

**POST GRADUATE TEACHING DEPARTMENT OF
HOME SCIENCE
(Autonomous)
(Dept. Code-HS)**

**RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY
NAGPUR, MAHARASHTRA, INDIA**

SYLLABUS

For

SEMESTER PATTERN

As per NEP-2020

In

M.Sc. HOME SCIENCE

FOOD SCIENCE AND NUTRITION

(2023-24)

M.Sc. Semester Pattern in Food Science & Nutrition (Home Science)
Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur, (M.S.) India

Paper	Subject Code	Name of Paper	Marks	Credits
Semester-I				
Paper 1	MFN1T1	Advanced Nutritional Biochemistry-I	100	22
Paper 2	MFN1T2	Advanced Food Science-I	100	
Paper 3	MFN1T3	Electives (Choose any one) 1. Institutional Food Administration 2. Nutrition & Women Health	100	
Paper 4	MFN1T4	Research Methods and Statistics	100	
Practicals				
Practical 1	MFN1P1	Advanced Nutritional Biochemistry-I	100	
Practical 2	MFN1P2	Advanced Food Science-II	100	
Semester-II				
Paper 5	MFN2T5	Advanced Nutritional Biochemistry-II	100	22
Paper 6	MFN2T6	Advanced Food Science-II	100	
Paper 7	MFN2T7	Electives (Choose any one) 1. Food Safety & Quality Control 2. Pediatric & Geriatric Nutrition	100	
Practicals				
Practical 3	MFN2P3	Advanced Nutritional Biochemistry-II	100	
Practical 4	MFN2P4	Advanced Food Science-II	100	
Practical 5	MFN2I	On Job Training/Field Project/Internship	100	
Semester-III				
Paper 8	MFN3T8	Clinical & Therapeutic Nutrition-I	100	22
Paper 9	MFN3T9	Community Nutrition & Public Health-I	100	
Paper 10	MFN3T10	Electives (Choose any one) 1. Advanced Nutrition-I 2. Nutrition & Weight Management	100	
Practicals				
Practical 6	MFN3P6	Research Project (Design)	100	
Practical 7	MFN2P7	Clinical & Therapeutic Nutrition-I	100	
Practical 8	MFN2P8	Nutritional Assessment & Analytical Techniques-I	100	
Semester-IV				
Paper 11	MFN4T11	Clinical & Therapeutic Nutrition-II	100	22
Paper 12	MFN4T12	Community Nutrition & Public Health-II	100	
Paper 13	MFN4T13	Electives (Choose any one) 1. Advanced Nutrition-II 2. Sports Nutrition	100	
Practicals				
Practical 9	MFN4P9	Research Project (Major)	150	
Practical 10	MFN4P10	Clinical & Therapeutic Nutrition-II	100	
Practical 11	MFN4P11	Nutritional Assessment & Analytical Techniques-II	50	
Total			2400	88

	Program Outcomes
PO1	The student will be able to develop aptitude to manifest wide & extensive knowledge in the field of Home Science (Food Science & Nutrition).
PO2	The student will be proficient to develop a capacity to listen carefully, read & write analytically and present complex information in a clear & concise manner to different groups.
PO3	The student will be capable to critically analyze subjects of documents to classify them properly.
PO4	The student will be able to replicate curriculum content knowledge and apply one's learning to real life situations.
PO5	The student will be skillful to use digital resources for gathering information.

Course Outcomes (COs)	
ADVANCED NUTRITIONAL BIOCHEMISTRY: SEMESTER – I & II	
CO1	To understand classification, structure, properties & biological importance of carbohydrates, proteins & lipids. Students shall have coherent and systematic knowledge of metabolic regulations of carbohydrate, protein & fat.
CO2	To get an insight of structure and biochemical properties of water soluble and fat soluble vitamins and their coenzyme activities. They shall learn the enzymes, their types, enzyme activity and their diagnostic role in nutrition. They will be able to correlate the action of hormones with metabolic regulation.
CO3	To understand the metabolism of purines & pyrimidines & will be able to distinguish inherited disorders of purine and pyrimidine metabolism.
CO4	Develop insight into structure, functioning and repair of DNA. They shall gain the knowledge of synthesis & structure of RNA and translation process & DNA recombination concept.
CO5	Understand the concept of pH & regulation of water & electrolyte balance. They will know the composition/functions of blood & blood coagulation mechanism & regulation.
CO6	Comprehend the principles and application of various chromatographic and spectrophotometric techniques.
ADVANCED FOOD SCIENCE: SEMESTER – I & II	
CO1	Students get insight into different scientific methods of cooking of different foods & they shall learn how quality is changed during different processes/stages.
CO2	Students learn scientific principles which shall help them to know the preservation methods such as canning, pickling, drying and freeze drying, irradiation, pasteurization, smoking and the addition of chemical additives.
CO3	Students understand the composition and nutritive value of food and knowledge relevant to processing, shelf life extension, reduction of toxins and enhancement in sensory quality of food.
CO4	Students are acquainted with the principles of food product design and development.
CO5	Students learn food standards and food laws having critical and analytical rationale in the field of food safety.
INSTITUTIONAL FOOD ADMINISTRATION: SEMESTER – I	
CO1	Students gain the theoretical as well as practical knowledge of food service systems and its management, which helps them to understand the organization structure and basic working pattern of any institute.
CO2	It also aware students about the layout designing, work flow and work simplification techniques so that they can implement it in the practical work situations.
CO3	It imbibes the importance of entrepreneurship on the minds of the students. This guides them in the opening of new outlets.
CO4	It enables students to become managers or owner of their food service institute.
CO5	It develops knowledge in managing different types of food service systems.
NUTRITION AND WOMEN HEALTH	
CO1	To study the importance of nutrition for women's health.
CO2	To understand the role of women & their contribution to family & community.
CO3	To study effect of dietary choices on nutritional & health status of women.
CO4	To study the impact of economic policies, industrialization & globalization on women.
FOOD SAFETY AND QUALITY CONTROL	
CO1	To learn the concept of quality control & food safety.
CO2	To get acquainted with food safety policies.

CO3	To learn concepts of quality management.
CO4	To study food laws & regulations.
PEDIATRIC AND GERIATRIC NUTRITION	
CO1	To understand the process of growth & development of an infant.
CO2	To study the importance of diet & nutrition in wellbeing of infants.
CO3	To familiarize the students with the multifaceted aspects of aging.
CO4	To study factors affecting nutritional status & health of elderly.
RESEARCH METHODS AND STATISTICS	
CO1	Demonstrate knowledge of the scientific method, purpose and approaches to research. They shall understand the concept of quantitative and qualitative research.
CO2	Explain the concept of hypothesis & research design. Students shall be able to search the relevant literature & prepare key elements of a research proposal.
CO3	Understand the types, tools and methods of research and develop the ability to construct data gathering instruments appropriate to the research design.
CO4	Identify the various types of data measurement tools/tests/procedures and understand the concept of standardization and reliability and validity.
CO5	Differentiate between the qualitative and quantitative methods of analysis of data. Students shall suitably apply data compilation/reduction strategies and illustrate data using various graphical methods. They shall use appropriate parametric and non parametric statistical tests & draw conclusions and interpretations from the analysis of data using various statistical softwares & write reports.
CLINICAL AND THERAPEUTIC NUTRITION: SEMESTER – III & IV	
CO1	Summarize and critically discuss/understand fundamental aspects of clinical & therapeutic nutrition. Students shall learn about various duties of dietitians & hence, they shall come to know the responsibilities of dietitians/nutritionists in different fields of health care.
CO2	Use current information & technologies to locate and apply evidence-based guidelines and protocols and get imparted with critical thinking to take leadership roles in fields of health & dietetics (hospitals, specialized clinics, gyms, in the field of sports, as nutrition writer, as health supplement designer, as media writer), special nutritional needs and nutritional counseling.
CO3	Develop a detailed understanding of the etiology, physiological and metabolic anomalies of various acute and chronic disorders/diseases & to get acquainted with the dietary, pharmaceutical, surgical & lifestyle management of various system wise diseases. Students shall know about effect of drugs on ingestion, digestion, absorption and metabolism of nutrients as well as effect of foods, nutrients and nutritional status on drug dosage and efficacy.
CO4	Demonstrate competency in nutritional screening & assessment of hospitalized and outdoor patients. They shall use critical thinking & clinical reasoning to develop nutritional care plan & strategies for prevention and treatment of various disorders /diseases.
CO5	Inculcate the novel and advanced nutritional management practices in managing complications of lifestyle, degenerative and genetic diseases. Students shall be competent in therapeutic meal planning involving judicious modification of macro and micronutrients for various physiological and pathological conditions. They shall learn the effects of various diseases on the nutritional status of patients & counseling techniques to facilitate eating behaviour changes in patients.
ADVANCED NUTRITION: SEMESTER – III & IV	
CO1	Understand the basis of human nutritional requirements and recommendations through the life cycle. Students shall be acquainted with physiological and metabolic roles of

	macro- & micro-nutrients and their interactions in human nutrition.
CO2	Explain the functions of specific nutrients in maintaining health, identifying nutrient specific foods and apply principles from the various facets of food science and related disciplines to solve practical as well as real-world problems.
CO3	Understand body composition measurement techniques & its significance in the field of human nutrition. They shall learn the techniques of measurement of energy expenditure, protein quality of diets & dishes & nutritional status of individuals & groups.
CO4	Understand nutritional management in special conditions (space & sports) & shall be able to function effectively as a sports dietitian, with in-depth knowledge and skills so that they can support recreational and competitive athletes. They shall learn the role of macro- and micro-nutrients in sports performance and gain knowledge & application skills with respect to nutrition for high performance sports & nutritional care of special groups of athletes.
CO5	Track emerging concepts in the field of nutrition as they shall gain the knowledge about carbohydrates, proteins, fats, vitamins, minerals, electrolytes & water. Students shall be competent to make a prospective career in the area of Food, Nutrition & Dietetics.
NUTRITION AND WEIGHT MANAGEMENT	
CO1	To understand the concept of body weight components.
CO2	To learn the scientific approach of dietary modifications involved in obesity & underweight.
CO3	To understand the psychological aspects & behavioural management of eating disorders.
CO4	To understand pharmaceutical management & surgical techniques involved in weight loss.
SPORTS NUTRITION	
CO1	To provide students with detailed knowledge of the energy systems & metabolism of nutrients and nutritional requirements among sports persons.
CO2	To promote understanding of current theories of the relationships between diet and performance in sport, and between diet, exercise and health.
CO3	To impart knowledge regarding hydration level, sports drinks & ergogenic aids.
CO4	To understand the concept of pre & post game meals.
COMMUNITY NUTRITION AND PUBLIC HEALTH: SEMESTER – III & IV	
CO1	Students observe and assess the actual nutritional status and nutritional problems in the community by conducting surveys in the different strata and segment of the community so that these problems may be sought out while working in the field in future.
CO2	This also enables the students to understand the concept and methods of assessment of nutritional status of a community.
CO3	Explain the nutritional concerns among vulnerable sections of the community and strategies to combat them.
CO4	Acquire knowledge about the concept of food and nutrition security and the programmes for improving food and nutrition security.
CO5	Awareness helps them to get exposed to problems of malnutrition and how it impacts national development.
RESEARCH PROJECT (DESIGN & MAJOR): SEMESTER – III & IV	
CO1	The practical aspects of collection of data.
CO2	Evaluate and select the appropriate method for analysis and presentation of the data.
CO3	Illustrate the data using graphical and other methods.
CO4	Prepare a research project document based on the project work done.

FOOD SCIENCE AND NUTRITION
SEMESTER – I
PAPER 1
ADVANCED NUTRITIONAL BIOCHEMISTRY - I

MFN1T1

Marks: Theory: 60
Internal Assessment (Theory): 40
Practical: 60
Internal Assessment (Practical): 40

Objectives:

- Augment the biochemistry knowledge acquired at the undergraduate level. Understand the mechanism adopted by the human body for the regulation of metabolic pathway.
- Get an insight to interrelationship between various metabolic pathways. Become proficient for specialization in nutrition.
- Understand integration of cellular level metabolic events to nutritional disorders imbalance

Contents

Unit I

- Carbohydrates: Occurrence, classification, structure, properties and biological importance of carbohydrates. Polysaccharides.
- Proteins : Classification, structure and properties of amino acids, classification and properties of proteins, conformation and structure of proteins-primary, secondary, tertiary and quaternary structure.
- Lipids: Structure, distribution and biological importance of fats and fatty acids. Chemical properties and characterization of fats. Waxes, Cerebrosides, Gangliosides, Phospholipids and Proteolipids. Steroids and Bile salts. Prostaglandins.
- Vitamins: Structure and biochemical properties of water soluble and fat soluble vitamins and their coenzyme activity.
- Hormones: Mechanism of hormone action and its regulation.

Unit II

- Metabolism: Glycogenesis and Glycogenolysis, Inter-conversion of Hexoses, Glycolysis and Gluconeogenesis, Cori's cycle, Pyruvate dehydrogenase complex, Krebs cycle, Pentosephosphate pathway, Regulation of carbohydrate metabolism.
- Lipids: Biosynthesis of fatty acids, β -Oxidation of fatty acid, Ketone bodies, Synthesis

of Phospholipids and glycosphingolipids

Unit III

- Proteins: General reactions of protein metabolism, essential amino acids. Inborn errors of protein metabolism
- Metabolism of amino acids: Decarboxylation, Transamination, Deamination
- Nucleic acids: Biosynthesis and degradation of purines and pyrimidines and their regulation, Inherited disorders of purine and pyrimidine metabolism.

Unit IV

- Concept of Gene, DNA synthesis: The enzymes of DNA replication in prokaryotes and eukaryotes, mechanism of replication in bacteria and viruses, reverse transcriptase.
- RNA synthesis: The enzymes of transcription in prokaryotes and eukaryotes, mechanism of transcription in bacteria.
- Protein synthesis: Concept of the genetic code, structure of t-RNA, r-RNA and m-RNA, enzymes of translation in prokaryotes and eukaryotes, mechanism of protein synthesis, post translational processing of proteins.
- Inhibitors of Protein biosynthesis
- DNA recombination concept.

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INTERNAL ASSESSMENT (THEORY):

1. Attendance
 2. Assignments
 3. Presentations/Field Work/Visits
 4. Periodic Tests/Quizzes
 5. In-class Work/Class Discussion/Exploratory Activities/Speaking -Listening Activities /Participatory Activities
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MFN1P1	PRACTICAL
Marks: 60	
Internal Assessment: 40	

PRACTICALS:

- Determination of Calcium in food and serum
- Determination of Inorganic Phosphorous in food and serum
- Determination of Ascorbic Acid in food
- Determination of Serum Creatinine (Alkaline Picrate Method)

- Determination of Serum Bilirubin by Malloy & Evlylin Method
- Determination of Serum Chloride by Schales & Schales Method
- Estimation of Hemoglobin by Packed Cell Volume (PCV)
- Glucose Tolerance by Glucose Tolerance Test
- Estimation of Total Serum Protein & A/G Ratio by Biurett Method
- Determination of Total Lipida by Sulfo-phospho-vanillin method
- Study of examining the change in sugar content during germination of seeds
- Study of examining the induction of α -amylase during germination of seeds

INTERNAL ASSESSMENT (PRACTICAL):

1. Attendance
2. Planning
3. Laboratory Work
4. Practical Manual
5. Hands-on Training & Report Making on Laboratory Instruments: Operation & Functioning/Lab Visits

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- Bender David a., Shauna M.C. Cunningham (2021): Introduction to Nutrition & Metabolism. CRC Press Publication.
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FOOD SCIENCE AND NUTRITION
SEMESTER - I
PAPER 2
ADVANCED FOOD SCIENCE - I

MFN1T2

Marks: Theory: 60
Internal Assessment (Theory): 40
Practical: 60
Internal Assessment (Practical): 40

Objectives:

- To study scientific principles involved in food preparation and evaluation.
- To acquire knowledge regarding processing of foods.
- To understand the principles underlying newer techniques of food preservation and packaging.

Contents

UNIT I

Sensory Evaluation of Foods

1. Sensory Assessment of Food Quality

- Appearance of food - Size, shape & colour
- Flavour of foods - Odour, sensory organ for detecting odour, Odour stimuli
- Taste of foods - Sensory organ for detecting taste, Taste stimuli, Taste sensitivity, Taste interaction
- Mouth feel - Pain, hot & cold sensations, Tactile sensations
- Texture of foods - Measurement of texture of foods
- Consistency of foods - Measurement of consistency of foods
- Psychological/health factors in sensory assessment of foods

2. Sensory Testing of Foods

- Reasons for testing food quality, Selection criteria of panel of judges, Testing laboratory, Preparation of samples & score cards
- Types of tests:
 - Difference tests- Paired comparison test, duo-trio test, triangle test
 - Rating tests- Ranking test, single sample test, two-sample difference test, multiple sample difference test, hedonic rating test, numerical scoring test, composite scoring test
 - Sensitivity tests- Sensitivity-threshold test, dilution test

- Descriptive tests
- Limitations of sensory evaluation

UNIT II

1. Objective Assessment of Food Quality

- Rheological characteristics of food
- Objective evaluation- Advantages, disadvantages, different methods-physical, chemical, physicochemical, microscopic examination

2. Physical Properties & Physiochemical Changes in Foods

- Water: Types of water in foods- bound & free water
- Water activity and food spoilage
- Colloidal systems and its application to food preparation
- Solutions, sols, gels & suspensions
- Emulsions and foams

3. Product Development and Standardization of Recipes

- Product development process & steps of product development
- Standardization process, definition & benefits of food standardization, product adaptation

UNIT III

1. Sugar & Related Products

- Properties of sugar, jaggery & honey
- Sugar & Jaggery Cookery- Crystallization, factors affecting crystallization
- Stages of sugar & jaggery cookery, Caramelization of sugar & jaggery, Interfering agents & crystal formation
- Crystalline candies- Fudge & fondant
- Non-crystalline candies- Caramels & brittles
- Sugar substitutes- effect on cookery

2. Food Additives

- Use & need of food additives in food industry
- Types of additives - Preservatives, antioxidants, chelating agents/Sequestrants, colouring agents, curing agents, emulsifying agents, flavour enhancers, floor improvers, humectants, anti-caking agents, nutrient supplements, non-nutritive sweeteners, bleaching agents, leavening agents, pH control agents, preservatives, stabilizers, thickeners & other additives

- Additives & food safety
- Salt substitutes- effect on cookery

3. Food Preservation

- Food spoilage, Methods & principles of food preservation
- Food preservation by low & high temperature, Effect of food preservation on food quality
- Preservation by chemical agents, preservation by osmosis & preservation by irradiation

UNIT IV

1. Flours & Starches

- Composition & structure of cereals & millets
- Wheat- composition, types, milling & effects of milling, types of flours, products of wheat, formation of dough from wheat flour & baking quality
- Rice- composition, milling, parboiling, rice products
- Oats, barley, maize, jowar, bajra, ragi & quinoa
- Gluten-Development of gluten, factors affecting development of gluten
- Cereal starch- Sources of starch & their properties, Gelatinization, Factors affecting gelatinization, Changes in cooking starches
- Dextrinization
- Parboiling of rice and malting of grains, puffed and flake cereals

2. Leavening Agents

- Types of leavening agents - Steam, Air, Carbon dioxide
- Baking powder: Types of baking powder, Baking soda & Sour milk
- Yeast
- Batters & Doughs, Cakes, Biscuits & Breads - Ingredients & their functions and methods of preparation

3. Fermented Foods

- Process of fermentation, Advantages of fermentation, cereal based, pulse based & fruit based & vegetable based fermented foods

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INTERNAL ASSESSMENT (THEORY):

1. Attendance

2. Assignments
3. Presentations/Field Work/Visits
4. Periodic Tests/Quizzes
5. In-class Work/Class Discussion/Exploratory Activities/Speaking -Listening Activities
/Participatory Activities

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MFN1P2	PRACTICAL
Marks: 60	
Internal Assessment: 40	

PRACTICALS:

- **Use of measuring techniques and devices, weight and measures of different foods.**
- **Sensory Evaluation** - detection of primary flavour and sensitivity, threshold tests-triangle test, paired comparison, scoring test, ranking test.
- **Objective Methods** - ink print, percent sag, seed displacement.
- **Sugar and Jaggery Cookery** - Relative sweetness, solubility and size of sugar, stages of sugar cookery, caramelization, crystallization, factors affecting crystal formation.
- **Starches, Vegetable Gums and Cereals** -dextrinization, gelatinization, retrogradation, thickening powder. Factors affecting gels. Gluten formation and factors affecting gluten formation.
- **Leavened Products:** fermentation - use of micro organisms (lactic acid, yeast), steam as an agent, egg as an agent, chemical agents.

INTERNAL ASSESSMENT (PRACTICAL):

1. Attendance
2. Planning
3. Laboratory Work
4. Practical Manual
5. Market Survey related to current trends in Advanced Food Science (food processing technologies/food packaging technologies/food safety/quality control etc)

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REFERENCES:

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- Belle Lowe (1963) : Experimental Cookery, John Wiley And Sons Inc., New York
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FOOD SCIENCE AND NUTRITION
SEMESTER - I
PAPER 3
ELECTIVE 1
INSTITUTIONAL FOOD ADMINISTRATION

MFN1T3

Marks: Theory: 60
Internal Assessment (Theory): 40

Objectives:

- To develop a knowledge base in key areas of Institutional Food Administration.
- To provide practical field level experience in Institutional Food Administration.
- To impart necessary expertise to function as a Food Service Manager.
- To equip individuals to start their own food service unit leading to entrepreneurship.
- To develop critical abilities and provide basic grounding in research techniques.

Contents

UNIT I

1. Development of Food Service Systems

- History and Development, Factors Affecting Development of Food Service System

2. Types of Catering Services

- Commercial and Non- commercial

3. Food Management

- Principles & factors affecting menu planning, Writing, construction & display of menus
- Types of menus –Table d' hote, A la Carte, Other types

4. Catering Management

- Functions of Management
- Tools of Management – Organization Chart, Job Description, Job Specification, Work Schedule, Job Analysis, Training

UNIT II

1. Types of Food Services in Food Service Establishments

- Table Service, Assisted Service, Self Service, Single Point Service, Specialized Service
- **Methods of Delivery Service Systems:** Centralized and Decentralized Delivery System

2. Food Production System: Standardization of recipes, Principles involved in construction of recipes in large scale cooking
3. Large Quantity Cooking Techniques and Utilization of Left Over Foods

UNIT III

1. Layout and Design

- Definition of layout and design, Factors affecting layout and design
- Size and type of kitchens, designing, layouts & work centers of kitchens,
- Storage in kitchens, Work simplification

2. Equipments

- Classification, care and maintenance of equipments
- Factors affecting selection of equipments
- Purchasing methods of equipments

3. Purchasing, Receiving and Storage of Commodity

- Purchasing activity, Methods of Buying, Receiving & Delivery
- Delivery Procedure and Receiving Procedure
- Types of Storage, Storekeeping and Store Records, Maintenance of Food Quality in Storage

4. Entrepreneurship in Food Service Management

- Perspective of Entrepreneurship, Defining-Entrepreneurship, Entrepreneur
- Characteristics of successful entrepreneurs
- Approaches to entrepreneurship development

UNIT IV

1. Cost Accounting

- Budget, Types of Budget
- Purchase, Receiving, Storage, Production, Service, Income and Expenditure Record

2. Reviewing Actual Performance Reports

- Daily Food Cost Report, Cumulative Food Cost Report, Daily Cumulative Food Cost Report, Profit and Loss Statement

3. Cost Control

- Factors affecting cost control, Importance & components of costing, Breakeven analysis, Determining selling price of food, Checklist for cost control

4. Staff Recruitment

- Sources of recruitment, Selection, Induction, Staff Training, Supervision, Performance Appraisal, Motivation, Wages and other compensations, Labor laws and other legal aspects

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INTERNAL ASSESSMENT (THEORY):

1. Attendance
2. Assignments
3. Presentations/Field Work/Visits
4. Periodic Tests/Quizzes
5. In-class Work/Class Discussion/Exploratory Activities/Speaking -Listening Activities /Participatory Activities

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REFERENCES:

- Bali P. S. (2021): Food Production Operations. OUP India Publication.
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FOOD SCIENCE AND NUTRITION
SEMESTER - I
PAPER 3
ELECTIVE 2
NUTRITION AND WOMEN HEALTH

MFN1T3

Marks: Theory: 60
Internal Assessment (Theory): 40

Objectives:

This course aims to enable students to:

1. Be acquainted with the nutritional status of women.
2. Understand how various factors influence the health and nutritional status of women.
3. Plan and undertake various activities to improve the status of women.
4. Understand how health of women influences family, community and national development.

Contents

Unit I

1. Current Nutrition and Health Status of Women in India.
2. Women in Family and Community
 - Demographic changes, menarche, marriage, fertility, morbidity, mortality, life expectancy, sex ratio, aging and widowhood, female-headed families.
3. Women and Work
 - Environmental stress, production activities, nutrition, health and gender, living conditions, occupational health, health facilities.

Unit II

1. The Importance of Nutrition for Women's Health: Nutrition Issues for Women, Nutrition for Women at Every Age
2. Women's nutritional requirements and food needs. Dietary Choices for women at Every Age. Nutritional deficiency disorders among women.
3. Women and Society
 - Women's role, their resources and contribution to family and community and effect on nutritional status.
 - Effect of urbanization on women.
 - Impact of economic policies, industrialization and globalization on women.

Unit III

1. Women and Health
 - Health facilities
 - Disease patterns and Reproductive health
 - Health seeking behaviour
2. Women- pregnancy and lactation
 - Safe motherhood
 - Care of at-risk mothers
 - Family Planning
3. Women and aging- Menopause, osteoporosis, chronic degenerative diseases, neurological problems.
 - Women and AIDS

Unit IV

1. Women and Nutrition
 - Situation of women in global, national and local context. Improving the nutritional and health status.
2. Policies and Legislations
3. Empowerment of Women
 - Role of Education

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INTERNAL ASSESSMENT (THEORY):

1. Attendance
2. Assignments
3. Presentations/Field Work/Visits
4. Periodic Tests/Quizzes
5. In-class Work/Class Discussion/Exploratory Activities/Speaking -Listening Activities /Participatory Activities

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2. Census Reports, Government of India.
3. Bamji M.S., Prahalad Rao N., Reddy V.: Text Book on Human Nutrition, Oxford & IBM Publishing Co., Pvt. Ltd., New Delhi & Calcutta.
4. Proceedings of Nutrition Society of India, NIN, Hyderabad.
5. Technical Reports of WHO.

6. Technical Reports of ICMR, New Delhi.
7. Food & Nutrition Board, National Plan of Action on Nutrition, Department of Women and Child Development, Ministry of HRD, Govt. of India.
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9. Indian Agriculture Year Book (2006): Govt. of India Publication, Ministry of Agriculture, Government Press, New Delhi.
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FOOD SCIENCE AND NUTRITION
SEMESTER - I
PAPER 4
RESEARCH METHODS AND STATISTICS

MFN1T4

Marks: Theory: 60

Internal Assessment (Theory): 40

Objectives:

- To understand the significance and research methodology in Home Science research.
- To understand the types, tools and methods of research and develop the ability to construct data gathering instruments appropriate to the research design.
- To understand and apply the appropriate technique for the measurement scale and design.

UNIT I

- Definition, types & process of research
- Defining the research problem & formulation of research hypotheses
 - Hypothesis testing- A general procedure for hypothesis testing, One-tailed and two-tailed tests, Errors in hypothesis testing
- Research design- Meaning & types
 - Sampling considerations & concepts- Sampling vs non-sampling error, Probability & non-probability sampling design, Determination of sample size
- Estimation and confidence intervals- Point & interval estimation

UNIT II

- Concept & scope of statistics
 - Classification of data- Types of classification, Formation of discrete & continuous frequency distribution
 - Tabulation of data- General rules for tabulation, parts of a table & types of tables
- Diagrammatic and graphic presentation
 - General rules for constructing diagrams & graphs, types of diagrams & graphs
 - Graphs of frequency distributions
- Measures of central tendency- Mean, Median & Mode
- Measures of dispersion- Range, Quartile deviation & Standard deviation
- Students 't' test for small samples- Testing differences in means

- Large sample test (C. R. Test) for testing significance of difference between mean of two groups

UNIT III

- Normal distribution curve and probability- The meaning and importance, Measurement of normal probability distribution, Skewness & Kurtosis
- Analysis of variance (ANOVA)- One way & two way
- Chi-square test
 - Types- Equal probability type, Normal distribution type, 2 X 2 contingency tables type, Chi-square test of independence
- Correlation analysis- Significance & Types
 - Methods of studying correlation- Scatter diagram method, Karl Pearson's coefficient of correlation & Rank method
- Regression analysis- Types of regression models
 - Methods to determine regression coefficients- Method of normal equations & Deviations method

UNIT IV

- Literature search- Referencing, Abstracting, Bibliography
- Measurement and scaling- Classification of measurement scales & scaling techniques
- Questionnaire designing- Criteria & design procedure
- Data collection- Collection of primary & secondary data
- The writing process- Parts of dissertation/Research report/article
 - Abstract, Introduction, Review of literature, Materials and methods, Results and discussion, Summary and conclusion, Bibliography & Recommendations
- Computer applications in data analysis
 - Use of MS-Office for research, Graphic representation & Use of SPSS for data analysis

INTERNAL ASSESSMENT (THEORY):

1. Attendance
2. Assignments
3. Presentations/MS-Office Work
4. Periodic Tests/Quizzes
5. In-class Work/Class Discussion/Exploratory Activities/Speaking -Listening Activities /Participatory Activities

REFERENCES:

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- Trochim, W. Research Methods: The Concise Knowledge Base, Atomic Dog Publishing Inc., 2004.
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FOOD SCIENCE AND NUTRITION
SEMESTER - II
PAPER 5
ADVANCED NUTRITIONAL BIOCHEMISTRY - II

MFN2T5

Marks: Theory: 60
Internal Assessment (Theory): 40
Practical: 60
Internal Assessment (Practical): 40

Objectives:

- Augment the biochemistry knowledge acquired at the undergraduate level. Understand the mechanism adopted by the human body for the regulation of metabolic pathway.
- Get an insight to interrelationship between various metabolic pathways. Become proficient for specialization in nutrition.
- Understand integration of cellular level metabolic events to nutritional disorders imbalance

Contents

Unit I

- 1 The concept of pH, dissociation and ionization of acids and bases, pKa, buffers and buffering mechanism, Henderson Hasselbalch equation
- 2 Chromatography: Principles and application of adsorption, partition and ion-exchange chromatography, gel filtration, affinity and high performance liquid chromatography
- 3 Molecular weight determination of macromolecules (in particular proteins) by gel filtration chromatography, gel electrophoresis and ultracentrifugation
- 4 Spectrophotometry: Beer-Lamberts law, extinction coefficient and its importance, design of colorimeter, spectrometer and spectrophotometer
- 5 Principles of atomic absorption spectrophotometry and its application in Nutritional Biochemistry

Unit II

- 1 Mechanism of enzymes action: Multienzymes system, Mechanism of action and regulation of pyruvate dehydrogenase and fatty acid synthetase complex, Coenzyme action
- 2 Enzyme regulation: General mechanisms of enzyme regulation, Allosteric enzymes, sigmoidal kinetics and their physiological significance, Symmetric and sequential

modes for action of allosteric enzymes.

- 3 Enzymes in differential diagnosis of diseases and their clinical significance.

Unit III

- 1 Modes of Hormones action and role in metabolism: Hormones of Pancreas, Pituitary, Adrenal, Thyroid, Sex hormones.
- 2 Bioenergetics: Electron Transport Chain, oxidative Phosphorylation and synthesis of ATP.

Unit IV

- 1 Composition and function of blood, plasma and blood corpuscles, functions of plasma proteins, structure and function of haemoglobin, abnormal haemoglobin.
- 2 Blood coagulation – mechanism and regulation. Blood groups.
- 3 Regulation of water and electrolyte balance, role of kidneys and hormones in their maintenance. Hydrogen ion homeostasis, acid-base balance- metabolic and respiratory acidosis and alkalosis.

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INTERNAL ASSESSMENT (THEORY):

1. Attendance
 2. Assignments
 3. Presentations/Field Work/Visits
 4. Periodic Tests/Quizzes
 5. In-class Work/Class Discussion/Exploratory Activities/Speaking -Listening Activities /Participatory Activities
- =====

MFN2P3	PRACTICAL
Marks: 60	
Internal Assessment: 40	

PRACTICALS:

- Determination of cholesterol in blood
- Determination of Serum Acid Phosphatase Activity by Guttman & Guttman
- Method determination of Alkaline Phosphatase
- Estimation of Serum Amylase Activity in the given serum sample
- Determination of Blood Urea by Nesslerisation Method
- Determination of Serum Uric Acid by Henry Caraway's Method
- Determination of Serum Glutamate Pyruvate Transaminase (SGPT) (E.C. No. 2.6.1.2)
- Determination of Serum Glutamate Oxaloacetate Transaminase (SGOT) (E.C. No. 2.6.1.1)

INTERNAL ASSESSMENT (PRACTICAL):

1. Attendance
2. Planning
3. Laboratory Work
4. Practical Manual
5. Hands-on Training & Report Making on Laboratory Instruments: Operation & Functioning/Lab Visits

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REFERENCES:

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FOOD SCIENCE AND NUTRITION
SEMESTER - II
PAPER 6
ADVANCED FOOD SCIENCE - II

MFN2T6

Marks: Theory: 60
Internal Assessment: 40
Practical: 60
Internal Assessment: 40

Objectives:

- To study scientific principles involved in food preparation and evaluation.
- To acquire knowledge regarding processing of foods.
- To understand the principles underlying newer techniques of food preservation and packaging.

Contents

UNIT I

1. Pulses & Legumes

- Composition, Methods of processing & cooking, Effects of soaking, germination & fermentation, Toxic constituents

2. Oilseeds and Nuts

- Composition, Oil extraction & by-products, Role in cookery, Toxic constituents

3. Fats & Oils

- Composition & physical properties of fats & oils, Processing of fats & oils: rendering, pressing, solvent extraction, refining & hydrogenation & deterioration of fats
- Butter, lard, margarine, unconventional oils & fat substitutes - Role in cookery

UNIT II

1. Milk & Milk Products

- Composition & properties of milk, Types of milk, Processing of milk-Clarification, Pasteurization, Homogenization, Ultra Heat Treatment System (UHTS), Effect of heat & acid on milk protein
- Composition & processing of curd, cheese, paneer, concentrated and dried milk products, Milk substitutes

2. Vegetables and Fruits

- Classification, Composition, Selection & Storage of vegetables & fruits, Colour pigments, Textural changes during maturing/ripening & processing, Pectic substances, Processing of vegetables & fruits
- Browning reactions-Enzymatic & Non-enzymatic, Prevention of browning

UNIT III

1. Eggs

- Structure & composition, Egg Quality: evaluation of egg quality, egg grading, deterioration of egg quality & egg storage, Changes during storage, Effect of heat on egg proteins, Egg foams: egg beating factors influencing foaming, Factors affecting coagulation of egg protein, Use of egg as binding, foaming & emulsifying agent, Methods of cooking eggs

2. Meat, Poultry and Fish

- Structure & composition of meat, Classes of meat, Ripening of meat, Tenderizing of meat, Changes on cooking meat by dry & moist heat methods, Curing & smoking of meat, cuts & grades
- Structure & composition of meat & chicken, Ripening of meat, Tenderizing of meat & chicken, Changes on cooking meat & chicken by dry & moist heat methods, Curing & smoking of meat & chicken
- Types of fish, Composition, Fish spoilage, Preservation & processing, Criteria for fish selection, Changes during heat treatment, Fish products-fish meal, fish protein concentrate & fish oils

UNIT IV

1. Spices & Aromatics

- Functions of spices & herbs, Specific spices & herbs, Processing & storage, Role of spices & herbs in cookery

2. Beverages & Appetisers

- Classification & Processing of Beverages-Tea, coffee, cocoa, chocolate, fruit beverages, soups, vegetable juices, milk based beverages, malted beverages, carbonated non-alcoholic beverages & alcoholic beverages, other beverages

3. Convenience Foods

- Types, Techniques of instant mixes, Extruded foods/snacks

4. Organic Foods

- Organic farming, Characteristics of organic foods, Principles, types, advantages & limitations of organic farming, Certification of organic products

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INTERNAL ASSESSMENT (THEORY):

1. Attendance
 2. Assignments
 3. Presentations/Field Work/Visits
 4. Periodic Tests/Quizzes
 5. In-class Work/Class Discussion/Exploratory Activities/Speaking -Listening Activities /Participatory Activities
- =====

MFN2P4	PRACTICAL
Marks: 60	
Internal Assessment: 40	

PRACTICALS:

- **Jams and Jellies:** Effect/role of acid, pectin and sugar in jam and jelly formation. Use of gums as emulsifiers/stabilizers.
- **Fats and Oils:** Physical properties of fats & oils- Flash point, melting point, softening point, slipping point, & smoking point of different fats & oils. Role of fats and oils in cookery as: shortening agent & frying medium. Factors affecting fat absorption. Fat crystals. Plasticity of fat. Permanent and semi-permanent emulsions.
- **Milk and Milk Products:** Scalding & denaturation of milk. Effect of acid, alkali, sugar, salt, heat & enzymes on milk, khoa, curd, paneer & cheese.
- **Egg:** Assessment of egg quality. Use of egg in cookery-emulsions, air incorporation, thickening, binding & gelling. Methods of egg cookery and effect of heat. Egg white foams and factors affecting foams.
- **Pulses & Legumes:** Effect of different cooking and processing methods on various characteristics & functional properties of pulses & legumes.
- **Meat and Poultry:** Methods affecting tenderness of meat & chicken, Effect of various methods of cooking and ingredients on colour, texture, aroma, and water holding capacity of meat & chicken.
- **Fish:** Effect of different cooking methods on various fish.
- **Gelatin:** Gel formation, gel strength and factors affecting gelatin gel formation.

Ability of gelatin to foam.

- **Fruits and Vegetables:** Pigments-Effect of cooking, metal ions & pH. Effect of various cooking methods on different characteristics of vegetables & fruits. Prevention of enzymatic browning in fruits & vegetables.
- **Beverages:** Factors affecting quality of beverages.

INTERNAL ASSESSMENT (PRACTICAL):

1. Attendance
2. Planning
3. Laboratory Work
4. Practical Manual
5. Market Survey related to current trends in Advanced Food Science (food processing technologies/food packaging technologies/food safety/quality control etc)

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REFERENCES:

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FOOD SCIENCE AND NUTRITION
SEMESTER - II
PAPER 7
ELECTIVE 1
FOOD SAFETY AND QUALITY CONTROL

MFN2T7

Marks: Theory: 60
Internal Assessment (Theory): 40

Objectives:

This course will enable the students to:

1. To gain the knowledge of quality of food by imparting better nutrition and quality concepts.
2. To understand the importance and implementation of quality control & food safety in food industry.
3. To be the entrepreneurs and develop the capacity for setting up small scale enterprises.

Contents

Unit I

- Definition & concept of food quality & food safety
- Importance of food safety in the food processing industry: Aspects of food safety
- **Concept of Quality Attributes:** Physical, chemical, nutritional, microbial, and sensory.
- **Principles of Quality Control:** Application of quality assurance in food industry

Unit II

- **Food Adulteration:** Types of adulterants & Methods of detection of adulterants in foods
- **Food Contaminants:** Introduction, Types of food contaminants (microbial contamination, chemical contamination, physical contamination, allergen contamination) & Methods of preventing food contaminants
- **Packaging Hazards:** Introduction, Types of food packaging materials, Packaging quality control & Health hazards
- **Food Labeling:** Definition, Importance, Components & Requirements of food label

Unit III

- **Quality Management:** Concepts of quality management. Quality management system in India

- **Food Safety Management Systems Programmes**

- Personal hygiene program, Food safety training program, Supplier selection and specification program, Quality control and assurance programs, Cleaning and sanitation program, Standard operating procedures (SOPs), Facility design and equipment maintenance program.

- **HACCP (Hazard Analysis and Critical Control Points):** Introduction, Definition, Principles, Uses, Role of HACCP in food industry
- **GMP (Good Manufacturing Practices)**
- **GHP (Good Hygiene Practices)**
- **GLP (Good Laboratory Practice)**
- **GAP (Good Agricultural Practices)**
- **Sanitation and Safety:** Standards, Policies and Schedules, Sanitation in Food Services, Sanitation and Public Health, Plant Sanitation and Safety

Unit IV

- National & International Food Regulatory Agencies, General food laws and food safety regulations, Nutritional labeling regulation (mandatory and optional nutrients, nutritional descriptors and approved health claims)
- National & International Food Standards
- Indian & International quality systems and standards like ISO and Food Codex
 - Food Safety & Standards Authority of India (FSSAI)
- **Food Laws and Regulations:** Introduction & importance to food laws, National and International food laws
- Food Security Programmes
 - Good Manufacturing Practices (GMP)
 - Hazard Analysis and Critical Control Points (HACCP)

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INTERNAL ASSESSMENT (THEORY):

1. Attendance
 2. Assignments
 3. Presentations/Field Work/Visits
 4. Periodic Tests/Quizzes
 5. In-class Work/Class Discussion/Exploratory Activities/Speaking -Listening Activities /Participatory Activities
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REFERENCES:

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FOOD SCIENCE AND NUTRITION
SEMESTER - II
PAPER 7
ELECTIVE 2
PEDIATRIC AND GERIATRIC NUTRITION

MFN2T7

Marks: Theory: 60
Internal Assessment (Theory): 40

Objectives:

This course will enable the students to:

1. Understand the process of growth and development of an infant.
2. Get familiar with the nutritional needs at this stage.
3. Understand the concept of growth promotion.
4. Familiarize the students with the multifaceted aspects of ageing.
5. Make the students competent for nutritional and health care of the elderly.

Contents

Unit I

1. Nutrition during Infancy

Infant physiology relevant to feeding and care.

Breast feeding- Colostrum, its composition and importance in feeding.

Initiation of breast feeding and duration of breast feeding.

2. Advantages of exclusive breast feeding.

Introduction to complementary foods, initiation and management of weaning, breast feeding, Preservation of breast milk (use of cold storage, breast milk bank etc).

3. Bottle feeding- circumstances under which bottle feeding is to be given. Care and sterilization of bottles.

Unit II

1. Immunization schedule for infants and children.

2. Growth and development - Importance of nutrition for ensuring adequate growth and development.

3. Growth monitoring and promotion – Use of growth charts and Standards Prevention of growth faltering.

4. Management of preterm and low birth weight infants.

5. Feeding children with special needs.

6. Nutrition and health care programmes for the children.

Unit III

1. The ageing process- physiological, biochemical and body composition changes.
2. Nutritional requirements of the elderly and dietary management. Nutritional deficiency disorders

Unit IV

1. Chronic degenerative diseases and nutritional problems of the elderly.
2. Policies and programmes of the government and NGO sector pertaining to the elderly.

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INTERNAL ASSESSMENT (THEORY):

1. Attendance
2. Assignments
3. Presentations/Field Work/Visits
4. Periodic Tests/Quizzes
5. In-class Work/Class Discussion/Exploratory Activities/Speaking -Listening Activities /Participatory Activities

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REFERENCES:

1. Park, K.: Preventive and Social Medicine, Banarsidas Publishers, Jabalpur.
 2. Jelliffe D.B. (1965): Infant Nutrition in Tropics and Sub-tropics, WHO, Geneva
 3. Bamji M.S., Prahalad Rao N., Reddy V.: Text Book on Human Nutrition, Oxford & IBM Publishing Co., Pvt. Ltd., New Delhi & Calcutta.
 4. Proceedings of Nutrition Society of India, NIN, Hyderabad.
 5. Technical Reports of WHO.
 6. Technical Reports of ICMR, New Delhi.
 7. Food & Nutrition Board, National Plan of Action on Nutrition, Department of Women and Child Development, Ministry of HRD, Govt. of India.
 8. Gopalan C.: Combating Under Nutrition- Basic Issues and Practical Approaches, Nutrition Foundation of India, New Delhi.
 9. Indian Agriculture Year Book (2006): Govt. of India Publication, Ministry of Agriculture, Government Press, New Delhi.
 10. The Management of Nutrition in Major Emergencies (2002): WHO, Published by AITBS Publishers, New Delhi.
 11. Gupta Piyush (2010): Textbook of Preventive and Social Medicine, CBS Publishers Pvt Ltd. New Delhi.
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FOOD SCIENCE AND NUTRITION
SEMESTER - II
ON JOB TRAINING/ FIELD PROJECT/ INTERNSHIP

MFN2I

Total Marks: 100

- Four weeks internship in food industry/recognized research laboratory is compulsory after semester-II.
- Internship must be completed within four weeks of its commencement without break.
- 75% attendance of students in semester- I & II is compulsory to do internship.
- Internship will be comprised of 120 hours.
- The students will have to undertake the internship in the subsequent week after the completion of theory examination.
- Students must confirm their internship with the letter of confirmation from the organization two weeks before the end term examination.
- **Mechanism of Evaluation:**
 - The internship will be evaluated on the basis of regularity, punctuality, technical skills, presentation & domain knowledge of students.
 - After completion of internship, it is mandatory for all students to give presentation and submit the report with certificate.

FOOD SCIENCE AND NUTRITION
SEMESTER - III
PAPER 8
CLINICAL AND THERAPEUTIC NUTRITION - I

MFN3T8

Marks: Theory: 60
Internal Assessment (Theory): 40
Practical: 60
Internal Assessment (Practical): 40

Objectives:

The course will enable the students to:

- Understand the role of dietitian/nutritionist in preventive, promotive & curative health care.
- Understand the etiology, physiologic and metabolic anomalies of acute and chronic diseases and patient needs.
- Know the effects of various diseases on nutritional status and nutritional and dietary requirements.
- Be able to recommend and provide appropriate nutritional care for prevention and treatment of the various diseases.
- Provide practical laboratory training in the preparation of special diets.
- Understand the modifications of normal diet for therapeutic purposes.
- Provide exposure to actual hospital situation & to study the types of cases admitted & their biochemical, clinical and dietary histories.

Contents

UNIT I

1. Definition & Classification of Dietitians & Nutritionists in Health Care

- Dietetics - the Science & Art of human nutrition care
- Role & responsibilities of dietitians & nutritionists in health care
- Adaptation of therapeutic diets
- Therapeutic diets – Definition, Types of dietary adaptations for therapeutic needs, Normal nutrition - a base of therapeutic diet, Constructing therapeutic diets
- Routine hospital diets/types of therapeutic diets
 - Normal / General diets, Liquid diets, Soft diets, Bland diets & Other therapeutic diets for various disease conditions

2. Nutritional Screening and Assessment of Nutritional Status of Hospitalized and Outdoor Patients

- Identification of high risk patients
- Assessment of patient needs based on interpretation of patient data: - clinical, biochemical, biophysical, personal etc.

3. Newer Trends in Delivery of Nutritional Care and Dietary Counselling

- Nutritional care plan - Development of a plan, Implementation of nutritional care, Monitoring & Evaluation of nutritional care, Nutritional care record
- Care Management Strategies - Care management, Patient- focused care
- Counselling for change - Counselling techniques & Stages of change

4. Diet, Nutrient and Drug Interaction

- Effect of drugs on ingestion, digestion, absorption and metabolism of nutrients.
- Effect of foods, nutrients and nutritional status on drug dosage and efficacy.

5. Nutrition for Weight Management

- Components of body weight, Regulation of body weight
- **Obesity-** Prevalence, Etiology, Classification, Assessment, Metabolic aberrations & clinical manifestations, Consequences/risk factors, Dietary modifications, Lifestyle modifications, Pharmaceutical management, Surgical management, Preventive aspects
- **Underweight-** Etiology, Classification, Assessment, Metabolic aberrations & clinical manifestations, Dietary management

UNIT II

1. Nutrition in Eating Disorders

- **Anorexia Nervosa & Bulimia Nervosa-** Diagnostic criteria, Etiology, Clinical characteristics, Medical complications, Nutritional assessment, Nutritional management, Psychological management, Nutrition education

2. Nutrition Therapy for Upper Gastro Intestinal Tract Disorders

Etiology, signs & symptoms, Diagnostic criteria, Complications, Medical Nutrition Therapy for upper gastro intestinal tract disorders ---

- **Disorders of Oesophagus-** Oesophagitis, Hiatal Hernia
- **Disorders of Stomach-** Indigestion/Dyspepsia, Gastritis, Peptic Ulcer, Dumping Syndrome

3. Nutrition Therapy for Lower Gastro Intestinal Tract Disorders

- Etiology, signs & symptoms, Diagnostic criteria, Complications, Medical Nutrition Therapy for lower gastro intestinal tract disorders ---
- **Disorders of Small Intestine and Colon-** Intestinal Gas and Flatulence, Constipation, Diarrhoea, Steatorrhoea, Celiac Disease, Irritable Bowel Syndrome, Diverticular Disease
 - Inflammatory Bowel Diseases: Ulcerative Colitis, Crohn's Disease

UNIT III

1. Nutrition Therapy for Liver, Biliary System and Exocrine Pancreas Disorders

Liver Diseases

- Physiology and functions of the liver, Liver function tests
- Etiology, signs & symptoms, Diagnostic criteria, Complications & Medical Nutrition Therapy for liver diseases ---
 - Hepatitis - types
 - Cirrhosis - types, metabolic consequences of alcohol consumption
 - Hepatic Coma - stages

Gall Bladder Diseases

- Physiology and functions of gall bladder, Gall bladder function tests
- Etiology, signs & symptoms, Diagnostic criteria, Complications & Medical Nutrition Therapy for gall bladder diseases ---
 - Cholelithiasis
 - Cholecystitis
 - Acute Cholangitis
 - Cholestasis

Pancreatic Diseases

- Physiology and functions of exocrine pancreas, Pancreatic function tests
- Etiology, signs & symptoms, Diagnostic criteria, Complications & Medical Nutrition Therapy for pancreatic diseases ---
 - Pancreatitis (Acute & Chronic)

2. Nutritional Support

- **Special Feeding Methods:**
 - **Enteral Nutrition:** Enteral access/feeding routes, Types of formulas, Formula composition, Administration/delivery methods, Complications & Monitoring

- **Parenteral Nutrition:** Parenteral access, Parenteral nutrition solutions/ composition, Administration methods, Complications & Monitoring

UNIT IV

1. Hypertension and Coronary Heart Diseases

- **Hypertension**
 - Definition, Classification, Pathophysiology, Causes, Symptoms & Complications
 - Management- Medical Nutrition Therapy & Lifestyle modifications
- **Coronary Heart Diseases (CHD)**

Pathophysiology, Etiology, Diagnostic criteria/Clinical Determination, Complications, Medical Nutrition Therapy, Surgical Management & Lifestyle Modifications for coronary heart diseases ---

 - Dyslipidemias, Atherosclerosis, Angina Pectoris, Myocardial Infarction, Congestive Cardiac Failure, Rheumatic Heart Disease
 - Dietary factors- Fatty acids, Amount of fat, Dietary cholesterol, Fiber, Antioxidants, Calcium etc.

INTERNAL ASSESSMENT (THEORY):

1. Attendance
2. Assignments
3. Presentations/Field Work/Visits
4. Periodic Tests/Quizzes
5. In-class Work/Class Discussion/Exploratory Activities/Speaking -Listening Activities /Participatory Activities

MFN3P7	PRACTICAL
Marks: 60	
Internal Assessment: 40	

PRACTICALS:

1. Standards for hospital diets :

- Food exchange list for use in special diets using common Indian foods.
- Interpretation of diets in common household measures; standardization of measures.
- Determination of raw and cooked weights in selected breakfast, lunch, snacks and dinner recipes; calculation of exchanges in the recipes.

2. Market survey of commercial nutritional supplements and nutritional support substrates

3. Case studies for planning day's diets for various diseases- system-wise.

- Interpretation of patient data and diagnostic tests.
- Calculations of the nutrient requirements for patients based on anthropometric, clinical, biochemical data & diet history of patients suffering from various diseases.
- Planning & preparation of day's diets for patients suffering from various diseases.

INTERNAL ASSESSMENT (PRACTICAL):

1. Attendance
2. Planning
3. Laboratory Work
4. Practical Manual
5. Case study analysis/Surveys related to therapeutic nutritional supplements

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FOOD SCIENCE AND NUTRITION
SEMESTER - III
PAPER 9
COMMUNITY NUTRITION AND PUBLIC HEALTH - I

MFN3T9

Marks: Theory: 60

Internal Assessment (Theory): 40

Objectives:

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

Contents

UNIT I

1. Demographic Profile & Vital Statistics

Demographic Profile: Definition of Demography, Importance of demographic data, Demographic Transition, Demographic Cycle

- Population trends in India: Interstate Variations in population growth rate.
- Density of population: Factors influencing the distribution & density of population
- Age structure: Population Pyramid
- Sex ratio: Reasons for low sex ratio, Social & economic impacts of low sex ratio, Government policies to improve the sex ratio
- Family size
- Literacy and Education
- Life expectancy

2. Vital Statistics: Definition of vital statistics

- Infant Mortality Rate (IMR): Definition of Infant Mortality Rate, Causes of infant mortality, Government's initiative to lower the Infant Mortality Rate
- Birth rate (CBR): Trends of India's birth rate, Sample Registration System (SRS), Registrar General of India

- Fertility rate: General Fertility Rate (GFR), Total Fertility Rate, Total Marital Fertility Rate, General Marital Fertility Rate, Age specific fertility rate (ASFR), Gross Reproduction Rate (GRR), Replacement level of fertility
- Maternal Mortality Rate (MMR): Definition of MMR, Causes of Maternal Death, Government's initiatives to improve maternal health indicators
- Under 5 Mortality Rate (U5MR): Definition, Causes of child mortality, Preventable causes of deaths of U5MR, Solutions to the most preventable causes of U5MR

3. Population Policy

UNIT II

1. Food Production & Sufficiency

- Food production, post-harvest technology, food grain storage
- Food requirements versus food availability

2. Food Security and Food Safety

- Definition of Food Safety & Food Security
- Food Safety Hazards
- Components of Food Security
- Interrelationship of food safety and food security
- Nutrition and food security
- Climate change & Food Security
- India's Food Security System

3. Nutri Garden

- Concept, Principles to design nutri garden, Benefits
- Nutrition Gardens for food security
- School Nutrition Kitchen Garden
- State Initiatives to Promote Kitchen Gardens

4. Food Security Programmes

- Public Distribution System (PDS), Antyodaya Anna Yojana (AAY), Annapurna Scheme, Food for Work Programme.

UNIT III

1. Nutrition Policy and Programme

- Need for Nutrition Policy within the & Development Context
- National Nutrition Policy- aims and objectives

- Nutrition Policy Instruments: Short and long term policies and implementation
- Anganwadi- its management, its role in implementation of nutrition policy programme.
- Functions of Primary Health Centre.

2. Nutrition Programme

- Supplementary feeding programmes (Mid Day Meal Programme), Special Nutrition Programme, Pradhan Mantri Gramodaya Yojana (PMGY), Balwadi Feeding Programme, Composite Nutrition Programme, Applied Nutrition Programme, Rashtriya Kishor Swasthya Karyakram (RKSK), Kishori Shakti Yojna, Nutrition Programme for Adolescent Girls (NPAG), Weekly Iron & Folic Acid Supplementation (WIFS), Wheat Based Supplementary Nutrition Programme (WNP)

UNIT IV

1. Assessment of Nutritional Status

- Methods of Nutritional assessment, anthropometry, growth standards, dietary and clinical assessment, biochemical and radiological assessment

2. Nutrition Monitoring – Objectives & Components of Nutrition Monitoring, Agencies engaged in nutrition monitoring

3. Nutritional Surveillance – Need for nutritional surveillance, Objectives of nutritional surveillance, Uses of Nutrition Surveillance System, Key indicators of nutritional surveillance programme.

INTERNAL ASSESSMENT (THEORY):

1. Attendance
2. Assignments
3. Presentations/Field Work/Visits
4. Periodic Tests/Quizzes
5. In-class Work/Class Discussion/Exploratory Activities/Speaking -Listening Activities /Participatory Activities

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FOOD SCIENCE AND NUTRITION
SEMESTER - III
PAPER 10
ELECTIVE 1
ADVANCED NUTRITION - I

MFN3T10

Marks: Theory: 60
Internal Assessment (Theory): 40

Objectives:

This course is designed to:

- Provide in-depth knowledge of the physiological and metabolic role of various nutrients and their interaction in human nutrition.
- Enable students to understand the basis of human nutritional requirements and recommendations through the life cycle.
- Enable students to understand the pharmacological actions of nutrients and their implications.
- Nutritional problems / nutrition related diseases prevalent among the affluent and the less privileged groups with reference to their incidence, etiology and public health significance.
- Biochemical and clinical manifestations, preventive and therapeutic measures of the nutritional problems.
- Familiarize students with the recent advances in nutrition.

Contents

UNIT I

1. Body Composition

- Levels of body composition
- Body composition measurement techniques
 - Compartmental models of body composition
 - **Direct Methods & Indirect Methods**- Anthropometric indices, Circumference measurements, Skinfold thicknesses, Body volume determination/Underwater weighting (UWW), Isotope dilution method, Bioelectrical impedance analysis (BIA), Dual energy X-ray absorptiometry, (DEXA), Near-infrared interactance, Total body potassium (TBK), Total body protein (TBP), Air displacement plethysmography (ADP), Total body electrical conductivity (TOBEC), Total

body electrical conductivity, Imaging techniques: Magnetic resonance imaging (MRI), Computed tomography (CT scan), Ultrasound measurements

- Significance of body composition measurement

UNIT II

1. Energy Metabolism

- Basic concept of energy
- Regulation of food intake, Factors influencing food intake
- Energy intake- Energy from glucose, protein and fat
- Components of energy requirement
- Factors affecting energy expenditure & requirement
- Methods of estimation of energy expenditure & requirement
- Energy requirements & dietary energy recommendations- Energy requirements in infants, children, adolescents, adults, pregnancy, lactation, elderly, physically active group, disease & trauma cases
- Energy imbalance- Consequences of energy imbalance. Indices for measurement of energy imbalance

UNIT III

1. Carbohydrates

- Classification
- Functions
- Sources
- Digestive fate of dietary carbohydrates
- Absorption and metabolic utilization of carbohydrates
- Regulation of blood glucose concentration
- Dietary management to control blood glucose concentration- Glycemic index, Fructose
- Non glycemic carbohydrates- Dietary fiber, Resistance starch, Fructo oligosaccharides
- Inborn errors of carbohydrate metabolism- Galactosemia, Glycogen storage diseases,

UNIT IV

1. Protein

- Classification - proteins, amino acids
- Functions
- Sources

- Nutritional significance of dietary amino acids
- Digestion, absorption and transport
- Protein synthesis, degradation and turnover
- Factors influencing protein & amino acid requirements
- Protein and amino acid requirements for various age and physiological groups
- Concept of protein quality, methods of measuring protein quality
- Improvement of protein quality of diets.
- Inborn errors of protein metabolism- Phenylketonuria, Maple syrup urine disease

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INTERNAL ASSESSMENT (THEORY):

1. Attendance
2. Assignments
3. Presentations/Field Work/Visits
4. Periodic Tests/Quizzes
5. In-class Work/Class Discussion/Exploratory Activities/Speaking -Listening Activities /Participatory Activities

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FOOD SCIENCE AND NUTRITION
SEMESTER - III
PAPER 10
ELECTIVE 2
NUTRITION AND WEIGHT MANAGEMENT

MFN3T10

Marks: Theory: 60
Internal Assessment (Theory): 40

Objectives:

This course is designed to:

- Provide in-depth knowledge of the physiological and metabolic role of various nutrients and their interaction in human nutrition during weight management.
- Enable students to understand the basis of human nutritional requirements and recommendations during weight management.
- Enable students to understand the pharmacological & surgical interventions during obesity.
- Understand the concept of adequate diet & the importance of meal planning in obesity.
- Nutritional problems / nutrition related diseases prevalent among the affluent and the less privileged groups with reference to their incidence, etiology and public health significance.
- Biochemical and clinical manifestations, preventive and therapeutic measures of the nutritional problems like obesity & underweight.
- Familiarize students with the recent advances in nutrition.

Contents

UNIT I

1. Components of Body Weight

- Adipocytes
 - Types & fat cell development, hypertrophy & hyperplasia
 - Fat storage & transport
- Hunger & Satiety
 - Control of food intake & regulation of body weight
- Energy homeostasis

- Energy expenditure, energy intake, energy balance & weight control (positive energy balance & weight gain, negative energy balance & weight loss)
- Factors affecting energy expenditure
- Regulation of body weight
 - Short term & long term regulation
 - Factors regulating food/energy intake & body weight

UNIT II

1. Obesity

- Prevalence of obesity
- Definition, classification & etiology of obesity
- Assessment of obesity
 - Diagnostic procedures
- Complications of obesity
 - Metabolic syndrome, diabetes mellitus, cardiovascular diseases, musculoskeletal consequences etc.
- Nutritional management of obesity
 - Determination of energy needs
 - Rate & extent of weight loss
 - Dietary modifications-energy restricted diets: moderately energy deficit diet, low & very low energy diets, fasting, low carbohydrate & low fat diets, high fiber diets, fad diets & practices, intake of protein, vitamins, minerals & fluid intake in obesity.
- Childhood & adolescence obesity
 - Prevalence, definition, causes, consequences, treatment & prevention

UNIT III

1. Underweight

- Definition, classification & causes of underweight
- Assessment of underweight
- Complications of underweight
- Nutritional management of underweight

2. Eating Disorders

- Anorexia Nervosa

- Definition, diagnosis, clinical characteristics & complications of anorexia nervosa
- Nutritional management of anorexia nervosa
- Bulimia Nervosa
 - Definition, diagnosis, clinical characteristics & complications of bulimia nervosa
 - Binge eating disorder & obesity
 - Nutritional management of bulimia nervosa
- Psychological management of anorexia nervosa & bulimia nervosa
 - Behaviour management & nutritional counseling

UNIT IV

- **Psychological viewpoints/aspects of obesity**
 - Eating behavioural control
- **Prevention of overweight & obesity**
 - Lifestyle modification
 - Diet counseling & nutrition education
 - Weight management in children
 - Maintenance of reduced body weight
- **Exercise & weight loss**
 - Effect of exercise on obesity & body fat distribution
 - Exercise & use of body fuels
 - Types of exercise for weight reduction
 - Fat utilization & fat mobilization
 - Exercise regime for weight loss & weight maintenance
- **Pharmaceutical management of obesity**
- **Surgical management of obesity**
- **Other methods & techniques of weight reduction**

INTERNAL ASSESSMENT (THEORY):

1. Attendance
2. Assignments
3. Presentations/Field Work/Visits
4. Periodic Tests/Quizzes
5. In-class Work/Class Discussion/Exploratory Activities/Speaking -Listening Activities /Participatory Activities

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FOOD SCIENCE AND NUTRITION
SEMESTER - III
Practical 6
RESEARCH PROJECT (DESIGN)

MFN3P6

Marks: 100

External: 60

Internal: 40

Content:

Course Work will include-----

- Workshop/Lecture/ Hands-on Training for Research Methodology & Statistics
- Workshop/Lecture on Tools & Techniques of Data Collection
- Workshop/Lecture on Collecting Literature Review
- Pilot Study
- Documentation & Presentation of Research Project (Design)

The Research Project (Design) (Semester III) will be continued as Research Project (Major) in Semester IV.

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NUTRITIONAL ASSESSMENT & ANALYTICAL TECHNIQUES-I

Marks: 100

Content:

1. Preparation of questionnaire to conduct the surveys in community----

- Socio-economic data.
- Anthropometric data- Techniques of measurements, validity and reliability.
- Clinical assessment-
- Dietary information- 24 hour's recall, food frequency and weighment of food

2. Assessment of body composition using-

- Anthropometric measurements
- Skinfold measurements
- Body composition analyzer

3. Estimation of bone mineral density

4. Evaluation of protein quality of dishes

- To calculate chemical score & NDP Cal% of dishes

5. Methods of calculation of ideal body weight (IBW).

6. Calculation of energy requirement-

- Calculation of basal metabolic rate (BMR) using different formula
- Calculation of energy expenditure (EE) based on physical activities using-
 - i. Factorial Approach
 - ii. Satyanarayana Method

7. Designing of low energy food products for overweight/obese persons.

FOOD SCIENCE AND NUTRITION
SEMESTER - IV
PAPER 11
CLINICAL AND THERAPEUTIC NUTRITION - II

MFN4T11

Marks: Theory: 60
Internal Assessment (Theory): 40
Practical: 60
Internal Assessment (Practical): 40

Objectives:

The course will enable students to:

- Understand the etiology, physiologic and metabolic anomalies of acute and chronic diseases and patient needs.
- Know the effect of various diseases on nutritional status and nutritional and dietary requirements.
- Be able to recommend and provide appropriate nutritional care for prevention/and treatment of the various diseases.
- Provide practical laboratory training in the preparation of special diets.
- Understand the modifications of normal diet for therapeutic purposes.
- Provide exposure to actual hospital situation; Study the types of cases admitted, their biochemical, clinical and dietary history.

Contents

UNIT I

1. Nutritional Management of Diabetes Mellitus

- Prevalence, Etiology, Symptoms, Types
- Factors affecting normal blood glucose levels, Impaired glucose homeostasis
- Diagnostic and screening criteria for diabetes, Complications of diabetes- macro-vascular and micro-vascular
- Medical Nutrition Therapy for Diabetes Mellitus
 - Meal planning approaches, Food exchange list, Glycemic index of foods, Sweeteners and sugar substitutes
 - Medications - Oral hypoglycemic drugs, Insulin
 - Lifestyle modification

UNIT II

1. Nutritional Management of Renal Diseases

- Physiology & functions of kidney, Kidney function tests
- Etiology, signs & symptoms, Diagnostic criteria, Complications & Medical Nutrition Therapy for kidney diseases ---
 - Glomerulonephritis
 - Nephrotic Syndrome
 - Acute Renal Failure (ARF)
 - Chronic Renal Failure (CRF)
 - Nephrolithiasis/Renal Calculi
- Dialysis - Hemodialysis, Peritoneal dialysis
- Kidney Transplant
- Use of sodium, potassium and phosphorus exchange lists in diet planning for renal cases.
- Psychological support and Lifestyle changes
- Prevention of kidney diseases

UNIT III

1. Nutrition and Cancer

- Development & Characteristics of cancer
- Etiology of cancer
- Metabolic alterations during cancer- Cancer cachexia, Other metabolic abnormalities, Sensory changes
- Clinical manifestations and nutritional problems associated with cancer
- Cancer therapies- Chemotherapy, Radiation therapy, Surgery etc.
- Dietary management of cancer patients and feeding problems related to cancer therapies
- Nutritional considerations- Oral nutritional management, Enteral tube feeding, Total parenteral nutrition
- Cancer prevention

2. Nutrition for Bone Health

- Bone Mass- Measurement of bone mineral density (BMD), Peak bone mass (PBM)
- Nutrition & bone- Calcium, phosphate & vitamin D

- Osteoporosis- Prevalence, types, etiology, pathophysiology & medical nutrition therapy

UNIT IV

1. Nutrition During Stress- The Stress Response

- **Surgery**
 - Physiological response to surgery, Preoperative & postoperative nutritional care in minor & major surgeries, Determination of nutritional support, Nutrition therapy during surgery
- **Burns**
 - Classification of burns, Complications of burns, Calculations for nutrient requirements, Dietary management & mode of nutrition support for burns, Non dietary treatment and wound management of burns
- **Trauma & Sepsis**
 - Physiological response to injury, Metabolic response to injury, Hormonal response to injury, Dietary management in trauma & sepsis (Multiple Organ Dysfunction Syndrome (MODS))

3. Gout

- Pathophysiology, Etiology, Clinical features, Complications and medical nutrition therapy

INTERNAL ASSESSMENT (THEORY):

1. Attendance
2. Assignments
3. Presentations/Field Work/Visits
4. Periodic Tests/Quizzes
5. In-class Work/Class Discussion/Exploratory Activities/Speaking -Listening Activities /Participatory Activities

MFN4P10	PRACTICAL
Marks: 60	
Internal Assessment: 40	

PRACTICALS:

1. Case studies for planning day's diets for various diseases - system-wise.
- Interpretation of patient data and diagnostic tests.

- Calculations of the nutrient requirements for patients based on anthropometric, clinical, biochemical data & diet history of patients suffering from various diseases.
 - Planning & preparation of day's diets for patients suffering from various diseases.
- 2. Preparation of diet counselling aids for common disorders.**
 - 3. Six-week internship in hospital providing hospital diets under the care of registered dietitian.**

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INTERNAL ASSESSMENT (PRACTICAL):

1. Attendance
2. Planning
3. Laboratory Work
4. Practical Manual
5. Diet Counselling Aid/Case study analysis/Surveys related to therapeutic nutritional supplements

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FOOD SCIENCE AND NUTRITION
SEMESTER - IV
PAPER 12
COMMUNITY NUTRITION AND PUBLIC HEALTH - II

MFN4T12

Marks: Theory: 60

Internal Assessment (Theory): 40

Objectives:

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

Contents

UNIT I

1. **Nutrition and Infection-** Effect of nutrition on human body immune system, Introduction to immune system, types of immunity.
2. Vicious cycle of malnutrition & infection, immune response to infection, effects of malnutrition on immunity.
3. **HIV/AIDS-** Signs & Symptoms, transmission, risk factors, diagnosis, prevention, treatment, National Programmes

UNIT II

1. **Nutrition Education**
 - Importance of nutrition education. Objectives of nutrition education. Scope of nutrition education.
 - Components of nutrition education programmes.
2. **Nutrition Education Approaches-** Conventional approaches, Current approaches, Social marketing approaches, Community based approaches.
 - Planning a community nutrition education programme- Preparation, Formulation. Implementation and Evaluation.
3. **Training the change agents in nutrition education and the role of different sectors-** Agricultural extension workers, Health workers, Community Specialists and Media Journalists, Advocacy and training for policy- and decision – makers.

- Methods of imparting nutrition education – design messages, mass media, traditional methods.

UNIT III

1. **Problems in Human Nutrition** – Protein energy malnutrition, obesity, underweight, anemia, vitamin A deficiency, iodine deficiency, rickets, osteomalacia and osteoporosis, fluorosis.
2. **Strategies to combat Nutritional Deficiencies** – Food fortification, Food enrichment, Nutrition and health education, vitamin A prophylaxis programme, prophylaxis against nutritional anemias, control of iodine deficiency disorders.

UNIT IV

1. **Natural /manmade disasters resulting in emergency situation**
 - Types of Disasters
 - **Famine:** Famine & public health, effects on physical health & economy, **Drought:** Classification & effects, **Flood:** Types & causes of flood, Effects of flooding, **Earthquake:** Impacts of earthquakes, **Cyclone:** Types of cyclone & effects on public health, **War and Political Emergencies:** Definition of war, Types of political emergencies.
2. **Assessment and surveillance of nutritional status in emergency affected population**
 - Indicators of malnutrition, clinical signs for screening acute malnutrition. Reasons for measuring malnutrition in emergencies
3. **Nutritional relief and rehabilitation**
 - Assessment of food needs
 - Mass & supplementary feeding
 - Local foods in rehabilitation
 - Scarcity ratio

INTERNAL ASSESSMENT (THEORY):

1. Attendance
2. Assignments
3. Presentations/Field Work/Visits
4. Periodic Tests/Quizzes
5. In-class Work/Class Discussion/Exploratory Activities/Speaking -Listening Activities

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FOOD SCIENCE AND NUTRITION
SEMESTER - IV
PAPER 13
ELECTIVE 1
ADVANCED NUTRITION - II

MFN4T13

Marks: Theory: 60
Internal Assessment (Theory): 40

Objectives:

This course is designed to:

- Provide in-depth knowledge of the physiological and metabolic role of various nutrients and their interaction in human nutrition.
- Enable students to understand the basis of human nutritional requirements and recommendations through the life cycle.
- Enable students to understand the pharmacological actions of nutrients and their implications.
- Nutritional problems / nutrition related diseases prevalent among the affluent and the less privileged groups with reference to their incidence, etiology and public health significance.
- Biochemical and clinical manifestations, preventive and therapeutic measures of the nutritional problems.
- Familiarize students with the recent advances in nutrition.

Contents

UNIT I

1. Lipids

- Classification - fats and fatty acids
- Functions
- Sources
- Digestion, absorption, transport and storage of fat in the body
- Nutritional and metabolic effects of dietary fatty acids
- Effect of diet on serum lipids and lipoproteins
- Nutritional requirements of fats/oils & fatty acids for various age and physiological groups

2. Nutrition Regulation of Gene Expression

- Regulation of gene expression - Role of nutrients

UNIT II

1. Water, Electrolyte and Acid Base Balance

- **Water**
 - Functions
 - Distribution
 - Compartments of body water
 - Factors influencing water distribution
 - Water balance - water intake and elimination, Regulation of water balance
 - Water requirements
 - Disturbances in fluid balance
- **Electrolytes**
 - Sodium, Potassium and Chloride
 - Functions
 - Sources
 - Absorption, transport and excretion
 - Recommended intake
- **Acid - Base Balance**
 - Acid generation
 - Regulation of acid - base balance
 - Disorders of acid - base imbalance

2. Nutritional Considerations in Special Conditions

- High Altitudes, Cold and hot environments, Space mission

UNIT III

1. Vitamins

- **Fat Soluble Vitamins**
 - **Vitamin A, Vitamin D, Vitamin E & Vitamin K**
 - Absorption, transport, storage & excretion
 - Bioavailability
 - Functions
 - Food sources
 - Deficiency
 - Toxicity
 - Requirements and recommended dietary allowances

- Assessment of vitamin Status
- Interaction with other nutrients
- **Water Soluble Vitamins**
 - **Thiamin (B₁), Riboflavin (B₂), Niacin (B₃), Pyridoxine (B₆), Folic Acid (B₉), Cynocobalamin (B₁₂), Pantothenic Acid, Biotin & Vitamin C (ascorbic acid)**
 - Absorption, transport, storage & elimination
 - Bioavailability
 - Functions
 - Food sources
 - Deficiency
 - Toxicity
 - Requirements and recommended dietary allowances
 - Assessment of vitamin Status
 - Interaction with other nutrients

UNIT IV

1. Minerals

- **Macro Minerals**
 - **Calcium, Phosphorus & Magnesium**
 - Absorption, transport, storage & excretion
 - Bioavailability
 - Functions
 - Food sources
 - Deficiency
 - Toxicity
 - Requirements and recommended dietary allowances
 - Assessment of vitamin Status
 - Interaction with other nutrients
- **Micro Minerals/Trace Elements**
 - **Iron, Zinc, Copper & Fluorine**
 - Absorption, transport, storage & excretion
 - Bioavailability
 - Functions
 - Food sources

- Deficiency
- Toxicity
- Requirements and recommended dietary allowances
- Assessment of vitamin Status
- Interaction with other nutrients
- **Micro Minerals/Ultra Trace Elements**
 - **Iodine, Selenium, Manganese, Chromium, Molybdenum, Boron & Cobalt**
 - Absorption, transport, storage & excretion
 - Bioavailability
 - Functions
 - Food sources
 - Deficiency
 - Toxicity
 - Requirements and recommended dietary allowances
 - Assessment of vitamin Status
 - Interaction with other nutrients

2. Nutritional Requirements of Sports Persons

- Sports specific requirements of nutrients, Pre game and post-game meals, Commercial sports specific supplements, Sports drinks, Ergogenic aids

3. Potential Health Benefits of Food Components other than nutrients

- Polyphenols, Phytoestrogens, Probiotics, Prebiotics and Symbiotics
- Non-nutritive food components with Health Benefits
 - Tannins, Phytates, Lectins and Saponins

INTERNAL ASSESSMENT (THEORY):

1. Attendance
2. Assignments
3. Presentations/Field Work/Visits
4. Periodic Tests/Quizzes
5. In-class Work/Class Discussion/Exploratory Activities/Speaking -Listening Activities /Participatory Activities

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FOOD SCIENCE AND NUTRITION
SEMESTER - IV
PAPER 13
ELECTIVE 2
SPORTS NUTRITION

MFN4T13

Marks: Theory: 60
Internal Assessment: 40

Objectives:

This course is designed to:

- Provide in-depth knowledge of the physiological and metabolic role of various nutrients and their interaction in human nutrition during exercise & sports.
- Enable students to understand the basis of human nutritional requirements and recommendations during exercise & sports.
- Familiarize students with the recent advances in sports nutrition.

Contents

UNIT I

- **Energy Systems for Exercise & Sports**
 - Energy production: Aerobic pathway & anaerobic pathway
 - Factors influencing aerobic fitness
- **Fuel for Body Work**
 - Sources of fuel from foods
 - Substrate choice in relation to exercise type, intensity & duration
 - Mobilization of fuel stores during exercise
 - Effect of sports training on energy requirement
 - Energy allowances for various types of sports activities
- **Energy Expenditure**
 - Energy expenditure & energy balance in athletes & sports persons
 - Factors affecting energy expenditure
- **Body Composition**
 - Effect of sports training on body composition of sports persons
 - Methods to assess body composition
 - Factors affecting body composition among sports persons

UNIT II

- **Nutritional Requirements for Exercise & Sports**

- **Carbohydrates:**

- Types, sources, glycemic index of foods
 - Carbohydrate intake before, during & after exercise
 - Carbohydrate loading
 - Requirements of carbohydrate for different sports activities
 - Maintenance of blood glucose level

- **Protein:**

- Types & sources
 - Role of protein in sports & exercise
 - Protein needs for different types of exercise (endurance, resistance etc.)
 - Amino acids: classification, sources, role in sports & exercise, amino acid supplementation & requirements
 - Effect of protein deficiency & excess on performance

UNIT III

- **Nutritional Requirements for Exercise & Sports**

- **Fat:**

- Fat as energy sources for sports persons
 - Fat needs for exercise
 - Types, sources & requirements of fats for sports & exercise
 - Fatty acids: classification, sources & effect of fatty acids on work performance & exercise, requirement of essential fatty acids for sports persons
 - Effect of deficient intake of fats on sports performance

- **Micronutrients: Functions, Role in Exercise & Sports, Sources, Deficiency, Toxicity & Requirement for Various Sports Activities:**

- **Vitamins:** Fat soluble vitamins- A, D, E & K

Water soluble vitamins- Thiamine, riboflavin, niacin, pyridoxine, folic acid, vitamin B₁₂, pantothenic acid, biotin & vitamin C

- **Minerals:** Calcium, phosphorus, magnesium, sulphur, iron, zinc, copper, iodine, selenium, manganese, sodium, potassium & chloride

UNIT IV

- **Body Water**
 - Distribution of body fluids (intra-cellular & extra-cellular water), water/fluid balance
 - Water/fluid intake, absorption & elimination of fluids
 - Factors affecting water/fluid absorption: sodium content, glucose content, osmolality, temperature etc.
 - Water requirement for short duration & endurance events
 - Dehydration: Symptoms & effects
 - Hydration guidelines & regime for sports persons
- **Sports Drinks:** Classification, use & advantages
- **Ergogenic Aids**
 - Types, role in sports performance, nutritional & non-nutritional Ergogenic aids
- **Pre & Post-Game Meals**
 - Food choices for pre & post event meals, quality & quantity to be consumed, dietary modifications

INTERNAL ASSESSMENT (THEORY):

1. Attendance
2. Assignments
3. Presentations/Field Work/Visits
4. Periodic Tests/Quizzes
5. In-class Work/Class Discussion/Exploratory Activities/Speaking -Listening Activities /Participatory Activities

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FOOD SCIENCE AND NUTRITION
SEMESTER - IV
Practical 9
RESEARCH PROJECT (MAJOR)

MFN4P9

Total Marks: 150

External: 100

Internal: 50

Submission of Research Project Report & Open Viva-Voce.

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FOOD SCIENCE AND NUTRITION

MFN4P11

SEMESTER - IV

Practical 11

NUTRITIONAL ASSESSMENT & ANALYTICAL TECHNIQUES-II

Marks: 50

Content:

1. KAP survey to assess the perception of people.
2. Visit to Day Care Centre/ Old Age Home/ Anganwadi/ Hostel.
3. Planning low cost nutrition recipes for beneficiaries of supplementary feeding programme.
4. Assessment of proximate components of foods
 - Moisture, Fat, Protein, Ash, Crude fiber & Carbohydrate
 - Preparations of Ash solutions for estimations of Minerals (Ca, P, Na, K, Fe, Mg, Zn).
 - Estimation of vitamin C from food samples.