# PROPOSED SYLLABUS

# FOR

# TWO YEARS POSTGRADUATE COURSE

# IN

# MSc. in NUTRITION AND DIETETICS


## DEPARTMENT OF CLINICAL NUTRITION AND DIETETICS

## PARAMEDICAL SCIENCES

## SBKSMI & RC, SUMANDEEP VIDYAPEETH

## Proposed Scheme of M.Sc. in Nutrition and Dietetics

### 1st Year

| Subject code | Title | Credits (Th + Pr) |
|---|---|---|
| **Semester 1** | | |
| | Applied Physiology for Dietetics | **2(2+0)** |
| | Advanced Nutrition | **4(4+0)** |
| | Advanced Biochemistry | **4(4+0)** |
| | Research Methodology | **3(3+0)** |
| | Medical Nutritional Management-I | **4(3+1)** |
| | Nutritional Anthropology | **2(2+0)** |
| **Semester 2** | | |
| | Nutrition in Critical Care | **2(2+0)** |
| | Advanced Food Science | **2(2+0)** |
| | Public Health Nutrition | **3(2+1)** |
| | Medical Nutritional Management-II | **6(4+2)** |
| | Institution Food Service Organization | **2(2+0)** |
| | Food Microbiology and Food safety | **2(2+0)** |

## Proposed Scheme of M.Sc. in Nutrition and Dietetics

### 2nd Year

| Subject code | Title | Credits (Th+ Pr) |
|---|---|---|
| **Semester 3** | | |
| | Practice in Institutional Food Service Management | **3(0+3)** |
| | Food Product Development | **2(0+2)** |
| **Semester 4** | | |
| | Dissertation | **10(0+10)** |
| | Internship | **2(0+2)** |

## Proposed Scheme of M.Sc. in Nutrition and Dietetics

### SEMESTER I

| Subjects | Credits/week | | | | Teaching Hours | | |
|---|---|---|---|---|---|---|---|
| | Lecture (L) | Tutorial (T)/ Clinical training (CT) | Practical (P)/ Research work (RW) | Credits (C) | Lecture/ tutorial | Practical | Total Hours |
| Applied Physiology | 2 | - | - | 2 | 18 | - | 18 |
| Advanced Nutrition | 4 | - | - | 4 | 36 | - | 36 |
| Advanced Biochemistry | 4 | - | - | 4 | 36 | - | 36 |
| Research Methodology | 3 | - | - | 3 | 27 | - | 27 |
| Medical Nutritional Management-I | 3 | - | 1 | 4 | 27 | 18 | 45 |
| Nutritional Anthropology | 2 | - | - | 2 | 18 | - | 18 |
| **Total credits of program= 19**<br>**Total teaching hours of program=180** | | | | | | | |

### SEMESTER II

| Subjects | Credits/week | | | | Teaching Hours | | |
|---|---|---|---|---|---|---|---|
| | Lecture (L) | Tutorial (T)/ Clinical training (CT) | Practical (P)/ Research work (RW) | Credits (C) | Lecture/ tutorial | Practical | Total Hours |
| Nutrition in Critical Care | 2 | - | - | 2 | 18 | - | 18 |
| Advanced Food Science | 2 | - | - | 2 | 18 | - | 18 |
| Public Health Nutrition | 2 | - | 1 | 3 | 18 | 18 | 36 |
| Medical Nutritional Management-II | 4 | - | 2 | 6 | 36 | 36 | 72 |
| Institution Food Service Organization | 2 | - | 0 | 2 | 18 | - | 18 |
| Food Microbiology and Food safety | 2 | - | - | 2 | 18 | - | 18 |
| **Total credits of program= 17**<br>**Total teaching hours of program=180** | | | | | | | |

## Proposed Scheme of M.Sc. in Nutrition and Dietetics

### SEMESTER III

| Subjects | Credits/week | | | | Teaching Hours | | |
|---|---|---|---|---|---|---|---|
| | Lecture (L) | Tutorial (T)/ Clinical training (CT) | Practical (P)/ Research work (RW) | Credits (C) | Lecture/ tutorial | Practical | Total Hours |
| Practice in Food Service Management | 0 | - | 3 | 3 | - | 54 | 54 |
| Food Product Development | | | 2 | 2 | - | 36 | 36 |
| **Total credits of program=**<br>**Total teaching hours of program=** | | | | | | | |

### SEMESTER IV

| Subjects | Credits/week | | | | Teaching Hours | | |
|---|---|---|---|---|---|---|---|
| | Lecture (L) | Tutorial (T)/ Clinical training (CT) | Practical (P)/ Research work (RW) | Credits (C) | Lecture/ tutorial | Practical | Total Hours |
| Dissertation | - | - | 10 | 10 | - | 180 | 180 |
| Internship ( Postings) | - | - | 2 | 2 | | 18 | 18 |
| **Total credits of program= 12**<br>**Total teaching hours of program=198** | | | | | | | |

# DETAILED SYLLABUS FOR MSc. in NUTRITION AND DIETETICS

## SEMESTER I

### Applied Physiology

Unit1: General principles of Physiology.
Unit 2: The Skeleton
- General Account

Unit 3: The Muscular System
- General Account -Types of muscles, characteristics of each, Similarities and Differences.

Unit 4: Blood and Circulatory System
- Blood and its composition
- Functions of each constituent of blood
- Blood groups
- Blood transfusion and its importance
- Coagulation of blood, Blood vessels
- Structure and functions of heart
- Blood pressure, heart rate, Cardiac output and their regulation.

Unit 5: Lymphatic System
- Lymph, Lymph glands and functions
- Spleen – Structure and Functions.

Unit 6: Respiratory System
- Organs
- Structure and Functions
- Mechanism of Respiration
- Chemical Respiration.

Unit 7: Digestive System
- Structure and Functions of Alimentary tract
- Functions of various secretions and juices – Saliva, Gastric, Bile, Intestinal, Pancreatic.
- Functions of enzymes in digestion.
- Digestion of nutrients – Proteins, Fats, Carbohydrates
- Common problems of Digestive tract – Vomiting, Constipation, Diarrhea.

Unit 8: Excretory System
- Structure and Functions of (a) Kidney (b) Ureter (c) Bladder (d) Skin.
- Urine -Formation of urine, Composition of normal and abnormal urine.
- Role of excretory system in homeostasis, fluid balance, Regulation of body temperature.

Unit 9: Nervous System
- Structure of Nerve Cell, Fibre
- Classification of Nervous System
- Central Nervous System – Brain, Lobes of brain, Cerebrum, Cerebellum, Medulla oblongata, Hypothalamus. Pituitary
- Gland – structure, Functions, Spinal Cord – structure and functions, Autonomic and Sympathetic nervous system.

Unit 10: Reproductive System
- Female reproductive system – organs, structure and functions
- Male reproductive system – structure and functions
- Menstruation, menstrual cycle, Puberty, Menarche, Menopause, Fertilization of ovum, Conception, Implantation.

Unit 11: Sense Organs

- Eye – structure and function
- Ear – structure and function
- Skin -structure and function

Unit 12: Glands and Endocrine System

- Liver – structure and function
- Gall Bladder – structure and function
- Enterohepatic circulation
- Pancreas – structure and function
- Endocrine system
- Endocrine glands – structure and function. Hormone – types and functions, role in metabolism. Endocrine disorders
- Regulation of Hormone Secretion

## Advanced Nutrition

Unit 1: Concept and Definition of terms

- Nutrition, Malnutrition, Health
- Brief history of Nutritional Science
- Scope of Nutrition.

Unit 2: Minimum Nutritional Requirements and RDA.

- Formulation of RDA and Dietary Guidelines – Reference Man and Reference Woman.

Unit 3: Body Composition and Changes through the Life Cycle.

Unit 4: Energy in Human Nutrition

- Energy needs – Assessment and requirements
- Current approach for estimating RDA for energy intake of different age, sex groups and physiological conditions
- Metabolic regulation of food intake- weight management through life
- Clinical and biochemical manifestation of over and under Nutrition
- Disorders of metabolism – metabolic syndrome/syndrome X and increased cardio metabolic risk.

Unit 5: Proteins

- Protein Quality (BV, PER, NPU)
- Digestion and Absorption
- Factors affecting protein bio-availability including Anti nutritional factors
- Requirements

Unit 6: Lipids

- Digestion and Absorption
- Intestinal resynthesis of triglycerides – Types of fatty acids
- Role and nutritional significance (SFA, MUFA, PUFA, W-3)

Unit 7: Carbohydrates

- Dietary carbohydrates – utilization, assimilation and functions of starch, resistant starch, dietary fiber and sugar
- Dietary fiber and its role in health conditions – obesity (satiety), hypertension, glucose tolerance, insulin response, diabetes, heart disease.
- Disorders of carbohydrate digestion, absorption and metabolism
- Diagnostic tests to evaluate carbohydrate intolerance, glycemic index

Unit 8: Dietary Fibre

- Classification, Composition,
- Properties and Nutritional status significance.

Unit 9: Minerals and Trace Elements

- Physiological role, Bioavailability and Requirements.

Unit 10: Vitamins

- Physiological role, Bioavailability and Requirements.

Unit 11: Water

- Functions, Requirements.

**Advanced Biochemistry**

Unit 1: Carbohydrate Metabolism

- Metabolism with regard to:
  Intestinal transport of carbohydrates
  Transport of glucose across various cells
- Cellular metabolism of carbohydrates and metabolism of
- glycogen
- Regulation of carbohydrate metabolism at:
  Substrate level
  Enzyme level
  Hormonal level
  Organ level
- Disorders of carbohydrate metabolism

Glycogen storage diseases
Lactose intolerance
Galactosemia
Diabetes mellitus
Lactoacidosis

- Regulation of blood glucose levels
- Carbohydrate metabolism in undernutrition&overnutrition

Unit 2: Enzymes and biological oxidation

- Kinetics of monosubstrate and bisubstrate catalysed
- reactions
- Regulation of enzymatic activity and synthesis
- Enzyme inhibitors & drugs.
- Electron transport chain – components and mechanism.
- Role of high energy phosphates in metabolism

Unit 3: Metabolism of Lipids

- Metabolism with regard to:
  (a) Intestinal transport of lipids
  (b) Cellular uptake, metabolism and lipoprotein metabolism.
- The regulation of lipid metabolism at:
  (a) Substrate level

(b) Enzyme level
(c) Hormonal level
(d) Organ level
- Ketosis, lipoproteinemias, fatty liver

Unit 4: Metabolism of Amino Acids, Biologically Active Peptides, Polypeptides And Transport Proteins
- Amino acid oxidation and the production of urea
- Pathways for amino acid degradation
- Blood transport of ammonia via glutamate
- Role of transport protein in the metabolism of amino acids
- Biologically active amines & role in biomedicine

Unit 5: Protein Biosynthesis
- Gene expression
- Transcription
- Translation
- Post-translational modification
- Inhibitors of protein biosynthesis
- Gene expression in mitochondria

Unit 6: Disorders of Amino Acid and Nucleic Acid Metabolism
- Inborn errors of amino acid metabolism
- Disorders of nucleic acid metabolism

Unit 7: Molecular Endocrinology
- Classification of hormones
- Overview of hormone metabolism
- Hormones and neurotransmitters
- Signal generation, signal transduction, CAMP, CGMP, Protein kinase cascade system etc.
- Regulation of hormonal action

**Research Methodology**

Unit 1: Research Problems and Experimental Designs
- Selection of research topics – need, relevance, feasibility.
- Problem analysis, definition and stating hypothesis objectives.
- Literature search – referencing, abstracting, computer searches, bibliography.
- Sampling methods.
- Sample size calculations.

Unit 2: Experimental Designs
- True Experimental (TE) Designs and Quasi Experimental (QE) Designs.
- Internal & External Validity.
- Threats to validity in QE designs.
- Epidemiological studies
  (a) Observations and experiments
  (b) Observational epidemiology – Descriptive studies, ecological studies, cross-sectional studies, case-control studies, Cohort studies –Prospective and retrospective study design, Nested case control studies,

(c) Experimental epidemiology – field trials, community trials, Randomised controlled trials, single and Double blind studies, Factorial designs and Cross over studies, Meta analysis
(d) Potential errors in epidemiological studies – Random error,
sample size calculations, systematic error, selection bias, measurement bias, confounding and control of confounding

Unit 3: Qualitative Research Methodology

- Qualitative research tools and methods
- Qualitative methods in dietetic practices
- Integrating qualitative and quantitative methods.
- Critique of recent research studies.

Unit 4**:** Statistical tests

- Mean, Median & Mode.
- Standard Deviation and Standard Errors.
- Confidence Interval.
- Coefficient of variation.
- Chi square tests ($x^2$).
- t – tests for independent sampling.
- t – tests for paired samples.
- Analysis of variance.
- Correlation coefficients.
- Comparing disease occurrence (absolute comparison and
- relative comparison).
- Validity of a screening test
- Steps in data analysis: Cleaning and verifying data.,
- Coding data, Data entry, tabulating data, Data Analysis –
- Manual, Computer. Presentation of data.

Unit 5: Scientific writing as a means of communication and preparing for writing.

- Different forms of scientific writing - Articles in journals, research notes and reports, review articles, monographs, dissertations, bibliographies.
- How to formulate outlines- The reasons for preparing outlines, Kinds of outlines e.g., Topic outlines, Conceptual outlines, theme outline.
- Filling in the outlines and preparing the framework. e.g., drafting titles and subtitles
- Tables and illustrations as systematic means of presenting data.
    a) Titles, rows, columns, footnotes
    b) Types of illustrations- graphs, diagrams, flow charts
- Appendices: use and guidelines.

Unit 6: The writing process and styles of writing

- Use of outlines as a starting device
- Making a draft- improving the draft in relation to the objectives
- Various styles of writing, consistency and other aspects
- Types of scientific writing-reports, journal papers, abstracts, monographs, dissertation, funding etc.

- Components of scientific writing – Introduction. Review of literature, Methodology, Results and discussion, summary and conclusions, limitations, bibliography and appendices
- Refining and finalizing the report/paper/thesis – editing, formatting, proof reading.
- Writing a research proposal for grants – justification, rationale and importance of the question being addressed, empirical and theoretical conceptualization, presenting pilot study/data, research proposal and time frame, clarity, specificity of method, clear organization, outcome of the study and its implications, budgeting, available infrastructure and resources, executive summary etc.

**Medical Nutrition Therapy-I**

Unit 1: Selected Important Areas in Clinical Nutrition
- Diet prescription and nutritional care process – Essential
- components of diet prescription and steps involved in nutrition care process.
- Nutrition in hospitalized patients – Causes of malnutrition in hospitalized patients, identification of high risk patients, and assessment of nutritional status.
- Diet counseling : Definition, responsibilities of a counselor and a counsel and tips for successful counseling, components of counseling process, formulation of a proforma

Unit 2: Gastrointestinal Diseases
(Aetiopathogenesis, clinical picture, diagnostic tests, treatment, preventive aspects)
- Peptic ulcer
- Ulcerative colitis
- Diarrhoea, dysenteries, malabsorption syndrome
- IBD

Unit 3: Liver and Renal Disease
(Classification, etiology, clinical features, diagnostic tests, prevention and treatment)
- Liver disorders
  (a) Viral hepatitis types A and B, C, E
  (b) Cirrhosis of liver
  (c) Hepatic coma
- Renal disease
  (a) Glomerulonephritis
  (b) Nephrotic syndrome
  (c) Acute and chronic renal failure – Dialysis

Unit 4: Non Communicable Diseases
- Aetiopathogenesis, diagnostic tests, clinical features, prevention and dietary care of patients with multiple complications of
  a) Diabetes
  b) Hypertension
  c) Coronary Heart Diseases

Unit 5: Pediatric Nutrition
- Common Nutrition problems among pediatric population
- Nutritional Health management of severely acute malnutrition
- Management of Low birth weight babies, IUGR

Unit 6: Nutrition care in immune deficiency diseases

- Care during HIV aids
- Care during Cancers

Practicals:

Unit 1: Market Survey of Commercial Nutrition Supplements.

- Collection of information on commercial food formulae available in the market and their evaluation for suitability in treating various diseases.

1. Pharma therapeutic products: Clinical utility, age groups
2. Therapeutic food products
3. Generic food products (OTC products like spirulina etc).

Unit 2: Observation and Learning Experience of OPD and IPD Patients.

- Learning about recording of medical history – terms used in medical field
- Observe classical symptoms, diagnostic tests and recommendations
- Learn simple physiological indices of general health (BP, Hb, pulse rate, etc.)
- Prepare a case study report of a patient with a chronic disease after follow up for domiciliary care.

**Nutritional Anthropology**

## SEMESTER II

**Nutrition in Critical Care**

Unit 1:Nutritional screening and nutritional status assessment of the critically ill
Unit 2: Nutrition support systems and other life saving measures for the critically ill
Unit 3: Role of immuno enhancers, conditionally essential nutrients, immuno- suppressants and special diets in critical care
Unit 4: Complications of nutritional support systems including refeeding syndrome
Unit 5: Rehabilitation diets – stages
Unit 6. Diet related ethical issues in the terminally ill.

**Advanced Food Science**

Unit 1: **Constituents of Foods, Additives and Rheology**

- Water : Physical properties of water and ice, chemical nature and structure of the water molecule. Free andbound water. Water activity and food spoilage.
- Starch : Structure, characteristics of food starches,gelatinization, effect of different conditions andingredients on gelatinization.
- Non starch polysaccharides : Cellulose, hemi-cellulose,pectins, gums and animal polysaccharides.
- Food Enzymology: Endogenous enzyme activity,Methods controlling them, enzymes in food industry
- Food Rheology

Unit 2: Cereal and Cereal Products

- Cereal grains : Structure, composition, classification andgrading
- Cereal products : Malting, popping and puffing of cerealgrains and millets
- Flour and flour quality : Flour constituents, role in bakery
- Batters and dough.

Unit 3: **Pulses, Legumes, Nuts and Oilseeds, Fats and Oils**

- Pulses and Legumes : Structure, composition, selection,grading, processing, germination, fermentation, cookingquality and toxic constituents.
- Nuts and Oilseeds : Composition, selection, grading, oilextraction, protein concentrates and isolates.
- Fats and Oils : Sources, composition, effect ofcomposition on fat, classification, physical and chemicalproperties, rancidity changes, antioxidants and synergists, changes during frying, recent advances.

Unit 4: Milk and beverages
Milk and its Products Composition, physical and functional properties.
Denaturation, effects of processing and storage. Dairy products.
2. Fruits and Vegetables
Gross composition, classification, structural features.Enzymes in fruits and vegetables, browning reactions.Pigments : Structure, constituents, effect of cooking, acid,alkali, etc. on pigments.
Texture of fruits and vegetables during ripening.Vegetable products as spices.
Beverages
Composition, processing, phenolic compounds and factors
affectinga. Tea and coffee, Alcoholic beverages

**Public Health Nutrition**

Unit 1: Linkages between Nutrition, poverty, agriculture andfood security

- Food and nutrition security : Definitions, concept andcomponents
- National, community and household level food security :current definitions globally and In India
- Effect of macro economic policies.
- Impact of agricultural policies and practices on health careand food consumption.
- Food insecurity warning and mapping systems fornutritional vulnerability.
- Qualitative and participatory approaches to understandcommunity view of food security**.**
- Newer developments & strategies for improvingnutritional status of populations such as
- Food fortification
- Genetic modification of foods
- Multi micronutrient fortification of complementary foods& supplementary nutrition for pregnant & lactatingwomen

Unit 2: Nutrition, a Developmental Priority and its Progress

- MDG & its relationship with nutrition
- Countdown 2015, where are we in terms of achieving MDG in India : Bottlenecks & way forward
- New Emerging public health problem of NCD'sprogrammes & strategies recommended for their control

Unit 3: Approaches for Under Nutrition Control in India and the

- Developing World
- National programs & guidelines for controlling undernutrition in India with emphasis on IYCF (ICDS, RCH,IMNCI, NRHM, NUHM) & other developing countries,Best Practices from Thailand, Vietnam etc:
- Importance of focusing health & nutrition interventions infirst 1000 days of life & improving delivery of keynutrition interventions, its evidence, impact, significancefor controlling under nutrition & new governmentinitiatives (IYCF, IGMSY, JananiSurakshayojana,Chiranjeeviyojana in Gujarat etc.)
- Strengthening gender sensitivity and communityempowerment of above program
- The rolling of new WHO standards in India its importance& implications
- The problem of stunting & wasting in populations, theirdiagnosis, causes, & strategies & protocols for theirmanagement in mild to moderate & severe forms

**Medical Nutrition therapy II**

Unit 1: Introduction to Pharmacology

- Pharmacokinetics
- Pharmacodynamics
- Pharmacogenomics
- Effect of food on drug therapy: drug absorption, medication and enteral nutrition interactions, drug distribution, drug metabolism and drug excretion.

Unit 2: Nutrient-Drug Interaction

Common drugs, their name and mechanism of action- Antacids/ulcers, oral hypoglycemic agents, statins, antibiotics, anti-inflammatory drugs, anti-pyretic drugs, anti-hypertensives, anti-

spasmodic, anxiolytic or antianxiety, bronchodilators, anti-allergic or viral, antiepileptic, oral contraceptives, diuretics, anti-histamines, steroids, anti-carcinogenic, immune boosters.
Contraindications of various drugs and its impact on nutritional status.
Effects of drug on food and nutrition, nutrient absorption, metabolism and excretion.

Unit 3: Botanicals and Neutraceuticals in Health and Disease
Active compounds: name of the botanical
2. Indications and common uses
3. Mechanism of action and active constituents
4. Level of supplementation ,contraindications, side effects and toxicity.

Unit 4: Nutraceuticals
Food –pharma convergence
2. Nutraceuticals and diseases
3. Nutraceuticals and mental health.
4. Classifications: dietary supplements, medicinal foods, pharmaceuticals, their effectiveness and safety, bioavailability
Role of prebiotic, probiotic and symbiotic in Health and Disease.

Unit5: Concept of Communication and Introduction to IEC
Concepts of Communication
a) Communication and mass communication
b) Scope and elements of communication
c) Models of communication
d) Communication process
e) Approaches to communication
2. Different media, their characteristics and use
3. Introduction to IEC
(a) Importance of IEC
(b) Relevance to programs
(c) IEC for behavioralchanges :Behavior and determinants of behavior, need for IEC.

Unit 6: Planning, Implementing and Assessment
Planning effective IEC programme
(a) Broad based strategy and specific strategy
(b) Identification of key messages for reinforcement
(c) Preparation of IEC material and refining of IEC messages
(d) Social mobilization, social marketing and role of caregivers/individuals – training to use IEC
(e) Implementation – Use of IEC, training, supervision and monitoring
4. IEC for different target groups like policy makers, grassroot functionaries, community, hospitals, individuals, caregivers etc.
5. Impact assessment
6. Studies on various IEC programmes.

Practical:
General Estimations, Reference Values and Interpretations
1. Haemoglobin (comparing filter paper technique and Cyanmethemoglobin method)
2. Enzymatic estimations in blood and serum
(a) Blood glucose (Comparison with glucometer and enzymatic method)
(b) Serum total cholesterol
(c) Serum triglyceride
(d) Calculation of atherogenic indices
(e) Iodine content in salt (Iodine kit and Iodometric method)

Liver and Kidney Function Tests
Serum transaminases
2. Serum total proteins, albumin and globulins
3. Blood urea

**Institution Food Service Organisation**

Unit 1: Introduction to Food Service Organisation
Definition
2. Principles and functions
3. Characteristics
4. Types of catering establishments
5. Goals of service management

Unit 2: Food Service Management in Different Types of Catering Establishments
Catering management in Restaurants /Hotels, Theme restaurants, Malls, Cruise liners, Outdoor Catering with respect to the following:
1. Origin of catering
2. Concept, layout and design, selecting equipments.
3. Menus and compiling menus for catering operations.
4. Food and Beverage Service
5. Hygiene in food service operations
6. Managing sales, revenue and profits
7. Cost control
8. Human resource management in catering operations
9. Marketing, Sales management, strategies and technique
10. Communication Skills

Unit 3: Food Service Management Skills in Air and Railway Catering
Catering management in Air and Railways with respect to the following:
1. Menus and compiling menus for catering operations.
2. Time Management
3. Human resource management
Hygiene and Sanitation, Hygiene in food handling,

Personnel hygiene, Waste disposal, Safety, Causes of
Accidents, Safety procedures.
5. Speed of service
6. Pricing
7. Managing service quality.
8. Installing systems procedures and controls
9. Kitchen Management basics
10. Managing staff and labour

Unit 4: Food Service Management in Army, Hospitals, Schools/Educational Institutes and Corporate offices.
Catering management with respect to the following:
1. Food production
2. Menu design and pricing
3. Hygiene
4. Purchasing materials
5. Storing and serving food
6. Communication Skills

**Food Microbiology and Food Safety**

Unit 1: Historical developments and Taxonomy
**1.** Historical developments
(a) Food Preservation
(b) Food Spoilage
(c) Food Infection
(d) Food legislation
2. Taxonomy of microorganisms

Unit 2: Role and significance of microorganisms in food
Industries
Bacteria
2. Yeast
3. Mold

Unit 3: Newer and Rapid Methods of Isolation and Detection ofMicroorganisms in Institutional / Industrial Foods

- Conventional methods
- Rapid methods (newer techniques)
- Immunological methods; Fluorescent antibody, radio
- immune assay, ELISA etc.
- Chemical methods: Thermostable nuclease, DNA probes,ATP measurements, PCR techniques
- Microbiological criteria for various food products
- Sampling plans

Unit 4: Principles Involved in Destruction of Microorganisms for Prolonged Storage of Institutional Foods

- Physical methods: drying, freezing, cell storage, heattreatment, irradiation, high pressureprocessing.
- Chemical preservation and natural antimicrobial
- compounds.
- Biologically based preservation systems and probiotic
- bacteria.

## SEMESTER III

**Practice in Food Service Management**

- Hotels 3 star / 5 star
- Restaurants
- Fast food joints
- Industrial canteens
- Guest houses
- Catering Institute

**Food Product development**

- Introduction to food product development
- Product management and planning
- Computer aided ingredient analysis
- Computer aided formulation
- Ingredient technology - proteins
- Ingredient technology - carbohydrates
- Ingredient technology - fats and oils
- Ingredient technology - flavors and colorants
- Ingredient technology - stabilizers
- Ingredient interactions

## SEMESTER IV

**Dissertation**

- Identification of problem of Research in Foods & Nutrition
- Collecting relevant Review of Literature and developing the
- experimental design
- Proposal development, its approval by technical and ethical
- committee
- Tool development for Research and pilot testing /
- standardization of techniques
- Data Collection / Mid course corrections
- Data entry ; Statistical analysis
- Scientific Writing

**Internship**

**Duration of training:** 45 working Days
**Training:** Hospital Setting
**Norms:** As per the norms of the hospital
**Evaluation**
The students will be evaluated by the dietician of the hospital.
**Note:**
**1.** The student will have to prepare a report and submit to the department.
**2.** A presentation has to be made in seminar on their work experience.