

KURUKSHETRA UNIVERSITY, KURUKSHETRA
(‘A+’ Grade NAAC Accredited)
Department of Home Science



M.Sc. Home Science (Food, Nutrition and Dietetics) under CBCS-LOCF (IIIrd and IVth Semester)
w.e.f 2021-22

M.Sc. (Food, Nutrition & Dietetics) Under CBCS-LOCF w.e.f 2021-22
Semester –III
Core
Paper -FND-301
Clinical Dietetics- I

Total Marks: 100
External: 80
Internal: 20
Credits: 4
Duration of Exam: 3 hrs

Note:

- Examiner will set nine questions in all.
- All the questions will carry equal marks.
- Question No.-1 will be compulsory consisting of 5-10 short type questions (having no internal choice) and spread over the entire syllabus.
- Eight questions, two questions from each unit (I, II, III & IV) will be set.
- The candidates are required to attempt five questions in all. Question No -1 will be compulsory, remaining four questions will be attempted by selecting one question from each unit.

Objectives:

- To understand the role of diet in health and disease.
- To know about the nutritional problems related to various diseases.
- To equip the students about the etiology, clinical aberrations, prevention and nutritional management of various diseases.

Learning Outcomes:

This course will enable the students to know about:

- FND301 1. Therapeutic science
- FND301 2. Inter relationship between different diseases and their nutritional management.

UNIT-I

1. Therapeutic modification of the normal diet:

- Principles of Diet therapy
- Routine Hospital diet
- Diet modifications for therapeutic care
- Enteral and Parenteral nutrition

2. Nutrition in surgical conditions: pre and postoperative.

- **Common surgical conditions- Intestinal obstruction, Bowel obstruction, colostomy & gleostomy. Complications of abdominal surgery.**

UNIT-II

3. Etiology, clinical aberrations, prevention and nutritional management of:

- Infection
- Fever (Acute and chronic) & Metabolism in fever
- Food Allergy
- Metabolic Stress
- Burns

UNIT-III

4. Nutrition in bone and joint diseases:

- Arthritis
- Osteoarthritis
- Gout
- Rheumatoid arthritis

4. Etiology, manifestations and dietary management of:

- **Gastro intestinal tract disorders:** Peptic ulcer, Diarrhea, Constipation
- **Malabsorption syndrome:** Carbohydrates, Fat and Lactose intolerance, Sprue and Celiac disease.

UNIT-IV

5. Etiology, manifestation and dietary its types management in disorders of

- Liver disease-
 1. Jaundice-Etiology, types, symptoms & dietary management
 - Hepatitis-Types, symptoms & dietary management
 - Liver Cirrhosis- Etiology, symptoms & dietary management
 - Hepatic failure- Etiology, symptoms & dietary management
 2. Pancreas Disease- Pancreatitis (Acute & Chronic)
 3. Disease of Gall Bladder- Cholecystitis or Gall stones

References:

1. Diet Therapy- Williams
2. Nutrition and Physical fitness: Bogert, L.J.
3. Human Nutrition Mc Durt, Maxine
4. Applied Nutrition – Rajalakshmi, R.
5. Hand book of diet therapy: Dorothea, Turner.
6. Human Nutrition and dietetics- Davidson, S. Passmore, R. Brock- J.F. and Turswell A.S.
7. Clinical Dietetics and Nutrition - Antia, F.P.
8. Modern Nutrition in health and disease by Goodhearh R., S. Shills.

Attainment of Course Outcomes (COs):

Sr. No.	Course Outcomes	Methods for attainment of COs
1.	Therapeutic science	Through class room lectures and discussion
2.	Inter relationship between different diseases and their nutritional management.	Through class room lectures and discussion

CO-PO matrix for the course FND 301 (Clinical Dietetics-I)

COs#	PO1	PO2	PO3	PO4	PO5	PO6
FND301 1.	2	3	2	3	3	3
FND301 2.	3	2	3	2	3	3
Average	2.5	2.5	2.5	2.5	3	3

CO-PSO matrix for the course FND 301 (Clinical Dietetics-I)

COs#	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
FND301 1.	3	3	2	3	3	2
FND301 2.	3	2	3	3	2	3
Average	3	2.5	2.5	3	2.5	2.5

M.Sc. (Food, Nutrition & Dietetics) Under CBCS-LOCF w.e.f 2021-22
Semester –III
Core
Paper -FND-302
Public Health Nutrition- I

Total Marks: 100
External: 80
Internal: 20
Credits: 4
Duration of Exam: 3 hrs

Note:

- Examiner will set nine questions in all.
- All the questions will carry equal marks.
- Question No.-1 will be compulsory consisting of 5-10 short type questions (having no internal choice) and spread over the entire syllabus.
- Eight questions, two questions from each unit (I, II, III & IV) will be set.
- The candidates are required to attempt five questions in all. Question No -1 will be compulsory, remaining four questions will be attempted by selecting one question from each unit.

Objectives:

- To understand prevalence, etiology, biochemical and clinical manifestation and preventive measures for different community diseases.
- Develop a holistic knowledge base and understanding of the nature of important nutritional problems and their prevention and control for the disadvantaged and upper socio-economic strata in society.

Course Outcomes:

This course will enable the students to know about:

FND302 1. Causes/determinants and consequences of nutrition problems in society.

UNIT-I

Aim, Scope and content of Public Health Nutrition

Role of Public Health Nutritionist in National Development

- 1. Prevalence, etiology, biochemical and clinical manifestation and preventive measures for:**
- Protein calories Malnutrition
 - Beri-beri
 - Scurvy

UNIT-II

- 2. Prevalence, etiology, biochemical and clinical manifestation and preventive measures for:**
- Vitamin A deficiency
 - Iodine deficiency
 - Pellagra

UNIT-III

- 3. Prevalence, etiology, biochemical and clinical manifestation and preventive measures for:**
- Nutritional Anemia
 - Fluorine Deficiency and Toxicity

Unit-IV

- 4. Prevalence, etiology, biochemical and clinical manifestation and preventive measures for:**
- Rickets
 - Osteomalacia
 - Osteoporosis

References:

1. Nutritional evaluation of food processing, Roberts Haris John willy & Sons, N.Y. London.
2. Nutrition and Physical Fitness: Bogrert, L.J.
3. Nutrition in India: V.N.
4. Human Nutrition- M.C. Durtt, Maxine
5. Applied Nutrition- Rajalakshmi-R.
6. Biology of nutrition – Elements 1972, Platinum Press
7. Nutritional Evaluation of Food

Attainment of Course Outcomes (COs):

Sr.No.	Course Outcomes	Methods for attainment of Cos
1.	Causes/determinants and consequences of nutrition problems in society.	Through demonstration and class room lectures

CO-PO matrix for the course FND 302 (Public Health Nutrition-I)

COs#	PO1	PO2	PO3	PO4	PO5	PO6
FND302 1.	2	3	3	2	3	3
Average	2	3	3	2	3	3

CO-PSO matrix for the course FND 302 (Public Health Nutrition-I)

COs#	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
FND302 1.	3	2	3	2	2	3
Average	3	2	3	2	2	3

M.Sc. (Food, Nutrition & Dietetics) Under CBCS-LOCF w.e.f 2021-22
Semester –III
Core
Paper -FND-303
Research Methods, Statistics and Computer Applications

Total Marks: 100
External: 80
Internal: 20
Credits:4
Duration of Exam: 3 hrs

Note:

- Examiner will set nine questions in all.
- All the questions will carry equal marks.
- Question No.-1 will be compulsory consisting of 5-10 short type questions (having no internal choice) and spread over the entire syllabus.
- Eight questions, two questions from each unit (I, II, III & IV) will be set.
- The candidates are required to attempt five questions in all. Question No -1 will be compulsory, remaining four questions will be attempted by selecting one question from each unit.

Objectives:

- To understand the significance of statistics 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 apply statistical techniques to research data for analyzing and interpreting data meaningfully

Course Outcomes:

- FND303 1. This course will enable the students to understand the different research methods and their implication to different kind of research.
- FND303 2. Provide a deeper knowledge about the statistical skills to interpret the data and get the research outcomes.
- FND303 3. Equip the students about the role of computer softwares in research and statistical analysis of data.

Note: Students should be given hands on experiences to use appropriate software package for selected statistical analyses

UNIT-I

1. Role of Statistics and research in Home Science discipline:

Objective of research: Explanation, Control and Prediction

2. Nature, types, advantages and limitations of Research: Historical, Descriptive, Social Research, Experimental, Field studies, Case study.

3. Definition and Identification of a Research Problem:

- Selection of research problems
- Justification
- Hypothesis

4. Concept and types of variables and its advantages: Dependent, independent, random, discrete, continuous, qualitative and quantitative.

UNIT-II

5. Sampling, characteristics and advantages: Meaning, importance and types:

Random (simple, systemic, stratified, cluster, two stages and multi stage)

Non-random (incidental, purposive, quota, snow ball).

6. Data gathering Instruments: Meaning and importance, Interview, Observation, Questionnaire, Rating scale, Reliability and validity of measuring instruments.

7. Analysis of data and research report

UNIT-III

8. Statistics: Meaning, scope, function and importance,

9. Collection of data

10. Frequency, frequency distribution, graphical representation of frequency distribution and its type.

11. Measure of central tendency: Mean, median, mode, quartiles

12. Measure of dispersion: Range, mean deviation, standard deviation, skewness and kurtosis.

13. Characteristics of normal distribution

14. Parametric and Non parametric test.

UNIT-IV

15. Chi – square test

16. T-test: Single mean, independent mean, paired mean.

17. Correlation and coefficient of correlation

18. Analysis of variance: One way and two-way classification

19. Software related to Home Science; application and importance

References:

1. S.C. Gupta & V.K. Kapoor: Fundamentals of Mathematical Statistics
2. S.C. Gupta: Fundamentals of statistics
3. G. Udry Yule, N.M.G. Kendall: An Introduction to the theory of Statistics
4. Croxton, F.C. and Cowden, D. J. Applied General Statistics, Prentics hall Inc. 1955
5. Garrett. H. Statistical in Psychology and Education. Oxford book Co.1960.
6. R.P. Hooda: Introduction to statistics. The MacMillon Co.
7. Scotharman, W. A. Textbook of Statistics, (Revised edition) 1973.
8. Kerlinge, Foundations of Behavioral Research
9. Sneececer G. W. Statistical Methods. Applied Pacific Private Ltd., 1961.

Attainment of Course Outcomes (COs):

Sr. No.	Course Outcomes	Methods for attainment of COs
1.	This course will enable the students to understand the different research methods and their implication to different kind of research	Classroom lecture and Power Point Presentations
2.	Provide a deeper knowledge about the statistical skills to interpret the data and get the research outcomes	Classroom lecture and Power Point Presentations
3.	Equip the students about the role of computer softwares in research and statistical analysis of data	Classroom lecture and Power Point Presentations

CO-PO matrix for the course FND303 (Research Methods, Statistics and Computer Applications)

COs#	PO1	PO2	PO3	PO4	PO5	PO6
FND303.1	3	3	3	3	3	3
FND303.2	3	3	2	3	3	3
FND303.3	3	2	3	3	3	3
Average	3	2.6	3	3	3	3

CO-PSO matrix for the course FND303 (Research Methods, Statistics and Computer Applications)

COs#	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
FND303.1	3	3	2	3	3	3
FND303.2	3	3	3	3	3	3
FND303.3	3	3	3	3	3	3
Average	3	3	2.6	3	3	3

M.Sc. (Food, Nutrition & Dietetics) Under CBCS-LOCF w.e.f 2021-22
Semester –III
Elective
Paper -FND-304
Food Microbiology

Total Marks: 100
External: 80
Internal: 20
Credits: 4
Duration of Exam: 3 hrs

Note:

- Examiner will set nine questions in all.
- All the questions will carry equal marks.
- Question No.-1 will be compulsory consisting of 5-10 short type questions (having no internal choice) and spread over the entire syllabus.
- Eight questions, two questions from each unit (I, II, III & IV) will be set.
- The candidates are required to attempt five questions in all. Question No -1 will be compulsory, remaining four questions will be attempted by selecting one question from each unit.

Objectives:

- To gain deeper knowledge about role of microorganism in human environment.

Course Outcomes:

After completing this course students will be able to:

- FND304 1. Acquire an insight into different parameters of microbial growth.
- FND304 2. Know about various aspects of microbial nutrition, spoilage and food preservation.
- FND304 3. Identify the role of microbes in different fermented foods and food borne diseases.
- FND304 4. Gain knowledge into cultivation of microbes as foods and microbiological criteria for food testing and quality control.

UNIT-I

1. **Introduction to Food Microbiology.**
2. **Microbial growth and methods of measurement of growth.**
3. **Factors affecting growth of microorganisms in food:** intrinsic (nutrient content, pH and buffering capacity, redox potential, antimicrobial constituents, water activity), extrinsic (relative humidity, temperature, gaseous atmosphere).

UNIT-II

4. **Nutritional requirements, nutritional types, culture media and its types for microorganism.**
5. **Sources of contamination and microbial spoilage of:** milk and milk products, eggs and poultry, fish and other sea foods, Cereal and cereal products, meat and meat products, Vegetables and fruits, canned foods.
6. **Food Preservation:** General principles of food preservation, various classical physical, chemical, and biological methods of preservation. New developments in food preservation techniques.

UNIT-III

7. **Fermented foods:** Production of fermented milk and milk products, plant-based products, pickles, fish products, and meat products, Bread, Vinegar, Yoghurt, Beer, Wine, probiotics and prebiotics.
8. **Food borne diseases:** Food borne infections including bacterial, viral and fungal infections. Study of infections due to food borne parasites. Symptoms and methods of prevention and control of food borne diseases caused by following:
 - **Bacterial agents:** Salmonella, Staphylococcus, Clostridium, E. coli.
 - **Fungal agents:** Aspergillus, Fusarium, penicillium.
 - **Viruses:** Polio, Hepatitis.
 - **Protozoa:** Giardia, Entamoeba.

UNIT – IV

9. **Microorganisms as food:** single cell proteins, Mushrooms.
10. **Microbiological criteria for food testing and Quality control.** The HACCP system and food safety used in controlling microbiological hazards.

References:

1. General Microbiology – Powar
2. Good Microbiology – Frazier and Westhoff
3. Microbiology – Prescott, Harley, Klein
4. Food Microbiology – Adams
5. An Introduction of Microbiology _ P. Tauro
6. General Microbiology – Stanier
7. Food Microbiology – James M. H Jay
8. Food Hygiene, microbiology & HACCP – 3rd edition – S.J. Forsythe & P.R.Hayes

Attainment of Course Outcomes (COs):

Sr. No.	Course Outcomes	Methods for attainment of Cos
1.	Acquire an insight into different parameters of microbial growth.	Through class room lectures and demonstration
2.	Know about various aspects of microbial nutrition, spoilage and food preservation.	Through power point presentations
3.	Identify the role of microbes in different fermented foods and food borne diseases.	Through class room lectures and demonstration
4.	Gain knowledge into cultivation of microbes as foods and microbiological criteria for food testing and quality control.	Through power point presentations

CO-PO matrix for the course FND304 (Food Microbiology)

COs#	PO1	PO2	PO3	PO4	PO5	PO6
FND304.1	3	3	3	3	3	3
FND304.2	3	2	3	3	3	3
FND304.3	3	3	3	3	2	3
FND304.4	3	3	3	2	3	3
Average	3	2.75	3	2.75	2.75	3

CO-PSO matrix for the course FND304 (Food Microbiology)

COs#	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
FND304.1	3	3	3	3	3	3
FND304.2	3	3	3	2	2	3
FND304.3	3	2	3	3	3	3
FND304.4	2	3	3	3	3	3
Average	2.75	2.75	3	2.75	2.75	3

M.Sc. (Food, Nutrition & Dietetics) Under CBCS-LOCF w.e.f 2021-22
Semester –III
Elective
Paper -FND-305
Food Safety & Quality Control

Total Marks: 100
External: 80
Internal: 20
Credits: 4
Duration of Exam: 3 hrs

Note:

- Examiner will set nine questions in all.
- All the questions will carry equal marks.
- Question No.-1 will be compulsory consisting of 5-10 short type questions (having no internal choice) and spread over the entire syllabus.
- Eight questions, two questions from each unit (I, II, III & IV) will be set.
- The candidates are required to attempt five questions in all. Question No -1 will be compulsory, remaining four questions will be attempted by selecting one question from each unit.

Objectives:

- To equip the students about, food safety.
- To understand the different types of food processing in food industries.
- To learn about various food laws and standards related to quality management of food.

Course Outcomes:

After successful completion of this course, students will be able to know about:

- FND305 1. Food safety standards.
- FND305 2. Different types of food processing.
- FND305 3. Implications of food laws to assure food safety.

UNIT-I

1. **Introduction to food safety:** definition, food safety issues, factors affecting food safety, importance of safe foods.
2. **Shelf life of Food Products:** factors affecting shelf life and methods to check the shelf life.
3. **Food additives:** meaning, various types of additives and their numbering: food colours, preservatives, antimicrobial substances, flavoring, emulsifying, stabilizing agents, anticaking, antifoaming, glazing, acid regulator, chelating agent.
4. **Food contaminants of natural origin:** seafood toxins, toxic amino acids and lathyrism, goitrogens, haemagglutinins, phytates, cyanogenic glycosides.

UNIT-II

5. **Concerns in food safety:** Food adulteration, nature of adulterants, methods of evaluation of food adulterants and toxic constituents, food inspection and safety measurements, food grades, genetically modified foods, nano particles in foods
6. **Food processing:** types of processing methods, effect of processing treatments
– Processing of application of heat, processing by removal of heat, ambient temperature processing. Minimal processing.

UNIT-III

7. **Food laws and regulations:** national food legislation, other food legislations/authorities and their role- essential commodities act, 1955, standard of weight and measures act, 1976, export (quality control and inspection) act, 1963, voluntary based product certifications (ISI mark of BIS and AGMARK), Food safety and Standards Act 2006: salient provision and prospects, international: USFDA, FSSAI, Consumer protection.
8. **Organizations and agreements:** Food and agricultural organization (FAO), world health organization (WHO), codex Alimentarius, codex India, joint FAO/WHO expert committee on food additives (JECFA), world trade organization (WTO), sanitary and phytosanitary measures (SPS), international organization for standardization (ISO).

UNIT-IV

9. **Food safety and quality management systems:** General principle of food safety risk management, hazard analysis critical control point system (HACCP), quality management system, quality plan, documentation of records, total quality process.
10. **Latest Trends in different types in Food Packaging:** Meaning, Functions and types of Food Packaging Materials, Active packaging, Intelligent packaging, modified atmosphere packaging, Gas flushed packaging, Vacuum packaging, Retort pouches, Aseptic packaging and edible films.
11. **Food labeling.** Definition, nutrition labeling (health, function and nutrition claims) and mandatory labeling requirements.

References:

1. WHO, 1998 world health report life in the 21st century Report of the director general who Geneva.
2. FAO food and nutrition paper manual of food quality control – part 14/1 (1979), to 14/8 (1986) FAO of the United Nations.
3. Curricula on food safety. Directorate general of health services. Ministry of health and family welfare. Government of India. Nirman Bhavan, New Delhi.
4. Graham, H.D. 1980: the safety of foods, AVI publishing company Inc. Westport.

Attainment of Course Outcomes (COs):

Sr. No.	Course Outcomes	Methods for attainment of Cos
1.	Food safety standards.	Through discussions and class room lectures
2.	Different types of food processing.	Through PPTs
3.	Implications of food laws to assure food safety.	Through discussions and class room lectures

CO-PO matrix for the course FND305 (Food Safety and Quality Control)

COs#	PO1	PO2	PO3	PO4	PO5	PO6
FND305.1	3	3	3	2	3	3
FND305.2	3	2	3	3	3	3
FND305.3	3	3	3	3	2	3
Average	3	2.66	3	2.66	2.66	3

CO-PSO matrix for the course FND305 (Food Safety and Quality Control)

COs#	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
FND305.1	3	3	3	3	3	3
FND305.2	3	3	3	3	2	2
FND305.3	3	2	3	3	3	3
Average	3	2.66	3	3	2.66	2.66

M.Sc. (Food, Nutrition & Dietetics) Under CBCS-LOCF w.e.f 2021-22
Semester –III
Elective
Paper -FND-306
Human Physiology

Total Marks: 100
External: 80
Internal: 20
Credits: 4
Duration of Exam: 3 hrs

Note:

- Examiner will set nine questions in all.
- All the questions will carry equal marks.
- Question No.-1 will be compulsory consisting of 5-10 short type questions (having no internal choice) and spread over the entire syllabus.
- Eight questions, two questions from each unit (I, II, III & IV) will be set.
- The candidates are required to attempt five questions in all. Question No -1 will be compulsory, remaining four questions will be attempted by selecting one question from each unit.

Objectives:

To apply the knowledge of general and altered physiology to the field of nutrition such as by designing appropriate diets etc.

Course Outcomes:

This course will enable students to:

FND306 1. Advance their understanding of some of the relevant issues and topics of Human Physiology.

FND306 2. Understand the integrated function of all systems and the grounding of nutritional science in physiology.

FND306 3. Understand alteration of structure and function in various organs and systems in disease conditions.

UNIT-I

1. **Digestive System-** Different parts of digestive system, Secretory and digestive functions of the salivary glands, stomach, pancreas, liver and intestines, mechanism of absorption of carbohydrates, proteins and fats.
2. **Cardiovascular system-** Structure and function of the heart, ECG, cardiac cycle, cardiac output, heart sounds, regulation of heart rate, blood pressure: Factors affecting it and hypertension.
Blood formation, composition, blood clotting- formation and functions of plasma proteins, erythropoiesis, blood groups, histocompatibility and blood indices.
Immune system- cell mediated and humoral immunity, Innate and adaptive immunity, Activation of WBCs and production of antibodies and role in inflammation and defense.

UNIT-II

3. **Respiratory system-** Structure of respiratory organs, uptake and delivery of respiratory gases and regulation of breathing, Laryngitis, pharyngitis bronchitis, asthma in brief.
4. **Reproductive system-** Structure and function of testis and ovaries, menstrual cycle, puberty, menopause, breast and cervical cancer, menstrual disorders, infertility, ultra sound imaging in brief.
5. **Musculo-skeletal system-** Structure and function of bone, cartilage and connective tissue. Disorders of the skeletal system, types of muscles, structure and function.

UNIT-III

6. **Excretory System-** Structure and function of nephron, mechanism of urine formation and the role of the kidneys in water and electrolyte balance, diuretics, renal stone, albuminuria, haematuria, oedema, uremia, incontinence, in brief.
7. **Sensory System-** General senses (types, structure and functions). Special senses (structure and functions: olfaction, vision, gustation, equilibrium and hearing).

UNIT-IV

8. **Endocrine System-** structure, functions and the different syndromes resulting from hypo or hyperactivity of the following glands: Thyroid, parathyroid, adrenal cortex, adrenal medulla, endocrine pancreas, pituitary.
9. **Nervous system-** Main divisions, structure and function of various parts of brain: brain stem, cerebral cortex, cerebellum and diencephalon, structure and function of spinal cord, cerebrospinal fluid, cranial and spinal nerves, introduction to autonomic nervous system, neuralgia, sciatica, coma, poliomyelitis, EEG, CT, MRI in brief.

References:

1. Stand, F.L. Modern Physiology the Macmillan Company Latest Ed.
2. Guyton, A.C. Text Book of Medical Physiology W.S. Saunders
3. Davidson, B. and Smith E., Text book of Physiology and Biochemistry, 1972 (8th Ed.).
4. Human Physiology – A.J. Vander
5. Principles of Anatomy and Physiology – Anagnastakes.
6. Text Book of Physiology – Patton
7. Bloom W. & Favcott. D.W.A. – Text Book of Histology, W.B. Saunders and Company
8. Martini: Fundamentals of Anatomy and Physiology (6th & 7th Ed)

Attainment of Course Outcomes (COs):

Sr. No.	Course Outcomes	Methods for attainment of Cos
1.	Advance their understanding of some of the relevant issues and topics of Human Physiology.	Through PPTs, demonstration and class room lectures
2.	Understand the integrated function of all systems and the grounding of nutritional science in physiology.	Through PPTs, demonstration and class room lectures
3.	Understand alteration of structure and function in various organs and systems in disease conditions.	Through PPTs, demonstration and class room lectures

CO-PO matrix for the course FND306 (Human Physiology)

COs#	PO1	PO2	PO3	PO4	PO5	PO6
FND306.1	3	3	3	3	3	3
FND306.2	3	3	2	3	3	2
FND306.3	3	3	3	2	3	3
Average	3	3	2.66	2.66	3	2.66

CO-PSO matrix for the course FND306 (Human Physiology)

COs#	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
FND306.1	3	2	3	2	3	3
FND306.2	3	3	3	3	3	3
FND306.3	3	3	2	3	3	3
Average	3	2.66	2.66	2.66	3	3

M.Sc. (Food, Nutrition & Dietetics) Under CBCS-LOCF w.e.f 2021-22
Semester –III
Open Elective
Paper -FND-307
Nutrition During Life Cycle

Total Marks: 50
External: 40
Internal: 10
Credits: 2
Duration of Exam: 3 hrs

Note:

- Examiner will set nine questions in all.
- All the questions will carry equal marks.
- Question No.-1 will be compulsory consisting of 5-10 short type questions (having no internal choice) and spread over the entire syllabus.
- Eight questions, two questions from each unit (I, II, III & IV) will be set.
- The candidates are required to attempt five questions in all. Question No -1 will be compulsory, remaining four questions will be attempted by selecting one question from each unit.

Objectives:

This course will enable students to:

- To impart knowledge on the importance of nutrition during life span.
- To enlighten on the dietary modification.

Course Outcomes:

FND307 1. To provide the basic knowledge about role of nutrition in different conditions/ diseases.

UNIT-I

1. Meal Planning: Meaning and introduction
2. Concept of balanced diet.
3. Principles of meal planning, factors affecting it.

UNIT-II

4. **Principles of meal planning and nutritional requirement for-** infancy, children 3 to 5 years old school going children, adolescents and adults.
5. **Principles of meal planning and nutritional requirement for -**Pregnant women and lactating mother.

UNIT-III

6. **Principals and types of therapeutic diets**
7. **Introduction to therapeutic nutrition.** Therapeutic adaption of the normal diets: soft and fluid diet. Planning of dietary modification, food avoided and included in following conditions:
 - Obesity
 - Diarrhea
 - Constipation

UNIT-IV

8. **Introduction to therapeutic nutrition.** Therapeutic adaption of the normal diets: soft and fluid diet. Planning of dietary modification, food avoided and included in following conditions:
 - Typhoid fever
 - Diabetes
 - High Blood Pressure

References:

1. Diet Therapy- Williams
3. Human Nutrition Mc Durt, Maxine
4. Applied Nutrition – Rajalakshmi, R.
5. Hand book of diet therapy: Dorothea, Turner.
6. Human Nutrition and dietetics- Davidson, S. Passmore, R. Brock- J.F. and Turswell A.S.
7. Clinical Dietetics and Nutrition - Antia, F.P.
8. Modern Nutrition in health and disease by Goodhearth R., S. Shills.

Attainment of Course Outcomes (COs):

Sr. No.	Course Outcomes	Methods for attainment of Cos
1.	To provide the basic knowledge about role of nutrition in different conditions/ diseases.	Classroom lecture

CO-PO matrix for the course FND-307 (Nutrition During Life Cycle)

COs#	PO1	PO2	PO3	PO4	PO5	PO6
FND307.1	3	3	3	2	3	3
Average	3	3	3	2	3	3

CO-PSO matrix for the course FND-307 (Nutrition During Life Cycle)

COs#	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
FND307.1	3	3	2	3	3	3
Average	3	3	2	3	3	3

M.Sc. (Food, Nutrition & Dietetics) Under CBCS-LOCF w.e.f 2021-22
Semester –III
Core
Paper- FND-309(Practical)
Clinical Dietetics- I

Total Marks: 100
 External: 80
 Internal: 20
 Credits: 4
 Duration of Exam: 3 hrs

Course Objectives:

- To give knowledge about the diet therapy and therapeutic nutrition.
- To enable students to plan, calculate and prepare therapeutic diets.

Course Outcomes: After doing this course students will be able to:

- FND309 1. Plan and prepare therapeutic diets for various disorders.
 FND309 2. Know about commercial nutritional supplements available in market.
 FND309 3. Develop skills in preparing teaching aids for the diagnosis of different diseases.

- Planning, Calculation, Preparation, serving and evaluation of therapeutic diets for diseases covered in theory.
- Preparation of diet counseling aids for common disorders.
- Market survey of the following products:
 1. Food Supplements
 2. External formulas
 3. Disease specific foods

Attainment of Course Outcomes (COs):

Sr. No.	Course Outcomes	Methods for attainment of Cos
1.	Plan and prepare therapeutic diets for various disorders.	Hands on approach
2.	Know about commercial nutritional supplements available in market.	Demonstration through survey
3.	Develop skills in preparing teaching aids for the diagnosis of different diseases.	Hands on approach

CO-PO matrix for the course FND-309(Clinical Dietetics- I)

COs#	PO1	PO2	PO3	PO4	PO5	PO6
FND309. 1	3	3	3	2	3	3
FND309. 2	3	3	3	2	3	3
FND309. 3	3	3	3	2	3	3
Average	3	3	3	2	3	3

CO-PSO matrix for the course FND-309 (Clinical Dietetics- I)

COs#	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
FND309. 1	3	3	2	3	3	3
FND309. 2	3	3	2	3	3	3
FND309. 3	2	3	2	3	2	2
Average	2.66	3	2	3	2.66	2.66

M.Sc. (Food, Nutrition & Dietetics) Under CBCS-LOCF w.e.f 2021-22
Semester –III
Core
Paper- FND-310(Practical)
Public Health Nutrition- I

Total Marks: 100
 External: 80
 Internal: 20
 Credits:4
 Duration of Exam: 3 hrs

Course Outcomes: After doing this course students will be able to:

- FND310 1. Become familiar and understand the concept and current concerns of Public Health Nutrition.
 FND310 2. Develop low-cost standardized recipes for different age groups and physiology.
 FND310 3. Prepare cyclic menus for feeding programmes and institutions.

- Development and standardization of low-cost nutritious recipes based on locally available food and better quality.
- Development and standardization of low-cost nutritive recipes suitable for various vulnerable groups.
- Field experience in operational public nutrition programmes: nutrition rehabilitation centers, fortification programmes and cost analysis.

Attainment of Course Outcomes (COs):

Sr. No.	Course Outcomes	Methods for attainment of Cos
1.	Become familiar and understand the concept and current concerns of Public Health Nutrition.	Through practicals and presentations
2.	Develop low-cost standardized recipes for different age groups and physiology.	Through practicals and presentations
3.	Prepare cyclic menus for feeding programmes and institutions.	Through practicals and presentations

CO-PO matrix for the course FND-310 (Public Health Nutrition-I)

COs#	PO1	PO2	PO3	PO4	PO5	PO6
FND310. 1	3	2	2	2	3	3
FND310. 2	3	3	2	2	3	3
FND310. 3	2	3	2	2	3	3
Average	2.66	2.66	2	2	3	3

CO-PSO matrix for the course FND-310 (Public Health Nutrition-I)

COs#	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
FND310. 1	3	3	3	3	3	3
FND310. 2	3	3	2	3	3	3
FND310. 3	2	3	3	3	3	2
Average	2.66	3	2.66	3	3	2.66

M.Sc. (Food, Nutrition & Dietetics) Under CBCS-LOCF w.e.f 2021-22
Semester –IV
Core
Paper –FND-401
Clinical Dietetics–II

Total Marks: 100
External: 80
Internal: 20
Credits: 4
Duration of Exam: 3 hrs

Note:

- Examiner will set nine questions in all.
- All the questions will carry equal marks.
- Question No.-1 will be compulsory consisting of 5-10 short type questions (having no internal choice) and spread over the entire syllabus.
- Eight questions, two questions from each unit (I, II, III & IV) will be set.
- The candidates are required to attempt five questions in all. Question No -1 will be compulsory, remaining four questions will be attempted by selecting one question from each unit.

Objectives:

- To understand the etiology, physiology and metabolic anomalies of acute and chronic diseases and patients need.
- To know the effect of the various diseases on nutritional status and nutritional and dietary requirements.

Learning Outcomes:

After successful completion of this course students will be able to:

FND401 1. Recommend and provide appropriate nutritional care for prevention/ and treatment of the various diseases.

UNIT-I

1. Etiology, manifestations and dietary management of Renal Disorders:

- Glomerulonephritis
- Nephrotic syndrome
- Acute renal failure
- Chronic renal failure
- Renal stones- Major types of stones

UNIT-II

2. Nutrition Therapy management in:

- AIDS
- Cancer- various types of cancer, treatment & Nutrition support and common nutritional problems in cancer patients.

3. Nutrition management in special conditions:

- Space travel
- High altitude/ Low temperature

UNIT-III

4. Etiology, metabolic and clinical aberrations, complications, prevention and nutritional management of:

- Weight imbalances (over and under nutrition)
- Diabetes mellitus
- Cardiovascular disorders: Hypertension, Atherosclerosis, Coronary heart disease

UNIT-IV

5. Chronic alcoholism:

- Effect of Alcohol on digestion and absorption
- Alcohol nutrient interaction
- Dietary management

6. Introduction, clinical features, dietary management of:

- Inborn errors of metabolism:
 1. Phenylketonuria
 2. Galactosemia
 3. Alkaptonuria

References:

1. Mal-Nutrition and the Eye: DonalSterartMclaren, Academic Press, New York and London.
2. Diabetes Mellitus: Williames and Wikins Co., USA
3. Nutrition and Physical fitness: Bogert, L.J.
4. Human Nutrition Mc Durtt, Maxine
5. Applied Nutrition – Rajalakshmi, R.
6. Hand boom of diet therapy: Dorothea, Turner.
7. Human Nutrition and dietetics- Davidson, S. Passmore, R. Brock- J.F. and Turswell A.S.
8. Clinical Dietetics and Nutrition - Antia, F.P.
9. Food Science and Technology: Pyke, Maonus.
10. Modern Nutrition in health and disease by Goodhearth R.S. Skills.

Attainment of Course Outcomes (COs):

Sr. No.	Course Outcomes	Methods for attainment of Cos
1.	Recommend and provide appropriate nutritional care for prevention/ and treatment of the various diseases.	Through demonstration, Power Point Presentations and discussions

CO-PO matrix for the course FND 401 (Clinical Dietetics-II)

COs#	PO1	PO2	PO3	PO4	PO5	PO6
FND401 1.	2	3	2	3	3	3
Average	2	3	2	3	3	3

CO-PSO matrix for the course FND 401 (Clinical Dietetics-II)

COs#	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
FND401 1.	3	3	2	3	3	2
Average	3	3	2	3	3	2

M.Sc. (Food, Nutrition & Dietetics) Under CBCS-LOCF w.e.f 2021-22
Semester –IV
Core
Paper –FND-402
Public Health Nutrition-II

Total Marks: 100
External: 80
Internal: 20
Credits: 4
Duration of Exam: 3 hrs

Note:

- Examiner will set nine questions in all.
- All the questions will carry equal marks.
- Question No.-1 will be compulsory consisting of 5-10 short type questions (having no internal choice) and spread over the entire syllabus.
- Eight questions, two questions from each unit (I, II, III & IV) will be set.
- The candidates are required to attempt five questions in all. Question No -1 will be compulsory, remaining four questions will be attempted by selecting one question from each unit.

Objectives:

- Orient the students with all the important state of the art methodologies applied in nutritional assessment and surveillance of human groups.
- To develop specific skills to apply the most widely used nutritional assessment methods.

Course Outcomes:

After successful completion of this course students will be able to:

FND402 1. Familiarize with various approaches to nutrition and health interventions, programmes and policies.

UNIT-I

1. Concept, definitions and factors affecting Food and Nutrition Security at National, Household and Individual level.
2. Public sector programmes for improving Food and Nutrition Security and POSHAN ABHIYAN.

Unit II

3. National nutrition Policy.
4. Assessment of Nutritional status of the Community
 - Clinical
 - Biochemical
 - Anthropometric measurements
 - Dietary surveys

Unit III

5. Nutritional Programmes for improvement of Nutritional status:
 - Nutrient Deficiency control programmes.
 - Supplementary Feeding programmes.
 - Food Security Programmes
 - Self Employment and Wage Employment Schemes.

Unit IV

6. Nutrition Education:
 - Methods
 - Planning and execution
 - Evaluation and follow up

References:

- 1 Nutritional evaluation of food processing, Roberts Haris John willy & Sons, N.Y. London.
- 2 Nutrition and Physical Fitness: Bogrert, L.J.
- 3 Nutrition in India: V.N.
- 4 Human Nutrition- M.C. Durtt, Maxine
- 5 Applied Nutrition- Rajalakshmi-R.
- 6 Biology of nutrition – Elements 1972, Platinum Press
- 7 Nutritional Evaluation of Food

Attainment of Course Outcomes (COs):

Sr. No.	Course Outcomes	Methods for attainment of Cos
1.	Familiarize with various approaches to nutrition and health interventions, programmes and policies.	Through demonstration, Power Point Presentations and discussions

CO-PO matrix for the course FND 402 (Public Health Nutrition-II)

COs#	PO1	PO2	PO3	PO4	PO5	PO6
FND402 1.	3	2	3	2	2	3
Average	3	2	3	2	2	3

CO-PSO matrix for the course FND 402 (Public Health Nutrition-II)

COs#	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
FND402 1.	3	3	2	2	2	3
Average	3	3	2	2	2	3

M.Sc. (Food, Nutrition & Dietetics) Under CBCS-LOCF w.e.f 2021-22
Semester –IV
Core
Paper -FND-403
Physical Fitness and Sports Nutrition

Total Marks: 100
External: 80
Internal: 20
Credits: 4
Duration of Exam: 3 hrs

Note:

- Examiner will set nine questions in all.
- All the questions will carry equal marks.
- Question No.-1 will be compulsory consisting of 5-10 short type questions (having no internal choice) and spread over the entire syllabus.
- Eight questions, two questions from each unit (I, II, III & IV) will be set.
- The candidates are required to attempt five questions in all. Question No -1 will be compulsory, remaining four questions will be attempted by selecting one question from each unit.

Objectives:

- To understand the component of health and fitness.
- To make nutritional dietary and physical activity recommendations to achieve fitness and well being.
- To develop ability to evaluate fitness well being.

Course Outcomes:

After successful completion of this course students will be able to know about:

- FND403 1. Physical fitness and wellness
- FND403 2. Type of nutrient to support physical activity.
- FND403 3. Sports specific diets.

UNIT-I

- 1. Physical Fitness and health status:** Definition, concept, goal, assessment criteria and management
- 2. Healthy life style:** Strategies, factors that promote life style changes.
- 3. Self-management skills to attain physical fitness; its benefits and advantages.**

UNIT-II

- 4. Body composition:** in exercise and sport, health benefits of exercise.
- 5. Physical Activity:** need, principles of physical activity
- 6. Energy input and output:** Different energy systems for endurance and power activity. Fuels and nutrients to support physical activity, carbohydrate loading

Unit-III

- 7. Nutrition in Sports:** Introduction and benefits of sports nutrition, sports specific requirement, Diet manipulation, Pre-game, during and post-game meals.
- 8. Diets for athletes with high energy requirements:** Stress, Fracture and Injury.
- 9. Water and electrolyte balance:** Losses and their replenishment during exercise and sports events, types and effect of dehydration, health benefits of sports drinks.

Unit-IV

- 10. Special Nutrition considerations for:** Female, Older and Disabled athletes, adolescent athlete
- 11. Nutrition education of athletes and coaches.**
- 12. Alternative system for health and fitness like:** Yoga and its types, Meditation, advantages of Vegan and Traditional Diets.

References:

1. Ira Walinaky, (1998) Nutrition in Exercise and sport
2. Charles B. Corbin, Ruth Lindsey and grey walk (2000) Concepts of fitnessand wellness.
3. Robert A. Robergers and Scott O. Roberts (2000) exercise physiology.

Attainment of Course Outcomes (COs):

Sr. No.	Course Outcomes	Methods for attainment of COs
1.	Students will be able to know about physical fitness and wellness	Classroom lecture and Power Point Presentations
2.	Students will be able to know about type of nutrient to support physical activity	Classroom lecture and Power Point Presentations
3.	Students will be able to know about sports specific diets.	Classroom lecture and Power Point Presentations

CO-PO matrix for the course FND403 (Physical Fitness and Sports Nutrition)

COs#	PO1	PO2	PO3	PO4	PO5	PO6
FND403.1	3	3	3	3	3	3
FND403.2	2	3	3	2	3	3
FND403.3	3	3	3	3	3	3
Average	2.66	3	3	2.66	3	3

CO-PSO matrix for the course FND403 (Physical Fitness and Sports Nutrition)

COs#	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
FND403.1	3	3	3	3	3	3
FND403.2	3	3	3	2	3	3
FND403.3	2	3	3	3	3	3
Average	2.66	3	3	2.66	3	3

M.Sc. (Food, Nutrition & Dietetics) Under CBCS-LOCF w.e.f 2021-22
Semester –IV
Elective
Paper -FND-405
Food Toxicology

Total Marks: 100
External: 80
Internal: 20
Credits: 4
Duration of Exam: 3 hrs

Note:

- Examiner will set nine questions in all.
- All the questions will carry equal marks.
- Question No.-1 will be compulsory consisting of 5-10 short type questions (having no internal choice) and spread over the entire syllabus.
- Eight questions, two questions from each unit (I, II, III & IV) will be set.
- The candidates are required to attempt five questions in all. Question No -1 will be compulsory, remaining four questions will be attempted by selecting one question from each unit.

Objectives:

- To familiarize with hazards and toxicity associated with food and their implications for health.
- Know the various kinds of hazards.
- Be familiar with various tests.

Course Outcomes:

After successful completion of this course students will be able to:

- FND405 1. Assess and evaluate different aspects of food safety and various types of hazards.
- FND405 2. Know about the microbial problems in food safety.
- FND405 3. Get the idea about contaminants and additives.

UNIT-I

- 1. Introduction to food safety and Toxicology:** Hazards- Microbiological, Nutritional, Environmental.
- 2. Assessment of Food Safety**
 - Risk assessment and risk benefit
 - Acute toxicity
 - Mutagenicity and carcinogenicity
 - Reproductive and development toxicity
 - Neurotoxicity and behavioural effects
 - Immunotoxicity

UNIT-II

- 3. Agricultural and industrial contaminants in foods:** pesticides residues in fruits and vegetables, metal contaminants in foods and their toxicity in human body; animal drug residues in food and water, dioxins and related compounds in food; metals such as lead, arsenic and mercury.
- 4. Microbial Problems in Food Safety including Mycotoxins and viruses**

UNIT-III

- 5. Intentional Direct Additives:** Preservatives, Nitrate and N-nitroso Compounds.
- 6. Indirect Additives, Residues and Contaminants:** Anti-microbial drugs, polyhalogenated aromatic hydrocarbons, polycyclic aromatic hydrocarbons, packaging materials, radio nuclides in foods.

UNIT-IV

- 7. Naturally occurring toxicants & food contaminants:** Sea food toxins, biogenic amines, mutagens & carcinogens in heated & processed foods, coffee & methylxanthines, toxicity of mushrooms alkaloids compounds, glucosinolates, protease inhibitors, phytate.
- 8. Food additives as toxicants:** Sweeteners; toxicants formed during food processing such as maillard reaction products acrylamide, benzene; risk of genetically modified food, food supplements, persistent organic pollutants.

References:

1. OECD Documents (1996): Food Safety Evaluation. Organization for Economic Co-operation and Development Paris.
2. World Health Organization (1990): Strategies for Assessing the Safety of Food Produced by Biotechnology. Report of a Joint FAO/WHO Consultation- Geneva.
3. Walker and Quattrucci, E. (eds) (1980): Nutritional and Toxicological Aspects of Food Processing, Taylor and Francis, New York.
4. Lava, K.; Muller, E.I.; Toxicological Aspects of Foods; Elsevier Applied Science, London.
5. Lee, L.W. (ed) (1995): Human Tissue Monitoring and Specimen Banking; Opportunities for Exposure Assessment, Risk Assessment and Epidemiologic Research. Proceedings of a Symposium Research Triangle Park, NC, March 30 to April 1, 1993. Environ. Health Perspect. 103 (suppl.3)1.
6. Hayes, A.W. (ed) (1994): Principles and Methods of Toxicology, 3rd, Raven Press, New York.
7. Tyson, C.A.; Fraizer, J.M. eds (1994): Methods in Toxicology, Academic Press, New York
8. Yang, R.S.H. (ed) (1994): Toxicology of Chemical Mixtures, Case Studies, Mechanisms and Novel Approaches, Academic Press, New York.
9. Finley, J.W., Robinson, S.F. and Armstrong, D.J. (1992): Food Safety Assessment, ACS Symposium Series, American Chemical Society, Washington.
10. Graham. H.D. (1980): The Safety of Foods, AVI publishing Company Inc., Westport.
11. Steinhart, C.E. Doyce, N.E. and Cochrane, B.A. (1996): Food Safety, Food Research Institute, Marcel Dekker Inc., New York.
12. McMurray, C.H., Stewart, E.M., Gray, R. Pearce, P. (ed) (1996): Detection Method for irradiated Foods- Current Status, Vol. 14, Academic Press, New York.
13. Varnham, A.H. Evans, M.G. (1991): Foodborne Pathogens Wolfe.
14. Doyle, M.D. (ed) (1989): Food-borne Bacterial Pathogens, Marcel Dekker, New York.
15. Hayatsu, H. (1991) Mutagens in Food: Detection and Prevention. CRC Press.
16. Bronzetti, G.; De Flora, S.; Waters, M.D. and Shankel, D.M/ (1993): Antimutagenesis and Anticarcinogenesis Mechanisms Plenum Press, New York.

Attainment of Course Outcomes (COs):

Sr. No.	Course Outcomes	Methods for attainment of Cos
1.	Assess and evaluate different aspects of food safety and various types of hazards.	Classroom lecture and Power Point Presentations
2.	Know about the microbial problems in food safety.	Classroom lecture and Power Point Presentations
3.	Get the idea about contaminants and additives.	Classroom lecture and Power Point Presentations

CO-PO matrix for the course FND405 (Food Toxicology)

COs#	PO1	PO2	PO3	PO4	PO5	PO6
FND405.1	3	3	3	3	3	2
FND405.2	3	2	3	3	3	3
FND405.3	2	3	3	3	2	3
Average	2.66	2.66	3	3	2.66	2.66

CO-PSO matrix for the course FND405 (Food Toxicology)

COs#	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
FND405.1	3	3	3	3	3	3
FND405.2	3	3	3	3	3	2
FND405.3	3	2	3	3	3	3
Average	3	2.66	2.66	3	3	2.66

M.Sc. (Food, Nutrition & Dietetics) Under CBCS-LOCF w.e.f 2021-22
Semester –IV
Elective
Paper -FND-406
Food Processing and Technology

Total Marks: 100
External: 80
Internal: 20
Credits: 4
Duration of Exam: 3 hrs

Note:

- Examiner will set nine questions in all.
- All the questions will carry equal marks.
- Question No.-1 will be compulsory consisting of 5-10 short type questions (having no internal choice) and spread over the entire syllabus.
- Eight questions, two questions from each unit (I, II, III & IV) will be set.
- The candidates are required to attempt five questions in all. Question No -1 will be compulsory, remaining four questions will be attempted by selecting one question from each unit.

Objectives:

- To impart knowledge about the importance of food processing and technology.
- To enlighten about the various food processing methods and processing of different foods.

Course Outcomes:

This course will enable students to:

- FND406 1. Get the basic knowledge about role of physical principles in food processing operations.
FND406 2. Know of chemical principles in food processing.
FND406 3. Have an idea about processing of different types of foods.

UNIT-I

1. **Introduction:** Main crops growing in the country- importance and storage
2. **Physical principles in food processing operations:**
 - Thermal processing- Degree of processing or preservation, selecting heat treatment, heat resistance of microorganism, nature of heat transfer, protective effects of food constituents, types of thermal treatment.
 - Refrigeration – Refrigeration, cold storage and shelf life extension; cold storages with air circulation, humidity control and gas modification (i.e. CA, MA, & SA)
 - Freezing – Changes during freezing- rate of freezing, choice for final temperature for frozen foods, freezing methods, freezing effects.
 - Dehydration- Dehydration, water activity and food safety/quality; methods of dehydration.
 - Ionizing radiations- Forms of radiant energy; ionizing radiations, sources and properties; radiation units; radiation effects, limiting indirect effects; dose fixing factors; objectives in food irradiation, safety and quality of irradiated food; irradiation of various foods and comparison with other methods of preservation.

UNIT -II

3. **Chemical principles in food processing:** Preservation/processing by sugar, salt, curing, smoke, acid and chemicals; chemical changes in foods that affect texture, flavor, colour, nutritive value and safety during handling, storage and processing; Chemical and biochemical reactions affecting food quality and safety.
4. **Cereals and Pulses:** Wheat grain characteristics and products; wheat milling process; milling of drum or semolina; macaroni or pasta products noodles, wheat starch and gluten fraction, baking technology, production of bread, biscuits and cakes.
 - Corn wet milling; dry milling and air classification; wet fractionation of barley, pearling.
 - Barley malting; dry milling and air classification; wet fractionation of barley. Pearling.
 - Storage and quality of cereal grains
 - Rice processing, fractionation, quick-cooking rice, parboiled rice, rice based instant foods.
 - Pulses – processing, elimination of toxic factors, quick-cooking dals, fermentation and germination.

UNIT -III

5. **Fruits and vegetables:**
 - Structure, composition, physiological and biochemical changes during ripening, handling and storage.
 - Varietal, harvesting and pre- processing considerations for vegetables; post-harvest processing practices. Processing of vegetables, canning, freezing, dehydration, pickles and chutneys.
 - Potato processing- Raw material handling and storage, raw material quality and suitability for chips, French fries, dehydrated granules and boiled/canned potatoes; processing for chips, French fries, dehydrated granules.
 - Fruit processing- Canning, fruit-based beverages and concentrates, squashes, jams, jellies, ketchup's sauces, high sugar, high acid products.

6. Meat, Fish and Eggs:

- Chemistry of processed meats, Ageing and tenderizing, curing, smoking and freezing of meat, fresh storage of meat.
- Fish preservation and processing.
- Meat and fish products: preservation by curing, smoking, salting and pickling and dehydration, corned beef, sausages, salami, bacon, luncheon meat.
- Dehydrated egg powder and frozen egg, egg storage.
- Sources of bone meal, gelatin, casing plasma and blood, curing.

UNIT –IV

7. **Oilseeds:** Oilseed pressing, solvent extraction, purification (degumming, refining, bleaching, deodorization), hydrogenation, plasticizing and tempering, products- butter, margarine, shortening, mayonnaise and salad dressing, inter- esterification and production of MCT.
8. **Spices:** Processing and extraction of essential oils and colours, stability, storage and preservation.
9. **Fermentation Technology:** Fermentation technology, yeast, milk products, fermented vegetables, beer, vinegar, fermented soy products. Enrichment and fortification technology, high protein food technology.
10. **Additives and Preservatives:** definition of food additives; acids, bases, buffer systems and salts, chelating agents, antimicrobial agents, sweeteners, stabilizers and thickeners, fat replacers, firming texturizers, appearance control and clarifying agents. Flavour enhancers, aroma substances, sugar substitutes, antioxidants, anticaking agents, bleaching agents, protective gases.
11. **Functional foods and Technologies to meet special needs. New advances.**
12. **Waste disposal and sanitation:** Waste characteristics, treatment and technologies, food plant sanitation.

Reference:

1. Gould, G.W. (1995), New Methods of Food Preservation, Blackie Academic & Professional, London.
2. Connor, J.M. and Schick W.A. (1997), Food Processing An Industrial Powerhouse in Transition, John Wiley and Sons, New York.
3. Stadelman, W.J. and Cotterill, D.J. (1986), Egg Science and Technology, AVI Publishing Co., INC., Westport.
4. Arthey, D. and Ashurst, P.R. (1996), Fruit Processing, Blackie Academic & Professional London.
5. Philips, R.D. and Finley J.W. (1989), Protein Quality & Effects of Processing, Marcel Dekker, INC, New York.
6. Inglett, G.C. and Munet, L. (1980), Cereals for Food and Beverages, Academic Press, New York.
7. Jelen, P. (1985), Restron Publishing Co., INC, A Prentice-hall Co., Virginia.
8. Hirasa, K and Takemasa, M. (1998), Spice Science and Technology, Lion Corporation, Tokyo, Japan.
9. Kalp, K. Lorenz, k. and Brummer, J. (1995), Frozen and Refrigerated Doughs and Batters, American Association of Cereal Chemists INC. St. Paul, Minnesota.
10. Von Leosecke, H.W. (1998), Food Technology Series: Drying and Dehydration of Foods, Allied Scientific Publishers.
11. Marts, S.A. (1996), Bakery Technology and Engineering, Third Edition, CBCs Publishers, New Delhi.

Attainment of Course Outcomes (COs):

Sr. No.	Course Outcomes	Methods for attainment of Cos
1.	Get the basic knowledge about role of physical principles in food processing operations.	Through class room lectures, group discussions and PPTs
2.	Know of chemical principles in food processing.	Through class room lectures, group discussions and PPTs
3.	Have an idea about processing of different types of foods.	Through class room lectures, group discussions and PPTs

CO-PO matrix for the course FND406 (Food Processing and Technology)

COs#	PO1	PO2	PO3	PO4	PO5	PO6
FND406.1	3	3	3	3	3	2
FND406.2	3	2	3	3	3	3
FND406.3	3	3	2	3	3	3
Average	3	2.66	2.66	3	3	2.66

CO-PSO matrix for the course FND406 (Food Processing and Technology)

COs#	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
FND406.1	3	3	3	3	3	3
FND406.2	3	3	3	3	3	3
FND406.3	3	3	3	3	3	3
Average	3	3	3	3	3	3

M.Sc. (Food, Nutrition & Dietetics) Under CBCS-LOCF w.e.f 2021-22
Semester –IV
Core
Paper- FND-407(Practical)
Clinical Dietetics- II

Total Marks: 100
 External: 80
 Internal: 20
 Credits: 4
 Duration of Exam: 3 hrs

Objectives:

- To impart knowledge about planning, calculation & preparation of Therapeutic diets based on patient's needs.
- To give them knowledge about dietary counseling for treatment of various clinical diseases.
-

Course Outcomes:

This course will enable students to:

- FND407 1. Assessment of Patient's needs of various clinical disorders.
 FND407 2. To gain hands on experience after doing internship in various hospitals.
 FND407 3. To develop skill in Planning, Calculation & Preparation of therapeutic diets for various clinical conditions.

- Planning, Calculation, Preparation, serving and evaluation of therapeutic diets for diseases covered in theory.
- Market survey of commercial nutritional supplements and nutritional support substrate.
- Study of the management of food services in selected Hospitals.
- Visits to dietetic clinics in hospitals- case study of patients needing specific therapeutic diets.
- Internship in a hospital for 45 days after the theory exam with report submission.
- Preparations of teaching aids for common disorders.

Attainment of Course Outcomes (COs):

Sr. No.	Course Outcomes	Methods for attainment of Cos
1.	Assessment of Patient's needs of various clinical disorders.	Through case studies and class practicals.
2.	To gain hands on experience after doing internship in various hospitals.	Through gaining first hand Knowledge in clinical setup.
3.	To develop skill in Planning, Calculation & Preparation of therapeutic diets for various clinical conditions.	Through class practicals and presentations.

CO-PO matrix for the course FND407 (Clinical Dietetics- II)

COs#	PO1	PO2	PO3	PO4	PO5	PO6
FND407.1	3	3	3	3	3	2
FND407.2	3	3	3	3	3	3
FND407.3	3	3	3	3	3	3
Average	3	3	3	3	3	2.66

CO-PSO matrix for the course FND407 (Clinical Dietetics- II)

COs#	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
FND407.1	3	3	3	3	3	3
FND407.2	2	3	3	3	2	3
FND407.3	3	3	2	3	2	3
Average	2.66	3	2.66	3	2.33	3

M.Sc. (Food, Nutrition & Dietetics) Under CBCS-LOCF w.e.f 2021-22
Semester –IV
Core
Paper- FND-408(Practical)
Public Health Nutrition- II

Total Marks: 100
 External: 80
 Internal: 20
 Credits: 4
 Duration of Exam: 3 hrs

Course Outcomes:

This course will enable students to:

- FND408 1. Acquire knowledge about the concept of Food & Nutrition Security.
 FND408 2. Understand the concept & purpose of Nutritional status assessment in community sitting.
 FND408 3. Be familiar with standard methods & Techniques for assessing nutritional status.
 FND408 4. Gain knowledge on the basis of Nutrition education, communication strategies for the improvement of nutritional status.

- Assessment of nutritional status of community by using anthropometric, dietary measurement. (Report to be submitted in the practical exam).
- Preparation of visual aids like charts/ posters, pamphlets/ brochures, nutritional games/ nutritional stories for addressing Public Health Nutrition Problem in the community.
- Preparation and effective use of aids for improving Nutritional status.

Attainment of Course Outcomes (COs):

Sr. No.	Course Outcomes	Methods for attainment of Cos
1.	Acquire knowledge about the concept of Food & Nutrition Security.	Through practicals and presentations.
2.	Understand the concept & purpose of Nutritional status assessment in community sitting.	Through practicals and presentations.
3.	Be familiar with standard methods & Techniques for assessing nutritional status.	Through practicals and presentations.
4.	Gain knowledge on the basis of Nutrition education, communication strategies for the improvement of nutritional status.	Through practicals and presentations.

CO-PO matrix for the course FND408 (Public Health Nutrition-II)

COs#	PO1	PO2	PO3	PO4	PO5	PO6
FND408.1	3	3	3	3	3	2
FND408.2	3	3	3	3	3	3
FND408.3	3	3	3	3	3	3
FND408.4	3	3	3	3	3	2
Average	3	3	3	3	3	2.5

CO-PSO matrix for the course FND408 (Public Health Nutrition-II)

COs#	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
FND408.1	3	3	3	3	3	3
FND408.2	2	3	3	3	2	3
FND408.3	3	3	2	3	2	3
FND408.4	3	2	2	3	3	3
Average	2.75	2.75	2.5	3	2.5	3

CO-PO-PSO Mapping Matrix for all the courses of M.Sc. Home Science (Food, Nutrition and Dietetics)

Course Code	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
FND-101	2.75	3	2.75	3	3	3	3	2.75	3	2.75	3	3
FND-102	3	2.8	3	2.8	3	3	2.8	3	3	2.8	3	3
FND-103	3	3	2.5	3	3	2.5	2.5	3	3	3	2.5	3
FND-104	2.5	3	3	2.5	3	3	3	2.5	3	2.5	3	3
FND-105	3	3	3	3	3	3	3	3	3	3	3	3
FND-106	2.83	3	3	2.83	3	3	3	2.83	3	3	3	3
FND-201	3	3	2.75	3	3	3	3	3	3	3	2.75	3
FND-202	3	2.8	3	3	3	2.8	3	2.8	3	3	3	2.8
FND-203	3	2	3	3	3	2	3	3	2	3	3	3
FND-204	3	3	2	3	3	3	3	3	3	2	3	3
FND-206	3	2.5	3	3	3	2.5	3	2.5	3	3	2.5	3
FND-207	3	2.75	3	3	2.75	3	3	3	2.75	3	2.75	3
FND-208	2.83	3	3	3	2.83	3	2.83	3	3	3	3	2.83
FND-301	2.5	2.5	2.5	2.5	3	3	3	2.5	2.5	3	2.5	2.5
FND-302	2	3	3	2	3	3	3	2	3	2	2	3
FND-303	3	2.6	3	3	3	3	3	3	2.6	3	3	3
FND-304	3	2.75	3	2.75	2.75	3	2.75	2.75	3	2.75	2.75	3
FND-305	3	2.66	3	2.66	2.66	3	3	2.66	3	3	2.66	2.66
FND-306	3	3	2.66	2.66	3	2.66	3	2.66	2.66	2.66	3	3
FND-307	3	3	3	2	3	3	3	3	2	3	3	3
FND-309	3	3	3	2	3	3	2.66	3	2	3	2.66	2.66
FND-310	2.66	2.66	2	2	3	3	2.66	3	2.66	3	3	2.66
FND-401	2	3	2	3	3	3	3	3	2	3	3	2
FND-402	3	2	3	2	2	3	3	3	2	2	2	3
FND-403	2.66	3	3	2.66	3	3	2.66	3	3	2.66	3	3
FND-405	2.66	2.66	3	3	2.66	2.66	3	2.66	2.66	3	3	2.66
FND-406	3	2.66	2.66	3	3	2.66	3	3	3	3	3	3
FND-407	3	3	3	3	3	2.66	2.66	3	2.66	3	2.33	3
FND-408	3	3	3	3	3	2.5	2.75	2.75	2.5	3	2.5	3