Food Safety and Quality Assurance; and Process and Order Management | K3 |
| | | Demonstrate the Effective Sanitation Programs for Food Safety Success | K2 |
| III | Hazard Analysis and Risk Assessment | | |
| 3.1 | Physical hazards (metals, glass, etc), Chemical hazards (food additive toxicology, natural toxins, pesticides, antibiotics, hormones, heavy metals and packaging components), | Categorize the Physical hazards differ from chemical and biological hazards | K4 |
| | | Summarize the Naturally occurring physical hazards and dangerous | K2 |
| | | Explain the Prevention of harms from naturally occurring physical hazards | K2 |
| 3.2 | Biological hazards (epidemiology of biological pathogens: virus, bacteria and fungi) | Illustrate Risk factors, Major biological hazards | K2 |

| | | | |
|-----------|---|--|----|
| | | List the Sources, Control and Prevention | K4 |
| | | Identify the microbial toxins as Public Health Hazards | K3 |
| 3.3 | Evaluation of the severity of a hazard Controlling Food Hazards .Hazard Analysis Critical Control Point (HACCP) system. | Demonstrate the Importance of conducting a thorough hazard analysis | K2 |
| | | Identify the Food safety hazards , Hazard analysis process | K3 |
| | | Explain about Hazard identification, Determination of acceptable levels, Hazard evaluation, Control measures | K2 |
| IV | Food Hygiene Programs | | |
| 4.1 | Training programs, Infrastructure, Personal habits, Hygiene verification | Demonstrate the Hygiene programs, procedures, training ,records, monitoring and follow-up | K2 |
| | | Outline Introduction to the Principles and Concepts of Hygiene | K2 |
| | | Categorize the Components of hygiene and environmental health. | K4 |
| 4.2 | Water in the food industry, Water sources, Water uses, | List the primary sources of fresh water, Knowledge of the water source and how | K4 |

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| | Water quality, Treatments | it was obtained | |
| | | Explain about Impurity of water identification and measured in three basic categories -qualitative, general quantitative and specific | K2 |
| | | Analyze the Tests used for general quantitative analysis of water | K4 |
| | | Demonstrate the Common water treatment techniques and their purpose | K2 |
| 4.3 | Cleaning and sanitation, Cleaning agents, Sanitizing agents, Equipment and systems. | Classify the Types Of Cleaning Compounds, Properties Of A Cleaner | K4 |
| | | Illustrate the Factors That Affect Cleaning Efficiency, Cleaning Operation | K2 |
| | | Summarize about Heat, Chemical Sanitizers, Factors Affecting Sanitizing | K2 |
| | | Explain the Machine Ware washing, Dishwashing Machines, Hot Water Sanitizing, Chemical Sanitizing, Requirements For A Successful Dishwashing Operation | K2 |
| 4.4 | Waste management in food industry – food recovery hierarchy, source reduction and reuse | Outline the Waste management hierarchy-waste prevention | K2 |
| | | Explain the reuse, recycling, recovery, safe disposal, sustainable, effective and | K2 |

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| | | profitable waste management options | |
| 4.5 | animal feeding, recycling, composting, fermentation, landfills, incineration and land application | List the Methods of Processing Organic Waste | K4 |
| | | Classify the Disadvantages of using of organic waste as an animal feed. Incineration, Advantages and Disadvantages of waste incineration method | K4 |

4. Mapping scheme

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PSO1 | PSO2 | PSO3 | PSO4 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| CO1 | H | H | - | M | - | L | - | H | L | H | H | - | L |
| CO2 | - | H | - | M | H | - | - | H | L | H | L | - | L |
| CO3 | H | H | - | M | - | - | - | H | L | H | L | - | L |
| CO4 | H | H | - | M | - | - | - | H | L | H | L | - | L |
| CO5 | - | M | M | M | - | - | - | H | L | H | L | - | L |
| CO6 | H | H | - | M | - | - | - | H | L | H | L | - | L |

L-Low, M-Medium, H-High

5. COURSE ASSESSMENT METHOD

DIRECT

1. Continuous Assessment Test: T1, T2 (Theory & Practical Components): Closed Book
2. Open Book Test.
3. Assignment, Group Presentation, Group Discussion, project Report, Field Visit Report, Poster Presentation, Seminar, Quiz

(written).

4. Pre-Semester & End Semester Theory Examination

INDIRECT

1. Course end survey (Feedback)

Name of the Course Coordinator: Ms. Meera Muralidharan

CORE PRACTICAL- V- FOOD ANALYSIS

Semester : III
Credits :3

Code : P21FS3P5
Total Hours : 45

1. Course Outcomes

On completion of this course the students will be able to:

| CO.No | Course Outcomes | Level | Unit |
|-------|---|-------|------|
| CO1 | Illustrate the relationship between body composition and fitness | K2 | I |
| CO2 | Compare and contrast the metabolisms with reference to fitness | K4 | II |
| CO3 | Determine the relationship between exercise and prevention of disease and disorder | K5 | III |
| CO4 | Assess the role of energy balance and electrolyte balance with reference to physical activity | K5 | IV |
| CO5 | Interpret the nutritional requirements for male and female sports persons | K5 | V |
| CO6 | Determine the nutritional requirement for fitness and physical performance | K5 | V |

2. A. Syllabus:

1. Estimation of **moisture** in dehydrated powders
2. Estimation of **carbohydrate** by Anthrone method
3. Estimation of **minerals** in flour – Calcium, Iron and Phosphorus
4. Estimation of **beta carotene** in carrot, Sweet potato and pumpkin
5. Estimation of **ascorbic acid** in Green Leafy Vegetables
6. Estimation of **fibre** in vegetables – Crude and Dietary
7. Estimation of **protein** in pulses by Kjeldhal Apparatus
8. Estimation of **cholesterol** by Zak's method
9. Estimation of **fat** in dehydrated powders using Soxhlet apparatus
10. Determination of **Peroxide value, Iodine and Saponification number** in fats and oils

3. Specific Learning outcomes (SLO)

| Unit / Section | Course Content | Learning Outcomes | Highest Bloom's Taxonomic Levels of Transaction |
|----------------|---|--|---|
| 1. | Estimation of moisture in dehydrated powders | Identify the moisture content in dehydrated powder | K3 |
| 2. | Estimation of carbohydrate by Anthrone method | Analyze the carbohydrate content in the given food sample by Anthrone method | K4 |
| 3. | Estimation of minerals in flour – Calcium, Iron and Phosphorus | Identify the mineral content in the given flour | K3 |
| 4. | Estimation of beta carotene in carrot, Sweet potato and pumpkin | Analyze the beta carotene content in carrot, sweet potato and pumpkin | K4 |
| 5. | Estimation of ascorbic acid in Green Leafy Vegetables | Identify the ascorbic acid content in green leafy vegetable | K3 |
| 6. | Estimation of fiberein vegetables – Crude and Dietary | Identify the crude and dietary fibre content in vegetables | K3 |
| 7. | Estimation of protein in pulses by Kjeldahl Apparatus | Estimate the protein content by nitrogen concentration of the pulses | K5 |
| 8. | Estimation of cholesterol by Zak's method | Identify the cholesterol content by using zak's method | K3 |
| 9. | Estimation of fat in dehydrated powders using Soxhlet apparatus | Analyze the fat content in dehydrated powders | K4 |
| 10. | Determination of Peroxide value, Iodine and Saponification number in fats and oils | Estimate the degree of oxidation in fats and oils | K5 |

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4. Mapping scheme for PO, PSOs and COs

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PSO1 | PSO2 | PSO3 | PSO4 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| CO1 | M | L | H | M | - | - | - | - | L | M | M | H | L |
| CO2 | L | L | H | L | - | - | - | - | L | M | M | H | L |
| CO3 | M | L | H | M | - | M | - | - | L | M | M | H | L |
| CO4 | M | L | H | M | | - | | | L | L | M | H | L |
| CO5 | M | L | H | M | | H | | | L | M | M | H | L |
| CO6 | L | - | M | M | - | L | - | L | L | H | M | H | M |

L-Low, M-Medium, H-High

5. COURSE ASSESSMENT METHOD

DIRECT

1. Continuous Assessment Test: T1, T2 (Theory & Practical Components): Closed Book
2. Open Book Test.
3. Assignment, Group Presentation, Group Discussion, project Report, Field Visit Report, Poster Presentation, Seminar, Quiz (written).
4. Pre-Semester & End Semester Theory Examination

INDIRECT

1. Course end survey (Feedback)

Name of the Course Coordinator: Ms. Preethi S

CORE COURSE-XI : NUTRITION IN FITNESS

Semester : IV

Code : P21FS411

Credits : 4

Total Hours : 60

2. Course Outcomes

On completion of this course the students will be able to:

| CO.No | Course Outcomes | Level | Unit |
|-------|---|-------|------|
| CO1 | Illustrate the relationship between body composition and fitness | K2 | I |
| CO2 | Compare and contrast the metabolisms with reference to fitness | K4 | II |
| CO3 | Determine the relationship between exercise and prevention of disease and disorder | K5 | III |
| CO4 | Assess the role of energy balance and electrolyte balance with reference to physical activity | K5 | IV |
| CO5 | Interpret the nutritional requirements for male and female sports persons | K5 | V |
| CO6 | Determine the nutritional requirement for fitness and physical performance | K5 | V |

3. A. Syllabus

Unit I: Body composition and fitness

(12 Hours)

- (i) Body composition- classification (Fat mass and fat free Mass) and its components, actors influencing body mass composition. Techniques for measuring body composition.
- (ii) Fitness-definition, parameters of fitness- cardiovascular endurance, muscular strength, muscular endurance, flexibility and body composition

Unit II: Role of macronutrients

(12 Hours)

- (i) Carbohydrate- Carbohydrate reserves, Carbohydrate as energy source for sports and exercise. Glycogen synthesis and carbohydrate loading. Carbohydrate requirements.
- (ii) Consumption of carbohydrate –Consumption of carbohydrate in pre exercise, duration and recovery period. Carbohydrate supplementation during exercise, Factors affecting utilization of carbohydrates during exercise

Unit III: Role of lipids as an energy source for sports**(12 Hours)**

Fat stores, oxidation of fats, factors affecting fat oxidation (intensity, duration, training status and carbohydrate feeding). Consumption of fats – Fat requirements and utilization. Influence of dietary factors on fat utilization – total fat intake, high carbohydrate diets, dietary fibre and alcohol.

Unit IV: Protein and amino acid requirements**(12 Hours)**

Importance of protein and amino acid requirements during sports, Factors affecting protein turnover during endurance exercise, resistance exercise and recovery process. Protein supplementation. Importance of micronutrients in sports – Role of vitamins, minerals and antioxidants. Dietary supplements and ergogenic aids (Mechanical, nutritional, pharmacological, physiological and psychological) – concept.

Unit V: Water balance**(12 Hours)**

Fluid balance in sports and exercise, dehydration. Water recommendation for athletic performance, Sports anaemia, Performance – influencing factors – Chronic dieting and eating disorder, Female athlete triad, stress, type of exercise, gender influence, lipid metabolism and weight loss, caffeine and athletic performance.

2.B. Topics for Self-study –

Safety of nutritional ergogenics, Legal issues of nutritional ergogenics, Nutritional quackery – health and sports.

2.C. Text Book(s):

- 1) Mahan, L.K. & Ecott-Stump, S., Krause's Food, Nutrition and Diet therapy, 10th edition, W.B. Saunders Ltd, 2000.
- 2)Sizer, F. & Whitney, E. , Nutrition- Concepts & Controversies, 8th edition, Wadsworth Thomson learning, 2000.
- 3) Shills, M.E., Olson, J.A., Shike, N. and Ross, A.C. (Ed) Modern Nutrition in Health & disease, 9th edition, Williams & Wilkins, 1999.

2.D. Reference:

- 1) Parizkova. J. Nutrition, physical activity and health in early life, Ed. Wolinsky. I., CRC press, 2001.
- 2) Whitney, E.N. & Rolfes. S.R., Understanding Nutrition, 8th edition, West/Wadsworth, an International Thomson publishing Co. 2002.

2.E. Reference Link:

3.<http://ir.torren.t.tarafdari.com/complete/Nutrition%20for%20Health%2C%20Fitness%20and%20Sport%2C%2011th%20Edition/Nutrition%20for%20Health%2C%20Fitness%20and%20Sport%2C%2011th%20Edition.pdf>

4. Specific Learning Outcome (SLO)

| Unit / Section | Course Content | Learning Outcomes | Bloom's Taxonomic Levels of Transaction |
|----------------|--|--|---|
| I | Body composition and fitness | | |
| 1.1 | Body composition- classification (Fat mass and fat free Mass) and its components | Define Reference man and Reference Woman | K1 |
| | | Distinguish fat muscle mass and fat free muscle mass | K4 |
| | | Measure the Body Mass Index of an individual | K5 |
| 1.2 | Factors influencing body mass composition | Identify the factors influencing body mass composition | K3 |
| | | Assess body composition by anthropometric method | K5 |
| 1.3 | Techniques for measuring body composition | Define Broka's Index | K1 |
| | | Explain the techniques to measure body composition | K2 |
| | | Classify the techniques for the assessment of body composition | K4 |
| | | Distinguish BMI and body composition | K4 |
| | | Recommend the suitable method to assess body composition | K5 |
| 1.4 | Fitness-definition, parameters of fitness- cardiovascular endurance, muscular strength, muscular endurance, flexibility and body composition | Define and list the parameters of fitness | K1 |
| | | Explain the components of physical fitness | K2 |
| | | Contrast and Test for | K4 |

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| | | cardiovascular endurance over physical fitness | |
| | | Examine the muscular strength to ensure physical fitness | K4 |
| | | Analyze and compare the body composition | K4 |
| | | Estimate the duration of muscular endurance in physical fitness | K5 |
| II | Role of macronutrients | | |
| 2.1 | Carbohydrate - Carbohydrate reserves, Carbohydrate as energy source for sports and exercise | Label the sources of carbohydrates | K1 |
| | | Classify and explain the types of carbohydrates | K2 |
| | | Identify the reserves of carbohydrate | K4 |
| | | Categorize hormones for energy production during exercise | K4 |
| 2.2 | Glycogen synthesis and carbohydrate loading, Carbohydrate requirements | Explain the requirements of carbohydrate | K2 |
| | | Summarize glycogenesis pathway | K2 |
| | | Outline the role of ATP in energy transfer in exercise | K2 |
| | | Identify the alternative method to replace glycogen | K3 |
| 2.3 | Consumption of carbohydrate – Consumption of carbohydrate in pre exercise, duration and recovery period | Choose the type of carbohydrate required during exercise | K3 |
| | | Distinguish the effect of meal in pre- and post exercise period | K4 |
| | | Determine overall carbohydrate intake for individuals | K4 |
| 2.4 | Carbohydrate supplementation during exercise. Factors affecting utilization of carbohydrates during | Illustrate the factors affecting utilization of carbohydrates | K2 |

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| | exercise | | |
| | | Analyze the glycemic index in pre, during and post exercise periods | K4 |
| | | Interpret dietary guidelines for carbohydrate feeding in pre, during and post exercise periods | K5 |
| | | Formulate energy bars to provide adequate supply of carbohydrates | K6 |
| III | Role of lipids as an energy source for sports | | |
| 3.1 | Fat stores, oxidation of fats, factors affecting fat oxidation (intensity, duration, training status and carbohydrate feeding). | Define rancidity and Classify the types of rancidity | K1,K2 |
| | | Explain the functions, classification and dietary sources of fat | K2 |
| | | Identify the factors affecting oxidation of fat | K4 |
| | | Assess the highest fat containing dietary source | K5 |
| 3.2 | Consumption of fats – Fat requirements and utilization. | Explain the requirements of fat for physical fitness | K2 |
| | | Analyze the relationship between body fat and physical fitness | K4 |
| | | Analyze fat stores utilization during exercise | K4 |
| | | Identify Essential Fatty acids for physical fitness | K5 |
| 3.3 | Influence of dietary factors on fat utilization – total fat intake, high carbohydrate diets, dietary fibre and alcohol | Summarize oxidation of fat during physical exercise | K2 |
| | | Explain the effect of alcohol in physical fitness | K2 |
| | | Select foods with high fat, carbohydrates and dietary fibre content | K3 |

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| | | Develop fat-rich food for athletes | K6 |
| IV | Protein and amino acid requirements | | |
| 4.1 | Importance of protein and amino acid requirements during sports | Explain the impact of amino acids on physical performance | K2 |
| | | Classify proteins and amino acids | K4 |
| | | Compare the protein requirements for normal individuals and athletes | K4 |
| 4.2 | Factors affecting protein turnover during endurance exercise, resistance exercise and recovery process | Summarize protein breakdown for physical endurance | K2 |
| | | Relationship between protein synthesis and degradation | K4 |
| | | Analyze the impact of protein intake on exercise performance | K4 |
| 4.3 | Protein supplementation | Select the suitable protein supplements to compensate protein loss | K3 |
| | | Analyze the ergogenic properties of protein | K4 |
| 4.4 | Importance of micronutrients in sports – Role of vitamins, minerals and antioxidants | Explain the biological functions of micronutrients for sports individuals | K2 |
| | | Classify vitamins based on its requirements | K4 |
| | | Compare the requirement of antioxidants for sports and normal individuals | K4 |
| | | Assess clinical manifestations of micronutrients deficit sports individuals | K5 |
| 4.5 | Dietary supplements and ergogenic aids (Mechanical, nutritional, pharmacological, physiological and psychological) – concept | Relate the impact of high doses of supplements with natural fat rich foods | K2 |
| | | Illustrate the ergogenic | K2 |

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| | | aids and dietary supplements | |
| | | Identify the harmful effects of ergogenic aids and other supplements | K4 |
| | | Categorize ergogenic aids based on its effect imposed on sports individuals | K4 |
| | | Recommend natural foods for high physical performances | K5 |
| V | Water balance | | |
| 5.1 | Fluid balance in sports and exercise, dehydration. Water recommendation for athletic performance. | Illustrate the effect of fluid imbalance on body functions and performance | K2 |
| | | Relate body fluid balance and rehydration in sports and physical exercise | K2 |
| | | Compare the fluid requirement for sports, exercise and dehydrated individuals | K4 |
| | | Recommend guidelines to prevent thermal injury during endurance | K5 |
| | Sports anaemia, Performance – influencing factors – Chronic dieting and eating disorder, female athlete triad, stress, type of exercise, gender influence, lipid metabolism and weight loss, caffeine and athletic performance | Define and classify the types of anaemia | K1, K4 |
| | | Explain the performance influencing factors of sports individuals | K2 |
| | | Compare basal loss of iron | K4 |
| | | Compare iron requirement of normal individuals with sports individuals | K4 |
| | | Analyze the ergogenic aids influencing the | K4 |

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| | | performance | |
| | | Analyze the iron requirements for sports and athletics | K4 |
| | | Recommend iron supplements to the anaemic sports individuals | K5 |
| | | Estimate the haemoglobin concentration in blood | K5 |

4. Mapping scheme

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PSO1 | PSO2 | PSO3 | PSO4 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| CO1 | - | H | - | M | - | - | - | L | - | L | L | - | - |
| CO2 | M | H | - | M | - | - | - | H | - | L | L | - | - |
| CO3 | L | H | - | H | - | L | M | - | - | H | - | - | - |
| CO4 | L | H | H | H | - | - | - | H | - | L | L | - | - |
| CO5 | - | H | H | H | - | M | M | H | - | M | - | - | - |
| CO6 | - | H | H | H | - | M | M | H | - | M | - | - | - |

L-Low, M-Medium, H-High

5. COURSE ASSESSMENT METHOD

DIRECT

1. Continuous Assessment Test: T1, T2 (Theory & Practical Components): Closed Book
2. Open Book Test.
3. Assignment, Group Presentation, Group Discussion, project Report, Field Visit Report, Poster Presentation, Seminar, Quiz (written).
4. Pre-Semester & End Semester Theory Examination

INDIRECT

1. Course end survey (Feedback)

Name of the Course Coordinator:

ELECTIV –IV : FOOD PACKAGING

Semester : IV
Credits : 4

Code : P21FS4:4
Total Hours : 50

1. Course Outcomes

On completion of this course the students will be able to:

| CO.No | Course Outcomes | Level | Unit |
|-------|--|-------|------|
| CO1 | Explain the role of packaging in the food industry | K2 | I |
| CO2 | Compare the advantages and disadvantages of various packaging material | K2 | II |
| CO3 | Identify the types of packaging and their usage in packing various foods | K3 | III |
| CO4 | Analyse the differences in packing fresh and processed foods | K4 | IV |
| CO5 | Interpret the packaging designs and environmental issues in various packing techniques | K5 | V |
| CO6 | Determine the various laws relating to packaging industries and the importance of labels in the food packaging | K5 | V |

2. Syllabus

Unit I: Introduction to food packaging

(10 Hours)

- A. History, functions of Packaging –Types, Concepts, Significance, Testing & evaluation of packing media - retail packs (including shelf life evaluation) and transport packages. Packaging of food(s)- Fresh and processed, general characteristics
- B. Food products - General classification and packing types, varieties and trends. Storage, handling and distribution of packages (foods) - including palletisation & Containerization

Unit II: Packaging Materials

(10 Hours)

- A. An introduction to packaging materials,**Basic Packaging Materials – Paper, Wood, Plastics, Glass, Metal Containers (SS) Packaging Films – Polyethylene, Cellophane, Aluminium foil, Laminates, New Polymeric Packaging Films, Shrink Film, Cling and Wrap Film, Edible Film.**
- B. Packaging Methods and Systems-Traditional Food Packaging, Retortable, Lined Cartons, Bag in Box Aseptic, Modified Atmosphere Packaging, Vacuum, Gas Packaging, Bio Based Packaging,

Eco-friendly and Safe Packaging for Exports Ovenable Packages, Transport Packages, Packaging Equipments.

Unit III: Storage, Handling and Distribution of Packages (10 Hours)

Shelf-Life Testing of Packaged Foods, Evaluation of Packaged Foods **Labeling – Definition, Purpose, Types, Materials, Adhesives (SS)** Food and Nutritional Labeling as per FSSAI specifications Packaging Laws and Regulations – National and International Specifications

Unit IV: Packaging of fresh and processed foods (10 Hours)

Packaging of Fruits and vegetables, Fats and Oils, Spices, meat, Poultry and sea foods, Dairy Products, Bakery, beverages, Dehydrated and frozen foods. Liquid and powder filling machines – like aseptic system, form and fill (volumetric and gravimetric), bottling machines. Form Fill Seal (FFS) and multilayer aseptic packaging machines.

Unit V: Packaging Design & Environmental Issues in Packaging (10 Hours)

- A. Food marketing and role of packaging- bar coding, Migration in food packaging. FSSAI regulations for packaging and food labelling.
- B. **Packaging** - Laws & Regulations - FDA, PFA, Packaging Commodity Rules, Weight & Measures Act etc, Coding & marking including bar coding, Environmental & Eco issues and waste disposal.

Unit VI: Topics for Self-Study

Consumer awareness about packaging- influence of existing and new FMCG food products packaging on consumer buying behavior- consumer experience of purchasing packaged food products- how packaging can influence them to purchase their decision powers.

Reference Link:

<https://www.ukessays.com/essays/marketing/research-views-food-packaging-5714.php>

Text Books and Reference materials:

1. Miquel Angelo P R C, Ricardo Nuno C P, Oscar Leandro D S R, Jose Antonio C T, Antonio Augusto V , 2016, Edible Food Packaging: Materials and Processing Technologies, CRC Press. Taylor & Francis, Boca Raton , FL

2. Luciano P, Sara L, 2016, Food Packaging Materials, Springer Cham Heidelberg, New York, Department of Food Science and Technology 39

3. Robertson, G.L. 2006 Food Packaging: Principles and Practice (2nd ed.), Taylor & Francis

4. NIIR. (2003). Food Packaging Technology Handbook, National Institute of Industrial Research Board, Asia Pacific Business Press Inc.

5. Ahvenainen, R. (Ed.) 2003 Novel Food Packaging Techniques, CRC Press,

3. Specific Learning Outcomes (SLO)

| Unit / Section | Course Content | Learning Outcomes | Highest Bloom's Taxonomic Levels of Transaction |
|-----------------------|--|--|--|
| I | Introduction to food packaging | | |
| 1.1 | History , functions of Packaging –Types, Concepts, Significance, Testing & | Illustrate the history of packaging- Modern era and ancient era | K2 |
| | | List about the major functions of packaging | K4 |
| | | Outline the classification of packaging | K2 |
| 1.2 | Evaluation of packing media - retail packs (including shelf life evaluation) and transport packages. | Identify the quality control testing of packaging materials | K3 |
| 1.3 | Packaging of food(s)- Fresh and processed, general characteristics | Compare the packaging and Logistics of Fresh and Processed Foods | K4 |

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| | | Explain about packaging helps to ensure the safety of food and retain the quality of the product | K2 |
| | | Determine the packaging for organic foods | K5 |
| 1.4 | Food products - General classification and packing types, varieties and trends. | List the different types of food packaging | K4 |
| | | List the different packaging materials used in food products | K4 |
| | Storage, handling and distribution of packages (foods) - including palletisation & Containerization | Evaluate the storage conditions and distribution systems at various stages of food manufacturer | K5 |
| | | Evaluate the storage and distribution after food manufacture | K5 |
| II | Packaging Materials | | |
| 2.1 | An introduction to packaging materials, Basic Packaging Materials – Paper, Wood, Plastics, Glass, Metal Containers (SS) | Identify the materials used for packing | K3 |

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| | | Identify the food stuffs and desirable packing material | K3 |
| | Packaging Films – Polyethylene, Cellophane, Aluminium foil, Laminates, New Polymeric Packaging Films, Shrink Film, Cling and Wrap Film, Edible Film. | Explain the Active food packaging | K2 |
| | | Illustrate the points to be considered before designing a packaging systems | K2 |
| 2.2 | Packaging Methods and Systems-Traditional Food Packaging, Retortable, Lined Cartons, Bag in Box Aseptic, Modified Atmosphere Packaging, Vacuum, Gas Packaging | Outline the Advances in packaging methods | K2 |
| | | Identify the processes and systems in food packaging | K3 |
| | Bio Based Packaging, Eco-friendly and Safe Packaging for Exports Ovenable Packages, Transport Packages, Packaging Equipments. | Explain the Biobased packaging materials for the food industry | K2 |
| | | List the Packaging requirements for microwavable foods | K4 |
| | | Explain about Transport Packaging | K2 |
| | | Identify the Packaging equipment and machines | K3 |
| III | Storage, Handling and Distribution of Packages | | |
| 3.1 | Shelf Life Testing of Packaged Foods, Evaluation of Packaged Foods | Categorize the commonly used methods for determining the shelf life | K4 |

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| | | of packaged foods | |
| | | Analyze the quality <i>evaluation of Packaging Materials.</i> | K4 |
| 3.2 | Labeling – Definition, Purpose, Types, Materials, Adhesives (SS), Food and Nutritional Labeling as per FSSAI specifications | Identify the Guiding principles of nutrition labeling | K3 |
| | | Explain the Importance of ‘Nutrition Labelling’ | K2 |
| 3.3 | Packaging Laws and Regulations – National and International Specifications | Discuss on Laws related to packaging | K6 |
| | | Analyze the Recent development on the food labelling front in india | K4 |
| IV | Packaging of fresh and processed foods | | |
| 4.1 | Packaging of Fruits and vegetables, Fats and Oils, Spices, meat, Poultry and sea foods, Dairy Products, Bakery, beverages, Dehydrated and frozen foods. | Illustrate the Packaging requirements for fresh fruits and vegetables | K2 |
| | | <i>Evaluate the Packaging and Distribution of Fresh Fruits & Vegetables</i> | K5 |
| | | List the Factors required for the packaging of fats and oils | K4 |

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| | | Determine the Packaging strategies of meat, Poultry and sea foods | K5 |
| | | Identify the Packaging Materials for milk and dairy products | K3 |
| | | Classify the Packaging of different types of beverages | K4 |
| | | Explain the Vacuum packaging of dehydrated foods | K2 |
| | | Categorize the Types of frozen food packaging | K4 |
| 4.2 | Liquid and powder filling machines – like aseptic system, form and fill (volumetric and gravimetric), bottling machines. Form Fill Seal (FFS) and multilayer aseptic packaging machines. | Identify the Liquid fillers or liquid filling machines | K3 |
| | | Demonstrate liquid filling machine work | K2 |
| | | Demonstrate the aseptic filling machine | K2 |
| V | Packaging Design & Environmental Issues in Packaging | | |
| 5.1 | Food marketing and role of packaging- bar coding, Migration in food packaging. FSSAI regulations for packaging and food labelling. | Illustrate the Role of packaging in market development | K2 |
| | | Explain the purpose of food package labeling | K2 |

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| | | Identify the Labels and symbols used on packages | K3 |
| | | Identify the barcode for food products in India | K3 |
| | | Determine the Importance of bar coding on food packaging | K5 |
| 5.2 | B. Packaging - Laws & Regulations - FDA, PFA, Packaging Commodity Rules, Weight & Measures Act etc, Coding & marking including bar coding | Identify the Food packaging laws and regulations in India | K3 |
| | | Outline the Important role of coding and marking printer in food safety | K2 |
| 5.3 | Environmental& Eco issues and waste disposal. | Explain about the environmental issues of packaging | K2 |
| | | List the problems with plastic packaging | K4 |
| | | Explain the disposal of packaging | K2 |
| | | Evaluate the waste disposal bad for the most environmentally friendly packaging | K5 |

4. Mapping scheme

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PSO1 | PSO2 | PSO3 | PSO4 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| CO1 | M | H | - | M | M | L | - | L | L | H | H | - | M |
| CO2 | M | H | - | M | M | L | - | L | L | M | M | - | M |
| CO3 | H | H | | M | M | L | - | L | L | M | M | - | M |
| CO4 | H | H | - | M | M | L | - | L | L | H | M | - | M |
| CO5 | M | H | - | M | M | L | - | L | L | M | M | - | M |
| CO6 | M | H | - | M | M | L | - | L | L | M | M | - | M |

L-Low, M-Medium, H-High

5. COURSE ASSESSMENT METHOD

DIRECT

1. Continuous Assessment Test: T1, T2 (Theory & Practical Components): Closed Book
2. Open Book Test.
3. Assignment, Group Presentation, Group Discussion, project Report, Field Visit Report, Poster Presentation, Seminar, Quiz (written).
4. Pre-Semester & End Semester Theory Examination

INDIRECT

1. Course end survey (Feedback)

Name of the Course Coordinator:

ELECTIVE–V : NUTRITION DURING EMERGENCY

Semester : IV
Credits : 4

Code : P21FS4 : 5
Total Hours : 50

1. Course Outcomes

On completion of this course the students will be able to:

| CO.No | Course Outcomes | Level | Unit |
|-------|--|-------|------|
| CO1 | Apply Millennium Goals Development in prevention of loss of lives in disaster | K3 | I |
| CO2 | Recommend special nutritional requirements for epidemic, endemic and pandemic conditions | K5 | II |
| CO3 | Prioritize the demand for food in the State and manage distribution to the diverse population based on the nutritional requirement | K5 | III |
| CO4 | Assess malnutrition in the affected population and recommend suitable mitigation programs | K5 | IV |
| CO5 | Analyze various laws and policies on disaster management | K4 | V |
| CO6 | Discuss the mitigation programmes and preventive measures required during emergency situations | K6 | VI |

2. A. Syllabus

UNIT I: Categorization of disasters leading to emergency situations (10 Hours)

- (i) Definition of emergency situation /disaster — classification of emergencies – natural, man- made - Famine, drought, flood, earthquake, cyclone, war, civil and political emergencies.
- (ii) Factors leading to emergency conditions during disaster.
- (iii) History of emergency situations and disasters in Indian subcontinent – Gujarat earthquake, Surat plague, Chennai-Psunami etc.

Unit II: Health-related emergencies (10 Hours)

- (i) Epidemic diseases - Dengue, chikenguniya and other epidemic conditions.
- (ii) Endemic diseases - Hypothyroidism and hyperthyroidism.
- (iii) Pandemic diseases – SARS, COVID-19.

Unit III: Nutritional management during emergencies (10 Hours)

- (i) Nutritional relief and rehabilitation- Assessment of food needs, food distribution strategy, targeting food aid, mass and supplementary feeding, special foods/ rations for nutritional relief.
- (ii) Organizations for mass feeding/ food distribution, transportation and storage, feeding centers.

- (iii) Sanitation and hygiene and public nutrition approach to tackle nutritional and health problems in emergencies, ethical considerations.

Unit IV: Assessment and surveillance of nutritional status

(10 Hours)

- (i) Malnutrition in emergency affected populations- Indicators of malnutrition during emergencies classification of malnutrition Body measurement indicators, clinical and other impacts
- (ii) Scope for malnutrition assessment, indicators and simple screening methods.
- (iii) Organization for nutritional surveillance.

Unit V: Food and Nutrition Security and disaster management programmes (10 Hours)

- (i) Food production, Access, Distribution, Availability, Losses, Consumption.
- (ii) Food Security, Socio-cultural aspects and Dietary Patterns: Their implications for Nutrition and health.
- (iii) Disaster/emergency Management programmes in India & International - Disaster management acts & policies - Disaster Management Authority DMA (national, state, district, executive committees (national, state), National & state disaster response force. United nation disaster management team- assessment and humanitarian affairs

2.B. Topics for self study –

Monitoring tools, Monitoring mechanisms to assess the adequacy of the ration, Access to other food sources in post-emergency phase, Self-reliance and exit strategies.

2. C. Text Book(s):

- 1) Sharma S, Wadhwa A., “Nutrition in the Community- A textbook”, Elite Publishing House Pvt. Ltd, 2003.
- 2) Srilakshmi B. “Dietetics” Seventh Edition, New Age International (P) Ltd, 2016

2.D. References:

- 1) Gibney, “Public Health Nutrition”, Blackwell Publishing, 2004.
- 2) Khanna., “Textbook of Nutrition and Dietetics”, Phoenix Publisher,2013.

2.E. Reference Link:

3. <https://www.unhcr.org/45fa745b2.pdf>

3. Specific Learning Outcomes (SLO)

| Unit / Section | Course Content | Learning Outcomes | Highest Bloom's Taxonomic Levels of Transaction |
|----------------|--|---|---|
| I | Categorization of disasters leading to emergency situations | | |
| 1.1 | Definition of emergency situation /disaster — classification of emergencies – natural, man- made - Famine, drought, flood, earthquake, cyclone, war, civil and political emergencies | Define hazard, risk and vulnerability | K1 |
| | | Illustrate the impact of disaster | K2 |
| | | Classify and explain the types of disaster | K3 |
| | | Recommend measures to prevent man-made disasters | K5 |
| 1.2 | Factors leading to emergency conditions during disaster | Summarise the objectives and principles of disaster management systems | K2 |
| | | Choose the constant factors leading to emergency conditions | K3 |
| | | Identify factors influencing emergency conditions in disaster | K3 |
| 1.3 | History of emergency situations and disasters in Indian subcontinent – Gujarat earthquake, Surat plague, Chennai-Tsunami | Explain the occurrence of earthquake, Tsunami and plague | K2 |
| | | Select the mitigation program and preventive actions | K3 |
| | | Analyze and identify the rehabilitation measures in post-emergency situations | K4 |
| II | Health-related emergencies | | |
| 2.1 | Epidemic diseases - Dengue, chikenguniya and other epidemic conditions | Define epidemic | K1 |
| | | Select the suitable | K3 |

| | | | |
|------------|--|---|----|
| | | preventive measures | |
| | | Classify the types of epidemic diseases | K4 |
| | | Distinguish pandemic and epidemic | K4 |
| 2.2 | Endemic diseases - Hypothyroidism and hyperthyroidism | Illustrate the role of thyroid hormones | K2 |
| | | Select the suitable preventive measures | K3 |
| | | Classify the different grades of thyroid | K4 |
| | | Distinguish Hypo and Hyperthyroidism | K4 |
| 2.3 | Pandemic diseases – SARS, COVID-19 | Explain SARS and COVID-19 | K2 |
| | | Select the preventive measures based on the age | K3 |
| | | Analyze the rate of mortality during COVID-19 | K4 |
| | | Relate the symptoms of pandemic diseases with endemic and epidemic diseases | K5 |
| III | Nutritional management during emergencies | | |
| 3.1 | Nutritional relief and rehabilitation- Assessment of food needs, food distribution strategy, targeting food aid, mass and supplementary feeding, special foods/ rations for nutritional relief | Illustrate the types of feeding in nutritional relief | K2 |
| | | Choose the vulnerable population and support with nutritional reliefs | K3 |
| | | Analyze the role of GO's and NGO's in emergency situations | K4 |
| | | Discuss the types of risk | K6 |
| 3.2 | Organizations for mass feeding/ food distribution, transportation and storage, feeding centers | Choose the suitable transport for mass feeding | K3 |
| | | Analyze the importance of food distribution in emergency situation | K4 |

| | | | |
|-----|--|--|----|
| | | Enumerate and discuss the role of feeding centers during emergency situation | K5 |
| | | Assess the nutritional demands during emergency situations | K5 |
| 3.3 | Sanitation and hygiene and public nutrition approach to tackle nutritional and health problems in emergencies, ethical considerations | Explain global WASH situation | K2 |
| | | Analyze the preventive measures to combat WASH-related diseases | K4 |
| | | Choose methods for safer foods | K3 |
| | | Distinguish Hygiene and Sanitation | K4 |
| | | Recommend nutrition interventions to combat health problems in emergency | K5 |
| IV | Assessment and surveillance of nutritional status | | |
| 4.1 | Malnutrition in emergency affected populations- Indicators of malnutrition during emergencies classification of malnutrition Body measurement indicators, clinical and other impacts | Define and list the types of malnutrition | K1 |
| | | Explain the Millennium Developmental Goals | K2 |
| | | Identify the symptoms of malnutrition during emergency | K3 |
| | | Assess the nutritional status using types of indices | K5 |
| | | Classify malnutrition | K4 |
| 4.2 | Scope of normal nutrition assessment, indicators and simple screening methods | Classify the methods of screening | K4 |
| | | Explain the scope of assessment methods | K2 |
| | | Identify the suitable nutritional assessment | K3 |

| | | | |
|----------|--|--|----|
| | | method | |
| 4.3 | Organization for nutritional surveillance | List the organizations for nutritional surveillance | K1 |
| | | Assess the role of the organizations in nutritional surveillance | K5 |
| | | Classify organizations | K4 |
| | | Examine the nutritional surveillance systems | K5 |
| V | Food and Nutrition Security and disaster management programmes | | |
| 5.1 | Food production, Access, Distribution, Availability, Losses, Consumption | Identify governmental strategies to improve food production | K3 |
| | | Recommend measures to prevent food loss by means of spoilage | K5 |
| | | Distinguish food and nutrition security | K4 |
| | | Assess the disaster management programmes | K5 |
| 5.2 | Food Security, Socio-cultural aspects and Dietary Patterns: Their implications for Nutrition and health | Assess population growth and food security | K5 |
| | | Assess dietary patterns using dietary survey method | K5 |
| | | Take survey to on the socio-cultural background | K5 |
| 5.3 | Disaster/emergency Management programmes in India & International - Disaster management acts & policies - Disaster Management Authority DMA (national, state, district, executive committees (national, state) | Define disaster risk management | K1 |
| | | Identify the threats to food and nutrition security | K3 |
| | | Explain emergency management | K2 |

| | | | |
|-----|---|--|----|
| | | programmes | |
| | | Classify Disaster Management Authority | K4 |
| 5.4 | National & state disaster response force. United nation disaster management team- assessment and humanitarian affairs | List Humanitarian principles | K1 |
| | | Analyze the steps in disaster preparedness | K4 |
| | | Explain National and State disaster response force | K2 |

4. Mapping scheme

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|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| CO1 | - | - | - | - | - | - | - | L | - | L | - | - | - |
| CO2 | - | H | H | H | H | M | H | M | - | M | M | H | - |
| CO3 | - | H | H | L | H | H | M | H | - | M | - | M | - |
| CO4 | - | M | H | M | H | H | L | H | - | H | M | - | - |
| CO5 | - | - | - | - | - | - | H | H | - | - | - | - | - |
| CO6 | - | - | - | - | H | H | - | H | - | H | - | - | - |

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