

M.Sc. (Nutrition and Dietetics)					
Choice Based Credit system (CBCS) Syllabus					
COURSE OUTLINE AND SCHEME OF EXAMINATION					
FIRST SEMESTER					
Paper No.	Title	Instructions Hrs/ Week	Duration of Examination	Credits	Maximum Marks
Theory					
ND 101 T (CORE)	Human Nutrition	4	3	4	100 (80+20)
ND 102 T (CORE)	Nutritional Biochemistry I	4	3	4	100 (80+20)
ND 103 T (CORE)	Human Physiology	4	3	4	100 (80+20)
ND 104 T (CORE)	Principles of Dietetics	4	3	4	100 (80+20)
Practical					
ND 105 P	Human Nutrition	4	2	2	50
ND 106 P	Nutritional Biochemistry-I	4	2	2	50
ND 107 P	Human Physiology	4	2	2	50
ND 108 P	Principles of Dietetics	4	2	2	50
	Total	16 T + 16P		24	600 (T+P)
SECOND SEMESTER					
Paper No.	Title	Instructions Hrs/ Week	Duration of Examination	Credits	Maximum Marks
Theory					
ND 201 T (CORE)	Principles of Foods	4	3	4	100 (80+20)
ND 202 T (CORE)	Nutritional Biochemistry II	4	3	4	100 (80+20)
ND 203 T (CORE)	Diet in Disease	4	3	4	100 (80+20)
ND 204 T (CORE)	Research Methodology	4	3	4	100 (80+20)
Practical					
ND 205 P	Principles of Foods	4	2	2	50
ND 206 P	Nutritional Biochemistry II	4	2	2	50
ND 207 P	Diet in Disease	4	2	2	50
ND 208 P	Research Methodology	4	2	2	50
	Total	16 T + 16P		24	600 (T+P)

THIRD SEMESTER						
Paper No.	Title	Instructio ns Hrs/ Week	Duration of Examination	Credits	Maximum Marks	
Theory						
ND 301 T (CORE)	Community Nutrition	4	3	4	100 (80+20)	
ND 302 T (CORE)	Food Microbiology	4	3	4	100 (80+20)	
ND 303 T (ELECTIVE POOL)	Food Service Management	4	3	4	100 (80+20)	
	Food Hygiene and sanitation					
	Institutional Food Management					
ND 304 T (Inter- disciplinary ELECTIVE)	Food and Nutrition	4	3	4	100 (80+20)	
Practical						
ND 305 P	Community Nutrition	4	2	2	50	
ND 306 P	Food Microbiology	4	2	2	50	
ND 307 P	Food Service Management	4	2	2	50	
	Food Hygiene and sanitation					
	Institutional Food Management					
ND 308 P	Food and Nutrition	4	2	2	50	
	Total	32		24	600(T+P)	

FOURTH SEMESTER

Paper No.	Title	Instructions Hrs/ Week	Duration of Examinati on	Credits	Maximum Marks	
Theory						
ND 401 T (CORE)	Advanced Nutrition	4	3	4	100 (80+20)	
ND 402 T (CORE)	Paediatric Nutrition	4	3	4	100 (80+20)	
ND 403 T	Nutraceuticals and Functional	4	3	4	100 (80+20)	

(ELECTIVE POOL)	foods				
	Geriatric Nutrition				
	Clinical Nutrition and Immunology				
ND 404 T (ELECTIVE POOL)	Diet and Psychology Counselling skills	4	3	4	100 (80+20)
	Nutrition for Fitness and Sports				
	Maternal and Child Nutrition				
Practical					
ND 405 P	Hospital Internship in Nutrition and Dietetics	4	2	2	50
ND 406 P	Internship - case studies presentation	4	2	2	50
ND 407 P	Project Work – collection of data	4	2	2	50
ND 408 P	Project Work – Report writing and presentation of Project seminar	4	2	2	50
	Total Marks	32		24	600
Grand Total Marks of all the Four Semesters = 600+600+600+600=2400					Theory + Practical

SEMESTER I
ND 101 T HUMAN NUTRITION (CORE)

4 hrs/week

Objectives:

- **To understand the role of adequate nutrition in stages of life cycle.**
- **To know the nutritional requirement and meal management of athletes.**

CREDIT I: PRINCIPLES OF NUTRITION

- Energy value of foods
- Estimation of energy value of foods by Bomb Calorimeter and by Benedict's oxy Calorimeter
- Factors affecting energy requirements;
- Factors affecting BMR, SDA, RDA, and derivation of RDA.
- Physical activity, Reference man, Reference woman
- Basic five food groups, Nutritional contribution from each group
- Balanced diet, Food Pyramid
- Basic principles of meal planning
- Steps in meal planning, food cost
- Nutritional requirements of adult man
- Nutritional requirements of adult woman

CREDIT II: PREGNANCY, LACTATION AND INFANCY

Pregnancy:

- Physiological changes, Growth of fetus from conception till term
- Maternal weight gain and complications of pregnancy
- Increase in Nutritional requirements during pregnancy

Lactation:

- Development of breast, physiology of lactation
- Nutritional component of colostrum and mature milk
- Increase in Nutritional requirements during lactation, Lactogogues

Infancy:

- Growth and development during infancy
- Immunization Schedule
- Composition of different types of milk – cow, buffalo, goat and camel, formula milk
- Breast feeding Vs bottle feeding, Feeding of Low birth weight and premature infants, Human Milk Banks
- Weaning: Homemade foods Vs commercial foods

CREDIT III: PRE SCHOOLERS, SCHOOLGOING CHILDREN AND ADOLESCENTS

Preschoolers:

- Milestones and Growth Chart
- Nutritional requirements
- Factors to be considered while planning diet for the preschool children

School going children:

- Nutritional requirements
- Packed lunch
- Factors to be considered while planning diet for school going children

- Influence of television on eating habits of school going children

Adolescents:

- Sequence of developmental changes, Role of hormones on growth, development and maturation
- Nutritional requirements during adolescence
- Challenges in adolescence: weight control, skipping meals, anorexia, fast foods, smoking, alcohol and drug abuse, teenage pregnancy

CREDIT IV: GERIATRIC AND ATHELETES

Geriatric:

- Physiological changes in aging
- Nutritional requirements and Dietary modification
- Common diseases affecting geriatric groups
- Common disabilities affecting geriatric groups

Athletes:

- Exercise – Benefits, Types
- Source of energy – Creatinine phosphate, glucose and glycogen, fats, proteins
- Nutritional requirements
- Meal Management – pre, during and post event, supplements
- Water and electrolyte balance
- Ergogenic aids

BOOKS RECOMMENDED

- Modern Nutrition in Health & Diseases – Eds – Maurice E. Shils, James A. Olson, Moshe Shike, 8th edition, Vol I and II, Williams & Wilkins Publication.
- Nutrition and Dietetics – Shubhangini A Joshi, 2nd edition, Tata Mc Graw Hill publication.
- Food, Nutrition and Diet Therapy – Kathleen Mahan & Krause, Sylvia Escott Stump.

SUGGESTED REFERENCES FOR ADDITIONAL READING

- Perspectives in Nutrition – Gordon M. Wardlaw, Margaret Kessel, 5th edition, Mc Graw Hill Publication.
- Nutrition and Metabolism – Nutrition Society Textbook, Eds – Michael J. Gibrey, Ian A Macdonald and Helen, Blackwell publishing.
- Decisions in Nutrition – Vincent Hegarty.
- Human Nutrition – Geissler & Powers, 11th edition, Elsevier Publications.
- Dietetics – B Srilakshmi, 5th edition, New Age International Publishers

ND 102 T NUTRITIONAL BIOCHEMISTRY- I (CORE)

4 hrs/week

Objectives:

- To enable students to understand the role of nutrients in the body.
- To know the classification, functions and metabolism of carbohydrates, amino acids, proteins and nucleic acids.

CREDIT I: CARBOHYDRATES AND THEIR METABOLISM

- Classification, sources, functions and requirements
- Digestion and absorption
- Transport, utilization and storage
- Glycolysis
- TCA cycle
- Pentose phosphate pathway
- Glycogenesis, glycogenolysis, gluconeogenesis
- Electron transport chain
- Fermentation, alcohol metabolism
- Inborn errors of Carbohydrate Metabolism- Glycogen storage diseases, Lactose intolerance, Galactosemia, Fructose intolerance

CREDIT II: AMINO ACIDS, PROTEINS AND NUCLEIC ACIDS

Amino Acids:

- ♣ Classification, Functions
- ♣ Utilization of amino acids
- ♣ Urinary excretion

Proteins:

- ♣ Classification, sources and functions
- ♣ Digestion and absorption
- ♣ Transport and storage

Nucleic acids:

- Types (DNA , RNA) and Functions
- Components of Nucleic acids
- Structure of DNA (Double Helix)
- Structure of RNA
- Types of RNA

CREDIT III: AMINO ACID METABOLISM

- Deamination, transamination
- Decarboxylation, deamidation
- Metabolism of tyrosine, tryptophan, phenylalanine
- Metabolism of methionine, leucine and arginine
- Urea cycle
- Amino acids: balance, imbalance and toxicity
- Inborn errors of amino acid metabolism

- ♣ PKU
- ♣ Tyrosinemia, Maple syrup urine disease
- ♣ Homocystinuria, Alkaptonuria

CREDIT IV: PROTEIN AND NUCLEIC ACID METABOLISM

- Synthesis of purines and pyrimidines (flow chart)
- Degradation of purines and pyrimidines
- Gout
- ♣ Protein synthesis
 - ♣ Components required
 - ♣ Initiation of Translation
 - ♣ Elongation of Peptide chain
 - ♣ Termination of peptide Chain
 - ♣ Inhibitors of protein synthesis,
 - ♣ Chaperones and protein folding
 - ♣ Post transcriptional changes
 - ♣ Hypoalbuminemia

BOOKS RECOMMENDED

- Nutritional Science – B. Srilakshmi, New Age International Publishers, 2nd edition.
- Textbook of Medical Biochemistry – MN Chatterjee, Rana Shinde, 7th edition, Jaypee Brothers.
- A textbook of Biochemistry – A V S S Rama Rao, 9th edition, UBS Publisher's Distribution Pvt. Ltd.

SUGGESTED REFERENCES FOR ADDITIONAL READING

- Nutritional Biochemistry – Tom Brody, 2nd edition, Academic Press.
- Text Book of Human Nutrition – Mahtab S. Bamji, N Prahlad Rao, Vinodini Reddy, 2nd edition, Oxford & IBH Publishing Co. Pvt. Ltd.
- Textbook of Medical Biochemistry – S Ramakrishnan, K G Prasannan, R Rajan, 3rd edition, Orient Longman, Harper's Illustrated Biochemistry – Robert K. Murray, Daryl K. Granner, Peter A. Mayes, Victor W. Rodwell, 26th edition, McGraw Hills.
- Experimental Biochemistry – A Student Companion – B Sashidhar Rao, Vijay Deshpande, IK International Pvt. Ltd.
- Biochemistry – U Satyanarayana, U Chakrapani, Books & Allied (P) Ltd.
- Clinical Biochemistry – Nagini
- Principles of Biochemistry – Lehninger A L, CBS Publishers and Distributors.
- Textbook of Biochemistry (for Medical students) – DM Vasudevan and S Sreekumari, 4th edition, Jaypee Brothers Medical Publishers (P) Ltd., New Delhi.

ND 103 T HUMAN PHYSIOLOGY (CORE)**4 hrs/week****Objectives:**

- **To enable the students to understand the functions of various systems in the body.**
- **To acquaint the students with abnormalities of endocrine system.**

CREDIT I: DIGESTIVE AND EXCRETORY SYSTEM

- Structure and functions of gastrointestinal tract
- Structure and functions of liver
- Functions of gastrointestinal secretions
- Role of enzymes in digestion
- Gut flora, role of prebiotics and probiotics in the maintenance of health of digestive system
- Structure and functions of kidney
- Urine formation
- Organic constituents of urine
- Inorganic constituents of urine
- Water and electrolyte balance

CREDIT II: RESPIRATORY AND NERVOUS SYSTEM

- Structure and functions of nose and nasal cavity, pharynx, larynx, trachea, bronchi and lungs
- Mechanism of respiration, Oxygen transport, Carbondioxide transport
- Respiratory rate, Air volume in lung in different situations
- Respiratory abnormalities; Hypoxia, Hypercapnia, carbon monoxide poisoning, Asphyxia, Cyanosis, High altitude sickness
- Emphysema, Asthma, COPD
- Structure of nerve cell, nerve impulses
- Classification of nervous system, Structure and functions of brain, spinal cord
- Peripheral nervous system
- Cerebrospinal fluid, Blood Brain Barrier, Neurotransmitters
- Alzheimer's disease, Parkinson's disease

CREDIT III: BLOOD AND CIRCULATORY SYSTEM

- Structure and functions of heart and blood vessels
- Pulmonary, Systemic and Portal circulation
- Blood pressure, Heart rate, Factors affecting BP and heart rate
- Regulation of Cardiac output
- Composition of blood
- Plasma proteins; Functions, role in fluid balance
- Organic and Inorganic compounds in plasma
- Blood Lipids – Chylomicrons, VLDL, LDL, HDL, Cholesterol, Triglycerides

- Enzymes in blood
- Blood coagulation

CREDIT IV: ENDOCRINE SYSTEM

- Endocrine glands, Formation and secretion of hormones
- Control of hormone secretion, mechanism of hormone action
- Pituitary gland: Hormones secreted and their functions, abnormalities
- Thyroid gland: Structure of thyroid gland, formation of thyroid hormones, functions of thyroid hormones, hypothyroidism, hyperthyroidism
- Adrenal gland: Structure of adrenal gland, secretions of adrenal cortex and their functions, hypoadrenalism, hyperadrenalism
- Secretions of adrenal medulla and their functions
- Parathyroid gland: Structure of parathyroid gland, functions of parathormone, hypo and hyper secretion of parathormone
- Islets of Langerhans: Structure of islets of Langerhans, functions of Insulin, deficiency of insulin, functions of glucagon
- Testes: Structure of testes, functions of testosterone, deficiency of testosterone
- Ovaries: Structure of ovaries, functions of estrogens and progesterone

BOOKS RECOMMENDED

- Textbook of Medical Physiology – Guyton, 8th edition, HBJ International Edition, WB Sanders.
- Essentials of Medical Physiology – Anil Baran Singha Mahapatra, 2nd edition, Current Books International.

SUGGESTED REFERENCES FOR ADDITIONAL READING

- Human Physiology – An Integrated Approach – DU Silverthorne, Prentice Hall.
- Human Physiology – from cells to system – L Sherwood, 6th edition.
- Textbook of Biochemistry (for Medical Students) – DM Vasudevan and S Sree Kumari,
- 4th edition, Jaypee Brothers Medical Publishers (P) Ltd., New Delhi

ND 104 T PRINCIPLES OF DIETETICS (CORE)

4 hrs/week

Objectives:

- **To impart in depth knowledge regarding prevalence, etiology, diagnosis, diet and life style management in different diseases.**
- **To gain knowledge on the methods of assessment of nutritional status among individuals and interaction of drugs and nutrients.**

CREDIT I: INTRODUCTION TO DIETETICS

- Role and responsibilities of Dietitian – Administrative, Community, Hospital
- Interpersonal relationship with patient
- Nutritional counselling
- Nutritional Assessment:
- Anthropometry – Height, Weight, BMI.
- Clinical methods- SGA, MNA, MUST
- Biochemical method: Serum Albumin, Serum Transferrin, Albumin/ Globulin Ratio.
- Diet planning, implementation and follow up
- Dietetics – meaning, need for diet modification
- Modification of normal diets
- Types of hospital diets – clear fluid, full fluid, soft diet

CREDIT II: NUTRITION IN CRITICAL CARE**Enteral Nutrition:**

- Types – Short term feeding methods : Nasogastric, Nasoduodenal, Nasojejunal
- Long term feeding methods: Gastrostomy, Percutaneous Endoscopic Gastrostomy,
- Percutaneous Endoscopic Jejunostomy
- Methods of delivery – Bolus, gravity, pump, Formula feeds
- Advantages, Disadvantages and complications of enteral nutrition

Parenteral Nutrition:

- Types – Total Parenteral Nutrition, Peripheral Parenteral Nutrition
- Advantages, Disadvantages and Complications of parenteral nutrition, Composition of parenteral nutrition solutions

Surgery:

- Physiological response, endocrine and metabolic changes
- Nutritional care in pre and post operative conditions

Burns:

- Severity of burns, Metabolic changes in burns
- Nutritional support in burns

CREDIT III ENERGY IMBALANCE AND G.I. DISORDERS**Obesity:**

- Definition, types, etiology, assessment and complication

- Management of obesity – exercise, diet, behavior modification, pharmacotherapy and surgery

Leanness:

- Etiology, complications
- Dietary management

Gastrointestinal Disorders:

Etiology, symptoms, diagnosis, treatment and dietary management of

- Gastritis
- Peptic ulcer
- Diarrhea
- Constipation
- Malabsorption syndrome: ulcerative colitis, Crohn's disease, irritable bowel disease,
- lactose intolerance and celiac disease
- Diverticular diseases

CREDIT IV: FEBRILE CONDITIONS, DRUG AND NUTRIENT INTERACTION

- Metabolic changes during fever
- Febrile conditions:
- Short duration – Typhoid, Influenza
- Intermittent duration – Malaria
- Long duration – Tuberculosis
- Dietary Management
- Drug and Nutrient Interaction:
- Types of drugs – Antibiotics, Analgesics, NSAIDs, Antipyretics, Antihistamines
- Pharmacokinetics of drugs
- Effect of drugs on Pharmacokinetics
- Effect of drugs on food intake, absorption, metabolism and excretion
- Effect of food on drug therapy

BOOKS RECOMMENDED

- Clinical Nutrition – Ed Michael J Gibney, Marinos Elia, Olle Ljungqvist and Julie Dowsett.
- Text Book of Human Nutrition – Mahtab S Bamji, N Prahlad Rao, Vinodini Reddy, 2nd edition, Oxford & IBH Publishing Co. Pvt. Ltd.
- Food, Nutrition and Diet Therapy – Kathleen Mahan & Krause, Sylvia Escott Stump.
- Normal and Therapeutic Nutrition - Robinson & Lawler, 17th edition, Mac Millan Publishers.

SUGGESTED REFERENCES FOR ADDITIONAL READING

- Foods – Nutrition and Health – Dr. Vijaya Khader, Kalyani Publishers.
- Nutrition in Health and Diseases – Anderson, 17th edition.
- Modern Nutrition in Health & Disease – Eds – Maurice E. Shils, James A. Olson,
- Moshe Shike, 8th edition, Vol I and II, Williams & Wilkins Publication.
- Nutrition in clinical Practice – David L. Katz, Lippincott, Williams & Wilkins.
- Clinical Dietetics and Nutrition – F P Antia and Philip Abraham.
- Biochemistry – U Satyanarayana, U Chakrapani, Books & Allied (P) Ltd.
- Perspectives in Nutrition – Wardlaw Kessel, Mc Graw Hills.

SEMESTER I PRACTICALS**ND 105 P HUMAN NUTRITION****Objectives:****4 hrs/week**

- **To familiarise students with the raw and cooked quantities of food and plan diet for various age groups.**

I . To standardize raw and cooked foods.

1. Cereal and Pulse- Rice, Upma , Phulka,Chapathi, Kichidi, Idli, Dosa, Dhal with Green Leafy Vegetable
2. Beverages and Desserts - Tea, Soup, Juices, Milk Shakes, Porridges, Plain Custard
3. Vegetable and fruits- Vegetable curries and salads

II.Plan, Calculate Nutritive value, cost and Prepare a Day's diet for the following

4. Adult man/ woman
5. Pregnant woman/ Lactating woman
6. Children- Preschooler/ School going
7. Adolescent Girl/ Boy
8. Geriatric Woman / Man

ND 106 P NUTRITIONAL BIOCHEMISTRY- I**4 hrs/week****Objectives:**

- **To acquaint the students with principles, techniques and application of different methods of food analysis**
 - Qualitative analysis of carbohydrates
 - Qualitative analysis of protein
 - Separation of fatty acid by paper chromatography
 - Separation of Amino Acid by paper chromatography
 - Estimation of Total sugar by phenol sulphuric acid method
 - Estimation of bile pigments in urine
 - Estimation of blood glucose by oxidase method

ND 107 P HUMAN PHYSIOLOGY**4 hrs/week****Objectives:**

1. To acquaint the students with principles, techniques and application of different methods of analysis for various components in blood.

I. Microscopic Examination of various tissues and blood vessels
a. Epithelial b. Muscular c. Connective d. Bone e. Artery f. Vein (Specimens)

II. Estimation of blood sample for

1. Enumeration of RBC Count
2. Enumeration of WBC count
3. Determination of blood group and Rh factor
4. PCV - determination
5. Blood glucose by glucometer method
6. Blood Hemoglobin by Cyanmethaemoglobin method.

III. Estimation of Urine sample for

7. Sugar (Benedicts test)
8. Albumin

ND 108 P PRINCIPLES OF DIETETICS**6 hrs/week****Objectives:**

➤ **To familiarize the students with newer concepts in dietary management of Various disorders and diseases.**

• **Plan, Calculate Nutritive value, cost and Prepare a Day's diet for the following**

1. Burns
2. Obesity
3. Leanness
4. Peptic Ulcer
5. Diarrhoea
6. Constipation
7. Ulcerative colitis
8. Short duration fever- Typhoid
9. Long duration- Tuberculosis

SEMESTER II**ND 201 PRINCIPLES OF FOODS (CORE)****4 hrs/week****Objectives:**

- **To provide an understanding of composition of various food stuffs.**
- **To familiarize students with changes occurring in various food stuffs as a result of processing and cooking.**

CREDIT I: CEREALS AND PULSES**Cereals**

- Starch: functions and properties
- Gelatinization, factors affecting gelatinization
- Changes in cooked starches – gel formation, retrogradation, syneresis
- Cereal protein – gluten, factors affecting gluten formation
- Nutrient changes during different treatment methods of cereal grains
- Role of natural leavening agents
- Role of yeast

Pulses

- Decortication
- Soaking and germination of pulses
- Fermentation of pulses
- Roasting and Puffing
- Effect of cooking treatments on the nutrient composition, quality and quantity of legumes

CREDIT II: ANIMAL FOODS**Milk:**

- Composition and Nutritive Value of Milk
- Types of milk
- Properties of milk proteins – effect of heat, acid and phenolic compounds on milk

Egg:

- Composition and Nutritive Value of egg
- Egg as a binding, foaming and emulsifying agent
- Quality and Grading of Eggs

Meat:

- Post mortem changes in meat – rigor mortis, curing, ageing and tenderization
- Changes during cooking of meat

Poultry:

- Advantages of white meat

Fish:

- Classification, Characteristics of fresh fish, Spoilage, Nutritional importance of fish

CREDIT III: FATS AND OILS, SUGARS

- Properties of fats and oils
- Emulsions, Fat as emulsifying agent

- Fat as leavening and shortening agent
- Rancidity – types, mechanism and prevention
- Factors affecting amount of fat absorbed during cooking
- Fat replacers
- Types of sugar
- Sugar crystallization and caramalization
- Factors affecting crystallization
- Stages of sugar cookery, preparation of candies – crystalline and non crystalline

CREDIT IV: VEGETABLES, FRUITS AND SENSORY EVALUATION

Plant pigments:

- Water insoluble and Water soluble pigments
- Factors affecting plant pigments on cooking: acid, alkali, metals, heat
- Flavour compounds: terpenoids, flavonoids, Sulphur compounds and other volatile flavor compounds
- Enzymatic Browning and its prevention
- Physio – Chemical changes in Fruits and Vegetables- Ripening, Respiration and Textural changes

Sensory Evaluation:

Subjective evaluation techniques:

- Difference tests: paired comparison test, duo-trio test, triangle test
- Rating tests – Ranking, single sample, Two sample and
- Multiple sample difference Tests, Hedonic scaling, Numerical scoring, Composite scoring
- Sensitivity tests and Descriptive tests

Objective tests to assess sensory properties of foods:

- Measurement of colour, viscosity, consistency and texture

BOOK RECOMMENDED

- Food Science – Norman N Potter, Joseph H. Hotchkiss, 5th edition, CBS Publishers & Distributors, New Delhi.
- Food Facts and Principles – ShakuntalaManay, New Age International Publishers.
- Food Science – B Sri Lakshmi, New Age International Publishers.

SUGGESTED REFERENCES FOR ADDITIONAL READING

- Fruit and Vegetable Preservation – Principles & Practices – R P Srivastava, Sanjeev Kumar. 3rd edition, international Book Distributing Co., Lucknow.
- Food Science, Chemistry and Experimental Foods – Dr.M.Swaminathan, The Bangalore Printing & Publishing Co. Ltd., Mysore

ND 202 T NUTRITIONAL BIOCHEMISTRY – II (CORE)**Objectives:****4 hrs/ week**

- **To enable students to understand the role of nutrients in the body.**
- **To know the classification, functions and metabolism of lipids, vitamins, and minerals.**

CREDIT I: LIPIDS AND THEIR METABOLISM

- Classification, sources and functions
- Digestion and absorption, Deposition and storage
- Role of essential fatty acids and Lipoproteins
- Role of Triglycerides and Cholesterol
- Oxidation of fatty acids
- Synthesis of fatty acids
- Biosynthesis of triglycerides and phosphatides
- Cholesterol metabolism
- Bile pigments, Ketosis
- Lipotropic factors, Fatty Liver

CREDIT II: IMBALANCES OF LIPIDS AND FAT SOLUBLE VITAMINS**Imbalances of Lipids**

- Obesity, Cachexia
- Inborn errors of Lipid Metabolism- Gaucher's disease, Niemann's picks disease, Tay-sach's, Fabry's disease
- Hyperlipoproteinemia
- Interrelationship between carbohydrate, fat and protein metabolism
- Metabolic Changes during starvation

Fat Soluble Vitamins

Physiological action, transport, utilization, storage, sources, functions and deficiency of:

- Vitamin A
- Vitamin D
- Vitamin E
- Vitamin K

CREDIT III: WATER AND WATER SOLUBLE VITAMINS**Water**

- Functions, Distribution, Requirements
- Disturbances in Fluid Balance- Dehydration and Oedema
- Role of solutes (Sodium and Potassium) in maintaining the volume of the fluid compartments

Water Soluble Vitamins

Physiological action, transport, utilization, storage, sources, functions and deficiency of:

- Thiamin
- Riboflavin
- Vitamin B12, Pantothenic acid
- Folic Acid
- Pyridoxine
- Niacin

- Ascorbic acid

CREDIT IV: MINERALS AND TRACE ELEMENTS

- Calcium – absorption, utilization, sources, functions and deficiency
- Phosphorous – absorption, utilization, sources, functions and deficiency
- Factors affecting calcium absorption
- Role of calcium in ossification and bone growth
- Inter-relationship between parathormone and vitamin D in the regulation of calcium and phosphorous metabolism
- Iron: Functions, sources, absorption, transport, utilization and storage of iron.
- Role of iron in prevention of anemia
- Iodine: Physiology and source of iodine, Role of iodine in human nutrition
- Physiology, sources, functions and deficiency of Fluorine and Zinc
- Physiology, sources, functions and deficiency of Copper, Manganese, Selenium and Chromium

BOOKS RECOMMENDED

- A Textbook of Biochemistry – A V S S Rama Rao, 9th edition, UBS Publisher's Distribution Pvt. Ltd.
- Nutritional Biochemistry – Tom Brody, 2nd edition, Academic Press
- Biochemistry – U Satyanarayana, U Chakrapani, Books & Allied (P) Ltd.
- Textbook of Biochemistry (for Medical Students) – DM Vasudevan and S SreeKumari, 4th edition, Jaypee Brothers Medical Publishers (P) Ltd., New Delhi.

SUGGESTED REFERENCES FOR ADDITIONAL READING

- Textbook of Medical Biochemistry – M N Chatterjee, RanaShinde, 7th edition, Jaypee Brothers.
- Textbook of Medical Biochemistry – S Ramakrishnan, K G Prasannan, R Rajan, 3rd edition, Orient Longman.
- Harper's Illustrated Biochemistry – Robert K Murray, Daryl K Granner, Peter A Mayes, Victor W Rodwell, 26th edition, McGraw Hills.
- Experimental Biochemistry – A Student Companion – B SashidharRao, Vijay Deshpande, I K International Pvt. Ltd.
- Clinical Biochemistry – Nagini.
- Principles of Biochemistry – Lehninger A L, CBS Publishers and Distributors.
- Nutritional Science – B. Sri Lakshmi, New Age International Publishers, 2nd edition.
- Text Book of Human Nutrition – Mahtab S Bamji, N PrahladRao, Vinodini Reddy, 2nd edition, Oxford & IBH Publishing Co. Pvt. Ltd

ND 203 T RESEARCH METHODOLOGY (CORE)**Objectives:****4 hrs/week**

- **To enable the students to understand the importance of research design**
- **To impart in depth knowledge on collection, compilation and analysis of data.**

CREDIT I: METHODS OF RESEARCH

- Definition of research, Characteristics of research, Criteria of good research
- Merits and demerits of scientific research
- Types of research - Historical research, Ex-post facto research, laboratory experiments, Field experiments, survey research, evaluative research Case study research, operational research, participatory research
- Research Strategies in the field of Food And Nutrition- Descriptive studies(Correlation, Case studies, Cross-sectional surveys)
- Analytical studies (Observational, Case-control, Cohort studies –Prospective and Retrospective)
- Experimental studies (Clinical /Intervention trials including Randomized controlled trials)
- Steps in conducting research
- Hypothesis: Definition, purpose, types
- Reporting: Methods of reporting, Technical reports
- Research Abstract: Definition, guidelines for writing abstract
- Thesis: Definition, parts, steps in writing thesis

CREDIT II: SAMPLING DESIGN AND TYPES OF SAMPLING

- Sampling- Definition, Meaning, Aim, Characteristics of good sample
- Sampling- Basis, Advantages, Limitations and Benefits
- Survey- Meaning, Advantages, Disadvantages, Types and Quality
- Census and sample survey
- Steps in sampling design
- Types of sampling: Random Sampling - Simple random sampling, Stratified random sampling, Systematic sampling, Cluster sampling
- Non random sampling methods -Judgment sampling, Convenience sampling, Quota sampling, Volunteer sampling and Snowball sampling
- Sampling and Non sampling errors
- Sample size and its determination
- Sampling distribution and Importance

CREDIT III: METHODS OF DATA COLLECTION AND COMPLICATION

- Types of Data- Primary Data and Secondary Data, Advantages and Disadvantages, Difference between Primary Data and Secondary Data
- Methods of collecting primary data: Questionnaire, Interview, Schedule, Observation, Inventories, Checklist
- Drafting of questionnaire, training of interviewers
- Ranking and Rating Scales

- Criteria for evaluation of instruments – reliability and validity
- Sources of secondary data, precautions in the use of secondary data
- Classification of data: types of classification- Geographical, Chronological, Qualitative and Quantitative
- Tabulation of data: parts of a table, general rules of tabulation, types of tables
- Diagrammatic representation of data
- Graphic representation of data

CREDIT IV: STATISTICAL METHODS

Statistical Methods:

- Measures of central tendency: mean, median and mode, their relative advantages and disadvantages
- Measures of dispersion: Mean deviation, standard deviation
- Coefficient of variation, percentile
- Types of correlation, coefficient of correlation and its interpretation
- Rank correlation
- Regression equations and predictions
- Analysis of variance
- Contingency tables, Chi-square test
- 't' test: student's 't' test, paired 't' test, unpaired 't' test
- 'F' test

BOOKS RECOMMENDED

- Statistical Methods – S P Gupta, Sultan Chand and Sons Publishers, New Delhi.
- Research Methodology – methods and techniques – C R Kothari, Wiley Eastern Limited, Madras.
- Research Methodology (Concepts, Methods, Techniques and SPSS)-Dr.Priji R. Majhi, Dr.Prafull K. Khatua, II Edition , Himalaya Publishing House, Pvt. Ltd. 2015.
- A Handbook of Methodology of Research – Dr.Rajammal P Devadas and Dr. K Kulandaveil, Sri Ramakrishna Mission, Coimbatore.
- Research Methods in Social Science – B H V Sharma, D Ravindra Prasad, P Satyanarayana, Sterling Publications.
- Biostatistics – SundaraRao., 7th edition, Jaypee Brothers medical Publishers
- Methods in Biostatistics- B.K. Mahajan, 2010
- Manual of Biostatistics- JP Baride, AP Kulkarni, RD Mazumdar, Jaypee Publishers
- Methodology of research in Social science – O.R. Krishnaswami and M. Ranganatham, 2nd revised edition, , Himalaya Publishing house ltd, 2015.

ND 204 T DIET IN DISEASE (CORE)**Objectives:****4 hrs/week**

- **To impart in depth knowledge regarding prevalence, etiology, diagnosis, diet and life style management in acute and chronic diseases.**
- **To gain knowledge to recommend and provide appropriate nutritional care for prevention or and treatment of various diseases.**

CREDIT I: DIET FOR HEPATIC DISORDERS

Liver:

- Structure and functions
- Etiology, symptoms, diagnosis/functional test and dietary management of:
- Jaundice – Types – hemolytic, obstructive and infective
- Viral Hepatitis – Types – A, B, C, D, E and G
- Fatty liver
- Cirrhosis
- Alcoholic liver disease
- Hepatic Coma
- Liver Transplant

Gall Bladder:

- Structure, functions and composition of bile
- Etiology, symptoms, diagnosis and dietary management of:
 - ♣ Cholecystitis
 - ♣ Cholelithiasis

CREDIT II: DIET FOR RENAL DISORDERS

Kidney:

- Structure and functions
- Etiology, symptoms, diagnosis and dietary management of:
 - ♣ Acute and Chronic Glomerulonephritis
 - ♣ Nephrosis
 - ♣ Acute Renal Failure
 - ♣ Chronic Renal Failure
 - ♣ Kidney Transplant
 - ♣ Urinary calculi – Types – Calcium oxalate, uric acid and struvite
- Dialysis
 - ♣ Hemodialysis - Advantages ,disadvantages and Dietary management
 - ♣ Peritoneal dialysis- Advantages, disadvantages and Dietary management

CREDIT III: DIET FOR HORMONAL DISTURBANCES

Disease of Pancreas:

- Etiology, symptoms, diagnosis and dietary management: Acute Pancreatitis, Chronic Pancreatitis

Diabetes Mellitus:

- Types, metabolic changes
- Etiology, symptoms, diagnosis

- Complications
- Treatment – exercise, hypoglycemic drugs, insulin and diet
- Dietary Management – Role of fibre, glycemic index, food exchange list
- Diseases of Adrenal Cortex:
 - Dietary management in Addison's diseases
 - Dietary management in Cushing's syndrome
- Diseases of Thyroid Gland:
 - Dietary management in Hypothyroidism
 - Dietary management in Hyperthyroidism

CREDIT IV: DIET FOR DEGENERATIVE AND CHRONIC DISORDERS

Disorders of circulatory system

- Dietary management of Hypotension, Hypertension
- Dietary management of Cardio Vascular Diseases
 - ♣ Ischemic Heart Disease- Arteriosclerosis, Atherosclerosis, Coronary Artery Disease, Myocardial Infarction, Angina, Heart Failure
 - ♣ Non- Ischemic heart disease-Cardiac Myopathy, Congenital Heart Disease

Disorders of Musculo – Skeletal system:

- Rheumatoid Arthritis – Types, etiology, symptoms and dietary management
- Osteoarthritis – Types, etiology, symptoms and dietary management
- Gout – etiology, symptoms and dietary management.

Cancer:

- Types, mechanism
- Etiology, metabolic changes, treatment (drugs, chemotherapy and radio therapy)
- Nutritional management of cancer

AIDS:

- Causes, symptoms, metabolic changes, diagnosis
- Treatment and dietary management

BOOKS RECOMMENDED

- Clinical Dietetics and Nutrition – F P Anita and Philip Abraham.
- Food, Nutrition and Diet Therapy – Kathleen Mahan & Krause, Sylvia Escott Stump.
- Normal and Therapeutic Nutrition – Robinson & Lawler, 17th edition, Mac Millan Publishers.
- Clinical Nutrition – Ed Michael J Gibney, Marinos Elia, Olle Ljungqvist and Julie Dowsett.
- Basics of Clinical Nutrition, 2nd Edition, Joshi, Jaypee Publishers

SUGGESTED REFERENCES FOR ADDITIONAL READING

- Foods – Nutrition and Health – Dr. Vijaya Khader, Kalyani Publishers.
- Nutrition in Clinical Practice – David L. Katz, Lippincott, Williams & Wilkins.
- Text Book of Human Nutrition – Mahtab S Bamji, N Prahlad Rao, Vinodini Reddy, 2nd edition, Oxford & IBH Publishing Co. Pvt. Ltd.
- Nutrition in Health and Diseases – Anderson, 17th edition.
- Modern Nutrition in Health & Disease – Eds – Maurice E. Shils, James A. Olson, Moshe Shike, 8th edition, Vol I and II, Williams & Wilkins Publication.
- Biochemistry – U Satyanarayana, U Chakrapani, Books & Allied (P) Ltd.
- Principles and Applications in Health Promotion – Sintor & Crowley, 2nd edition.
- Perspectives in Nutrition – Wardlaw Kessel, McGraw Hills.

ND 205 P PRINCIPLES OF FOODS PRACTICALS

4 hrs/week

Objectives:

- **To familiarize students with changes occurring in various food stuffs as a result of processing and cooking.**
 1. Gelatinization and factors affecting gelatinization
 2. Estimation of alkaline phosphates in milk
 3. Egg– Preparation of stable emulsion- Mayonnaise
 4. Stages of Sugar cookery – Any two Preparations
 5. Test for checking Rancidity of oils
 6. Testing pectin strength in fruits and vegetable extracts.

Sensory Evaluation:

1. Threshold test for salt/ sugar
2. Triangle Test
3. Paired Comparison Test
4. Hedonic Rating Test

ND 206 P NUTRITIONAL BIOCHEMISTRY- II PRACTICALS

4 hrs/ wk

Objectives:

- **To familiarize students with changes occurring in various food stuffs as a result of processing and cooking.**
 - Preparation of the sample
 - Estimation of the following
 1. Iron
 2. Calcium
 3. Phosphorus
 4. Sugar by DNase method
 5. Vitamin C
 6. Potassium
 7. Magnesium
 8. Chloride

ND 207 P RESEARCH METHODOLOGY PRACTICALS**4 hrs/week****Objectives**

- To familiarize the students with newer concepts in research.
- Enable the students to analyze the data for the project work with the Statistical techniques
- Application of statistical methods related to community nutrition and sensory evaluation techniques
 1. Tabulation of Raw Data
 2. Diagrammatic and Graphical representation of Raw Data
 3. Calculation of mean and Standard Deviation
 4. Calculation of t- test and its interpretation
 5. Calculation of F- test and its interpretation
 6. Calculation of ANOVA and its interpretation
 7. Calculation of Chi square test and its interpretation
 8. Calculation of Coefficient of Correlation and its interpretation

ND 208 P DIET IN DISEASE PRACTICALS**6hrs/week****Objectives**

- **To familiarize the students with newer concepts in dietary management of various disorders and diseases.**

Planning and Preparation of Diets for:

1. Viral Hepatitis
2. Cirrhosis of Liver
3. Nephritis
4. Nephrosis
5. Renal Failure
6. Renal calculi
7. Cancer
8. Diabetes with Hypertension / Nephropathy / Atherosclerosis