

Syllabus
Of
Master of Science (M.Sc.)
in
Dietetics and Community Nutrition management

Directorate of Distance Education
VIDYASAGAR UNIVERSITY

MIDNAPORE-721102

WEST BENGAL

Syllabus at a glance

Part I: 500 marks		Part II : : 500 marks		Total : 1000 marks	
Theory	Practical	Theory	Practical	Theory	Practical
300	200	300	200	600	400

M. Sc. Part I

Type	Paper	Topic	Full Marks	Credit
Theory	ND 01	Advanced Human Physiology –I	25	2.5
		Advanced Human Physiology –II	25	2.5
	ND 02	Food science and Nutrition	25	2.5
		Vitamins and Minerals in Nutrition	25	2.5
	ND 03	Nutritional biochemistry- I	25	2.5
		Nutritional biochemistry- II	25	2.5
	ND 04	Food Microbiology and toxicology	25	2.5
		Food bio technology	25	2.5
	ND 05	Food hygiene and sanitation	25	2.5
		Assessment of nutritional status	25	2.5
	ND 06	Nutrition through Lifecycle- I	25	2.5
		Nutrition through life cycle- II	25	2.5
Practical	ND 07	Experiments on Physiology	25	2.5
		Experiments on Food microbiology	25	2.5
	ND 08	Biochemical analysis in Nutrition –I	25	2.5
		Biochemical analysis in Nutrition –II	25	2.5
	ND 09	Nutritional Anthropometrics	25	2.5
		Growth Chart and Clinical Assessment of malnutrition	25	2.5
	ND 10	Review work – report	25	2.5
		Review work – Viva-Voce	25	2.5

M. Sc. Part II

Theory / Practical	Paper	Topic	Full Marks	Credit	
Theory	ND 11	Research methodology and statistics in nutrition	25	2.5	
		Bioinformatics and computer application in nutrition	25	2.5	
	ND 12	Diet therapy I	25	2.5	
		Diet therapy II	25	2.5	
	ND 13	Community nutrition	25	2.5	
		Nutrition in sports and fitness	25	2.5	
	ND 14	Nutrition in emergencies	25	2.5	
		Nutritional counselling	25	2.5	
	ND 15	Neutraceuticals	25	2.5	
		Food additives	25	2.5	
	ND 16	Food and nutrition services in hospital and other organizations	25	2.5	
		Drug nutrient interaction and nutrigenomics	25	2.5	
	Practical	ND 17	Preparation of Diet chart	25	2.5
			Preparation of Diet chart	25	2.5
ND 18		Nutritional survey and nutrient analysis	25	2.5	
		Advanced Food analysis	25	2.5	
ND 19		Statistical analysis in Nutrition	25	2.5	
		Computer analysis in Nutrition	25	2.5	
ND 20		Project work – report	25	2.5	
		Project work – Viva-Voce	25	2.5	

Distribution of Marks for each theoretical paper (50 Marks):

Sl No.	Theory	Question Marks
1	Answer any 04 questions out of 08 questions carrying 02 marks of each	4X 2=8
2	Answer any 04 questions out of 08 questions carrying 04 marks of each	4X4=16
3	Answer any 02 questions out of 04 questions carrying 08 marks of each	2X8=16
4	Internal Assessment	10
Total		50 Marks

Note for paper setting: In theory papers questions will be set unit-wise with 8 question carrying 2 marks each (4 questions to be answered) , 8 question carrying 4 marks each (4 questions to be answered) and 4 questions carrying 8 marks each (2 questions to be answered). Twenty percent (20%) marks in each theoretical paper will be assigned for internal assessment.

M. Sc Part I

Theory

Paper ND01: Unit 01

ADVANCED HUMAN PHYSIOLOGY - I

- 1.1 Cellular basis of Physiology** - Plasma membrane. Transport through cell membrane- Transport of nutrients, study of active and passive transport mechanisms. Glucose transporters as unique family of proteins. Golgi bodies, Endoplasmic reticulum, mitochondria, Lissome- EM structure related to functions. Cell junctions.
- 1.2 Digestive system:** Brief review of structure and functions of GI tract. Modern concept of digestion, absorption of carbohydrate, fat and protein Mechanism of secretion of saliva, gastric juices, bile and pancreatic juices. Dysfunctions of liver and gall bladder, GI hormones; control of movements of alimentary canal.
- 1.3 Blood:** composition and functions of blood cells, haemopoiesis, blood clotting, blood grouping, plasma proteins
- 1.4 Cardio-vascular system:** Structure of heart and blood vessels, origin and conduction heart beat, ECG-interpretation, Regulation of cardiac output and blood pressure, Hypertension, Heart failure
- 1.5 Excretory system:** Anatomy and function of kidney, formation, composition and excretion of urine. Role of kidney in water, electrolytes and acid base balance.

Paper ND01: Unit 02

ADVANCED HUMAN PHYSIOLOGY - II

- 2.1 Respiratory system:** Anatomy, physiology and mechanism of respiration, regulation of respiration, exchange of gases, transport of oxygen and carbon dioxide
- 2.2 Endocrinology:** Anatomy of endocrine glands and reproductive organs. Hormones - Mode of action, functions of hormones of the endocrine glands - Pituitary, Adrenal, Thyroid, Gonadal hormones, Pancreas, Hypo and Hyperfunctions of the glands.
- 2.3 Reproductive system:** Structure and functions of male and female reproductive organs. Menstrual cycle, Physiological changes in pregnancy, physiology of lactation
- 2.4 Excitable tissue:** nerve and muscle, types of muscle system and their importance, chemical, electrical, and molecular involvement in muscle contraction, Resting membrane potential, action potential, nerve impulse propagation. Synaptic and Neuromuscular transmission. Function of hypothalamus – hunger, satiety and thirst. , Neuroendocrine

regulation of hunger and satiety - Leptin, Ghrelin. Neural basis of behavior and emotion. Chemical sense – smell and taste.

2.5 Immune system: Properties, natural and acquired Immunity, features of immune responses, antigen - antibodies - types, properties, antigen - antibody interaction, B- and T- cell biology, MHC , Auto immune disorders, hypersensitivity and allergy, Immunomodulation by food

Paper ND02: Unit 03

FOOD SCIENCE AND NUTRITION

3.1 Carbohydrates: classification, sources, functions, utilization and storage, hormonal regulation of blood glucose. Inter conversion of hexoses. Sugar derivatives of biomedical importance. classification , structure and properties of glycoprotein and proteoglycans

3.2 Dietary fiber: Types, sources, role and mechanism of action. Resistant starch, fructo-oligosaccharides, other oligosaccharides: Chemical composition and physiological Significance. Glycemic Index and glycemic load

3.3 Proteins: Classification, sources, functions, utilization and storage. Protein quality evaluation, nutritional classification of amino acids, amino acid balance, imbalance and toxicity, amino acid pool. Amino acid and peptide transporters, Therapeutic applications of specific amino acids, Peptides of physiological significance. Protein and gene expression

3.4 Lipids - Nutritional significance of fatty acids – SFA, MUFA, PUFA: functions and deficiency. Role of n-3 and n-6 fatty acids. Prostaglandins, Trans Fatty Acids, Conjugated linoleic acid, Lipids and gene expression

3.5 Energy value of foods, SDA, energy production, factors affecting thermogenesis, energy utilization by cells, energy output - BMR, factors affecting energy input - hunger, appetite, energy balance, measurement of energy content of food. Methods of measuring energy expenditure. Regulation of energy metabolism and body weight:

Paper ND02: Unit 04

VITAMINS AND MINERALS IN NUTRITION

4.1 Fat soluble Vitamins: Vitamin A, Vitamin D, E & K : major sources, functions, mechanism of action, RDA, deficiency and toxicity (if any)

4.2 Water soluble vitamins: Vitamin C, Thiamine, Riboflavin, Niacin, Pantothenic acid, Biotin, Folic acid, Vitamin B₁₂, Vitamin B₆ : major sources, functions, mechanism of action, RDA, deficiency and toxicity (if any)

4.3 Macro minerals: Calcium, Phosphorus Magnesium, Sodium, Potassium: major sources, functions, mechanism of action, RDA, deficiency and toxicity (if any)

4.4 Micro minerals: Iron, Zinc, copper, selenium, chromium, iodine, manganese, Molybdenum and fluoride. Major sources, functions, mechanism of action, RDA, deficiency and toxicity (if any)

4.5 Ultra trace minerals: Arsenic, Boron, Nickel, Silicon, Vanadium & cobalt: Digestion & absorption, Functions, Toxicity, interaction with other nutrients. RDA and food sources

Paper ND03: Unit 05

NUTRITIONAL BIOCHEMISTRY - I.

5.1 Enzymology: Nomenclature and classification, basic structure; general properties, coenzymes and their functions, factors influencing enzyme reaction - kinetic properties, Michaelis constant, inhibition, purification, isoenzyme, mechanism of enzyme action, two-substrate reaction mechanism, allostericity and feed-back inhibition

5.2 Metabolism of carbohydrate: Glycolysis, Gluconeogenesis, TCA cycle, HMP shunt, bioenergetics, disorders of carbohydrate metabolism - galactosemia, glycogen storage disease, pentosuria, abnormal level in blood glucose.

5.3 Metabolism of lipids : Biosynthesis and oxidation of saturated and unsaturated fatty acids, glycerides, phospholipids and cholesterol, bioenergetics, disorders of lipid metabolism, lipoproteins and their significance.

5.4 Protein and amino acid metabolism: Biosynthesis of protein, general catabolism of amino acids, deamination, transamination, urea cycle, disorders of amino acid metabolism - phenyl ketonuria, cystinuria, albinism,

5.5 Metabolism of nucleic acids: Biosynthesis of purine and pyrimidine nucleotides, DNA replication and repair, biochemical importance of cyclic AMP. Disorders of purine and pyrimidine metabolism - gout, aciduria, xanthinuria.

Paper ND03: Unit 06

NUTRITIONAL BIOCHEMISTRY - II

6.1 Biological oxidation : Enzymes and co-enzymes involved in oxidation and reduction, respiratory chain, phosphates in biologic oxidation and energy capture, role of respiratory chain and mechanism of phosphorylation

6.2 Integration and regulation of metabolism: Interrelationship of carbohydrate, protein and lipid metabolism, importance of Krebs cycle, role of liver, muscle and adipose tissues; Metabolic adaptation during starvation, exercise, stress and diabetes mellitus

6.3 Molecular biology: Structure and types of DNA and RNA, Nucleic acid sequencing. Replication. Transcription. Translation. Lac operon. Transposon. Recombination.

6.4 Genetic engineering: Maternal inheritance, recombinant DNA technology. Plasmids, cosmids and bacteriophage based vectors for cDNA and genomic libraries. Principles and methods of protein and genetic engineering and gene targeting.

6.5 Oxidative stress and Antioxidants: Free radicals: definition, formation in biological Systems. Natural anti-oxidants, defense against free radicals. Role of free radicals and antioxidants in health and disease. Determination of free radicals, lipid peroxides and antioxidants.

Paper ND04: Unit 07

FOOD MICROBIOLOGY AND TOXICOLOGY

7.1 Classification of microorganism, morphology of yeast, mould, bacteria, virus, algae and protozoa, Microbiology of water: Number and kinds of microorganisms present in water. Detection, classification and confirmation of coliform bacteria, Faecal and non-faecal coliform bacteria. Purification of water

7.2 Microbiology of food: Microbes commonly present in food and the diseases caused by them, microflora present in milk, cereals, vegetables, flesh food. Mode of action of food borne diseases food borne illness (Clostridium, Escherichia coli, Brucella, Bacillus, Salmonella, Botulism and Salmonellosis). Non bacterial agent & food borne illness, (Helminths and Nematodes, protozoa, toxic algae, fungi and food borne viruses)

7.3 Food Spoilage: Causes of food spoilage. Microorganism in food (mold, yeast, bacteria): primary sources, morphology, cultural characteristics and biochemical activities, of microorganism, factors affecting growth and survival of microorganism in food, physical and chemical means to control microorganism, contamination and spoilage of foods (cereals, sugar, vegetables and fruits, meat, fish, eggs, milk), Methods of isolation and detection of microorganism in food.

7.4 Food toxicology and food borne illness: Toxicological paradigm, toxicokinetics and toxicodynamics, biotransformation, Phase I & II reactions. Natural toxicants from plant sources, mycotoxins, fungal toxins, pesticides and industrial waste contaminated toxicants environmental health hazards caused - by radioactive containing foods, by carcinogens, by antibiotics, by phytoestrogen

7.5 Food safety: Assessing the microbiological quality of food: indicator organisms, microbiological standards, principles of GMP & HACCP in food processing. Food safety

regulation, Food Safety and Standards Authority of India (FSSAI), Safety management at household and industrial level

Paper ND04: Unit 08

FOOD BIOTECHNOLOGY

8.1 Use of Biotechnology for food processing. Indian fermented foods – Historical perspective, Mechanism of fermentation, effect on nutritional value.

Enhancement of food crop yield (principles, techniques, problems, prospects and ethics), productivity, sustainability, nutritional quality and adequacy.

8.2 Genetically modified foods , need for GM foods , food challenges, potential benefits in agriculture, Crop engineered for input and output traits, nutritional improvement, animal foods,. Genomic analysis for GM food, the genomics of protein nutrition- high protein and restricted protein diets, issues of concern – safety of GM foods

8.3 Technology for production of alcoholic beverages, Fermented cereal and legume based products, traditional and yeast leavened products. Fermentation of vegetables and fruits – lactic acid fermentation, Fermented milk products – yoghurt, butter- milk, cheese. Fermentation of meat and fish

8.4 Food Preservation: method of food preservation by physical methods – a) Heat processing : sterilization, pasteurization, blanching, canning. b) Cold preservation; refrigeration, freezing, freeze drying, refrigerated gas storage c) Food irradiation: technology, application and safety assessments

Chemical methods like, concentration, fermentation, preservatives. Preservation by natural anti microbial compound, biologically based preservation System & pro biotic bacteria, newer method of food preservation.

8.5 Special food processing technology : a) Membrane technology (reverse osmosis and ultra filtration), agglomeration, agitation, extrusion, b) Enzyme Technology - Production of enzymes - Amylase, Protease, Lipase, Lactase and pectinase, Use of enzymes in food & beverage industry (e.g., Cheese, fruit, juice, Wine, Meat tenderizing & dairy)

Paper ND05: Unit 9

FOOD HYGIENE AND SANITATION

9.1 General principle of food hygiene, Hygiene in rural and urban areas in relation to food preparation, personal hygiene and food handling habits. Place of sanitation in food plants. Sanitary aspects of building and equipment: Plant layout and design.

9.2 a) Safe and effective insect and pest control: Extraneous materials in foods, Principles of Insects and pests control. b) Physical and chemical control. Effective control of micro-organisms: micro-organisms important in food sanitation, micro-organisms as indicator of sanitary quality.

9.3 Sanitary aspects of water supply: Source of water, quality of water, water supply and its uses in food industries. Purification and disinfection of water preventing contamination of potable water supply.

9.4 Effective detergency and cleaning practices: Importance of cleaning technology, physical and chemical factors in cleaning, classification and formulation of detergents and sanitizers, cleaning practices.

9.5 Sanitary aspects of waste disposal. Establishing and maintaining sanitary practices in food plants, role of sanitation, general sanitary consideration and sanitary evaluation of food plants.

Paper ND05: Unit 10

ASSESSMENT OF NUTRITIONAL STATUS

10.1 Basis for computing nutrient requirements, latest concepts in dietary recommendations, RDA- ICMR and WHO: their uses and limitations.

10.2 Indirect methods for nutritional assessment - Demography, population dynamics and vital events and their health implications, indicators of health and nutrition (IMR, TMR, MMR)

10.3 Direct methods - Anthropometry, Biochemical techniques,

a) **Anthropometry** – methods, reference standards in children and adults, scales of comparison (percentiles, Z score), classification and interpretation of somatic data, somatic indicators of PEM

b) **Biochemical** - use of specimen types, indicators of protein-energy status, anemia, immune function, CVD risk, oxidative stress. Urine and stool analyses.

10.4 Direct methods- for nutritional assessment Dietary and Clinical Assessments

a) **Dietary-** methods, nutrient intake analysis, dietary assessment in special populations and specific situations, Dietary reference intakes

b) **Clinical-** components of clinical assessment, associations with nutrient deficiencies and biochemical status

10.5 Assessing food and nutrition security – Definition and assessment schedules, National and household food security. Factors affecting food security system. National and International systems to improve food security

Paper ND06: Unit 11

NUTRITION THROUGH LIFE CYCLE - I

11.1 Growth and Development through the Life Cycle: Different aspects of growth – cellular to physical, Malnutrition and cognitive development, Determinants of growth and development, Impact of altered nutrition on growth and development, Changes in body composition throughout the life cycle. Alterations in body composition and their consequences

11.2 Nutrition in Pregnancy: Physiological changes, weight gain during pregnancy and nature of weight gain, food and nutrient requirements during pregnancy, impact of good nutrition on outcome of pregnancy, complications of pregnancy and their nutritional management.

11.3 Nutrition in Lactation: Physiology of lactation, impact of nutrition on milk production, food & nutritional requirement during lactation

11.4 Nutrition in infancy: Role of nutrition on physical, mental development, rate of growth, assessment of growth, nutrient requirement during in infancy. Feeding of infants: breast feeding, formula preparation, weaning and supplementary foods, Feeding of premature & low birth weight babies, Nutritional disorder and common ailments in infancy, immunization chart

11.5 Nutrition in Preschool :Growth and development of preschool children , Prevalence of malnutrition in preschool age, Food habits and nutrient intake of preschool children, Dietary allowances – supplementary foods, feeding programmes for preschool children, Psycho social and biological interaction, Behavioural characteristics, Attention span and exploratory behaviour

Paper ND06: Unit 12

NUTRITION THROUGH LIFE CYCLE - II

12.1 Nutrition during school age: Physical development – Nutritional status of school age children, School lunch programmes, Food habits, Nutritional requirements

12.2 Nutrition during adolescence: Change of growth, physiological changes characteristics of adolescents, nutritional needs of the adolescents, Food preferences, & nutritional problems, changes needed to prevent malnutrition in adolescence

12.3 Nutrition for Adults :Nutrition for the adults, basis for requirement nutrition and work efficiency

12.4 Nutrition for the Aged: Socio economic and psychological factors, Nutritional requirements, Clinical needs, Malnutrition, nutrients influencing aging process. Feeding old people

12.5 Nutritional requirements & food modification in higher altitudes, space travels, sea voyage, Soldiers

Part I: Practical

Paper ND07: Unit -13

EXPERIMENTS ON PHYSIOLOGY

1. Microscopic Examination of various tissues
2. Determination of clotting and bleeding time
3. Enumeration of RBC and WBC
4. Estimation of hemoglobin and Red blood cell indices
5. Determination of blood group and Rh factor
6. Determination of fragility of RBC
7. PCV – Determination of PCV and ESR
8. Determination of pulse rate and Blood pressure
9. Determination of Respiratory Rate
10. Lung function test
11. ECG – recording and analysis

Paper ND07: Unit 14

EXPERIMENTS ON FOOD MICROBIOLOGY

1. Identification of microorganism - Yeast, mould, algae.
2. Simple staining, Grams staining and hanging drop preparation.
3. Identification of microorganisms in curd.
4. Identification of mould in bread.
5. Bacteriological testing of milk.
6. Observation of culture characteristics and preparation of culture media.

Paper ND0 8: Unit 15

BIOCHEMICAL ANALYSIS IN NUTRITION -I

1. Determination of Saponification Number.
2. Determination of Acid Number and Iodine number
3. Estimation of Creatinine and uric acid in urine and blood
4. Estimation of Serum cholesterol, triglyceride.
5. Estimation of Blood glucose by Glucose oxidase method / Method of Nelson Somogy

Paper ND0 8: Unit 16

BIOCHEMICAL ANALYSIS IN NUTRITION -I

1. Estimation of Serum proteins by Biuret method /Lowry method.
2. Estimation of Albumin / Globulin ratio by biuret method
3. Estimation of starch from Wheat flour
4. Estimation of lactose from milk
5. Bio chemical testing of food additives

Paper ND0 9: Unit 17
NUTRITIONAL ANTHROPOMETRICS

1. Anthropometric measures related to nutritional assessment
2. Determination of anthropometric indices for nutritional assessment
3. Measurement of skin fold thickness
4. Determination of body composition – Percentage of body fat, Total body fat, lean body mass

Paper ND0 9: Unit 18
GROWTH CHART AND CLINICAL ASSESSMENT OF MALNUTRITION

1. Determination of growth rate (height , weight , BMI) ,
2. Determination incremental growth rate and growth spurt
3. Preparation growth charts
4. Clinical Assessment of malnutrition by the standard chart

Paper ND 10: Unit 19
REVIEW REPORT

An independent review work should be undertaken by student under the guidance of a teacher. A report should be submitted at the end of session in a standard format. The review topic can be selected in consultation with the supervisor.

Paper ND 10: Unit 20:
VIVA-VOCE ON REVIEW WORK

The student should appear before examiners board and the review work will be evaluated by means of viva-voce.

Part II

Theory

Paper ND 11: Unit 21

RESEARCH METHODOLOGY AND STATISTICS IN NUTRITION

- 21.1 Research Methodology:** Meaning, aim & objective of research, significance of Research, Role of Research , Types of Research, Research Process, Research Problem: selecting the problem, technique involved in defining a problem, Thrust areas in research in nutrition and dietetics

21.2 Sampling design, Census and sample survey, Steps in sampling design. Data collection: Collection of primary data through different methods (Questionnaire, observation, Interview, case study, sociometry, Anthropometry, Projective tests and other methods), Collection of Secondary data

21.3 Descriptive Statistics : Introduction, Measures of Central tendency- Mean, Median, Mode, Measures of Dispersion- Range, Coefficient of variation, percentiles Quartile deviation, Mean deviation, Standard deviation, Odds ratio

21.4 Statistical Testing Inference : Probability theory: Binomial, Normal and Poisson distribution, Statistical testing of hypothesis and inference, Type I error and type II error, Tests of significance, Chi-square test, t-test, Z-test, Mann Whitney U test One tailed and two tailed tests,

21.5 Measures of association- correlation , regression , Spearman's rho, Analysis of variance

Paper ND 11: Unit 22

BIOINFORMATICS AND COMPUTER APPLICATION IN NUTRITION

22.1 Basic bioinformatics- Introduction to bioinformatics , its importance and scope, sequence analysis, Biological data bases, primary and secondary sequence databases, Genbank, EMBL, DDBJ, PDB, MMDB. Nutritional databases

22.2 Basics of Computer a) generations of computer, types of computer b) Computer hardware – CPU, Peripherals devices, computer memory

22.3 Computer software – system software, application soft ware , Operating systems, computer languages, software packages

22.4 Word processing and data management – Ms Word , Ms Excel and nutritional data management, Ms PowerPoint – its application

22.5 Concept of internet – Components, uses. WWW, browsing , searching nutritional information / data , downloading and uploading through internet, application in nutrition

Paper ND 12: Unit 23

DIET THERAPY- I

23.1 Basic principles of planning a normal diet: characteristics of a normal diet, meeting nutrient requirements of individuals and family. Use of Dietary guidelines for Indians, Objectives of diet therapy- Regular diet and rationale for modifications in energy and other nutrients, texture, fluid, soft diets.

23.2 Diet in Febrile condition : a) Short duration - Typhoid, Influenza, Malaria, Long duration Tuberculosis b) c) Surgery - Physiological response, Metabolic Consequences, Stage of

Convalescence, pre and post operative diets d) Burns - Metabolic changes in protein and electrolytes and Nutritional support.

23.3 Diet in Energy Imbalance - Underweight and obesity, Etiology and dietary management. Diet in deficiency diseases – PEM and Vitamin A, Dietary management in Other deficiencies- osteoporosis, iodine and iron deficiency disorders etc

23.4 Diets in cardio vascular and pulmonary diseases - a) Risk factors of CVD, Etiology, Symptoms, and dietary management of atherosclerosis, Ischemic heart disease, dyslipidemia, prevention through life style modifications. Diet related factors influencing hypertension , Management of hypertension b) Pulmonary: Chronic obstructive Pulmonary disease, cystic fibrosis, pneumonia, tuberculosis; causes, pathology, effect of malnutrition, nutritional management.

23.5 Diets in Neurological diseases and Rheumatic disorders: Stroke, epilepsy, migraine, Parkinson's neurotrauma myasthenia gravis causes, effect of malnutrition, feeding problems, effect of nutrients. b) Arthritis- osteo and rheumatoid arthritis, Gout: Symptoms, causes, treatment, diet therapy

Paper ND 12: Unit 24:

Diet therapy- II

24.1 Diets in diseases of the Gastro intestinal system- Disorders, Etiology, Symptoms and dietary management of Acute gastritis, Chronic gastritis, Peptic ulcer - duodenal & gastric and Intestinal disease - Flatulence, Diarrhoea and Dysentery, Constipation, Celiac disease, Tropical sprue, Irritable bowel syndrome, diverticular disease, colon cancer, Ulcerative colitis.

24.2 Diets in Liver and Kidney diseases – a) dietary management of Hepatitis, cirrhosis, Jaundice, fatty liver, cholecystitis and cholelithiasis, Hepatic coma. Pancreatitis, b) Kidney : Etiology, Symptoms and Dietary modification, Nephritis, Nephrosis, Acute and chronic renal failure, Nephrolithiasis, Transplantation and dialysis, dietary management, Diet and kidney stones

24.3 Diabetes Mellitus - Etiology, Types, Symptoms, Diagnosis, metabolic alterations, complications and treatment. Diet therapy in diabetes mellitus

24.4 Diets in Cancer and HIV: Dietary modification and Nutritional Support for cancer , Carcinogens in foods, chemoprevention of cancer- nutrient and non-nutrient dietary components, nutritional impacts of cancer therapy. Diet therapy for HIV patients

24.5 Diet in allergy - Common food allergens, test for allergy - Skin test , Elimination diet and Treatment for allergy, food selection , Food allergy in infancy (milk sensitive enteropathy , colic prevention of food allergy

Paper ND13: Unit 25

COMMUNITY NUTRITION

25.1 Community health concept: Definition and brief study of community, family, village and block. Definition, dimension and determinant of health, positive health, health situation in India, Relationship between health and nutrition. Role of public nutritionist in health care delivery. Health Indices: fertility indicator, vital statistics, mortality, morbidity and demographic indicator, Human development Index, Reproductive health index. IMR, MMR, birth rate, sex ratio, poverty level. Concept of disease, causation (Agent, host, environmental factors) concept and control & prevention, modes of intervention.

25.2 Nutrition programs: National anemia prevention, Prevention of night blindness, National iodine prophylaxis program. The package programmes of immunization, nutrition education, feeding programmes. Malnutrition - causes, ecological factors, effects of malnutrition. Demographic changes due to malnutrition. Vitamin deficiency - B1, B2, Niacin, C, D - prevalence, programmes to combat. Protein deficiency diseases - PEM, Kwashiorkor prevalence, epidemiology and programs to combat, Nutritional Anaemia - Prevalence, programmes to control.

25.3 Nutrition and National Development: National nutritional policy - Aim, objectives, guidelines and thrust areas. PDS - Public distribution system. Need for voluntarism in community development, Assistance available to voluntary agencies from Ministries, Departments, Government of India, Central State Social Welfare Board etc, National nutrition surveillance system. Food for work etc.

25.4 Nutrition intervention Programmes - Objectives, operation of feeding programmes. ICDS, TINP, NNMS, IRDP, DWACRA. National organizations and their role in nutrition programmes - ICMR, NIN, NNMB, ICAR, CFTRI, NIPCCD. International organizations - FAO, WHO, UNICEF, UNESCO, World Bank.

25.5 Nutrition education - Meaning, nature and importance of nutrition education to the community, Training of workers in nutrition education programme . Principles of planning, executing and evaluation nutrition education programme. Methods and Techniques of organizing nutrition programmes using audio, video aids and exhibition, Problems of nutrition , Health care delivery - PHC, School Health services and their role in preventing communicable diseases

Paper ND13: Unit 26

NUTRITION IN SPORTS AND FITNESS

26.1 Approaches to the management of fitness and health: Nutrition, exercise, physical fitness and health- their inter relationship. Significance of physical fitness and nutrition in prevention and management of weight control regimes. Nutrition guidelines for maintenance of health and fitness

- 26.2 Nutritional requirements of exercise:** Energy requirements in exercise and different types of sports. Energy source of different sports events. Mobilization of fuel stores during exercise. Nutrient requirements in sports, proportion of nutrients, pre game and post game meals
- 26.3** Carbohydrate requirements before, during and after sports events, carbohydrate loading – method, merits and demerits. Dietary fat and protein for athletes – importance for exercise
- 26.4** Requirements and importance of different vitamins and minerals during exercise, Water and electrolytes requirements for different sports events, water replacement before, during and after sports events, ORS in exercise
- 26.5 Dietary supplements and Ergogenic aids:** Definitions, Use of different nutrigenic / ergogenic aids and commercial supplements, Sports drinks, sports bars etc.

Paper ND14: Unit 27

NUTRITION IN EMERGENCIES

- 27.1 Natural / manmade disasters:** resulting in emergency situations-Famine, drought, flood, earthquake, cyclone, war, civil and political emergencies, Factors contributing to the rise and development of emergency situations (Use illustrations from Indian case studies).
- 27.2 Nutritional problems and communicable diseases:** Causes, major deficiencies and communicable diseases, (PEM and other specific deficiencies) (Cholera, typhoid, measles, TB, plague).Control and prevention, role of immunization and sanitation.
- 27.3 Assessment and surveillance of nutritional status:** in emergency affected populations-Scope for malnutrition assessment, indicators and simple screening methods. Organization for nutritional surveillance
- 27.4 Nutritional relief and rehabilitation:** Assessment of food needs, food distribution strategy, targeting food aid, mass and supplementary feeding, special foods/ rations for nutritional relief, organizations for mass feeding/ food distribution, transportation and storage, feeding centers, sanitation and hygiene and public nutrition approach to tackle nutritional and health problems in emergencies, ethical consideration
- 27.5 Assessment of food needs in emergency situations.** Food distribution strategy – identifying and reaching the vulnerable group. Local production of special foods, Local food rehabilitation, Organization of mass feeding / general food distribution, Feeding centres, Household food security and nutrition in emergencies.

Paper ND14: Unit 28

NUTRITION COUNSELING

28.1 Nutrition Counseling: Definition, concept, the role of clinical dietician, the recipients, counseling environment. A systems approach to nutritional care: overview of the system, components of the system. Dietician as part of the medical team and outreach services

28.2 Factors for counseling: Dietary diagnosis and tests for nutritional status – correlation, clinical and dietary information Nutritional and health conditions, including body care, skin, hair, face, hands, feet etc. Psychological conditions, food allergies, aging, gender related and other problems. Aesthetic attributes of diets

28.3 Assessment and planning component: Medical History assessment – techniques of obtaining relevant information for patient. Methods of interview – verbal and nonverbal techniques. Counseling models – data analysis (dietary, biological, environmental, behavioral data). Facilitator resource analysis – Culmination of the assessment process. Designing of counseling plans – goals & objectives, classifying objections, resource planning – client care plan and designing evaluation instruments.

28.4 Implementation and evaluation component: Resources and aids of counseling the client/patient – client concurrence, co-ordination of care plans-the provision of learning experience. Measuring the success of performance of client and evaluating the counseling process. Patient Education and Counseling – Assessment of patient needs, establishing report, counseling relationship. Resources and aids of counseling , Follow up visits and patient education

28.5 Nutrition advocacy: Concepts and practices in nutrition advocacy– steps for success Concept of mainstreaming nutrition in all child survival programs and in national health and development programs. National Policies and Nutrition Advocacy - Nutrition Missions of various states & its implications, Need for revision in state nutrition policies

Paper ND15: Unit 29:

NUTRACEUTICALS AND HEALTH FOODS

29.1 Nutraceuticals: (a) Use of nutraceuticals in traditional health sciences. Their role in preventing /controlling diseases. (b) Definition, Classification, food and non food sources, mechanism of action. Role of omega-3,fatty acids, carotenoids, dietary fiber, phytoestrogens; glucosinates; organosulphur compounds as nutraceuticals.

29.2 Prebiotics and probiotics: Usefulness of probiotics and prebiotics in gastro intestinal health and other benefits. Beneficiary microbes; prebiotic ingredients in foods; types of prebiotics and their effects on gut microbes.

29.3 Functional foods Definition, development of functional foods, benefits and sources of functional foods in Indian diet. Effects of processing conditions and storage; Development of biomarkers to indicate efficacy of functional ingredients

29.4 Development of nutraceutical and functional foods – Standards for health claims. Process of developing - preclinical & clinical studies, Marketing and Regulatory issues,

29.5 Other Food components with potential health benefits: Polyphenols: Flavonoids, Catechins is flavones tanning. Phytoestrogens , Phytosterols , , Glucosinolates , Pigments: Lycopene, Curcumin etc. , Organo Sulphur Compounds, Other Components - Phytates, Protease inhibitions, saponins, amylase inhibitions, harmagglutinins., Active biodynamic principles, in spices, condiments and other plant materials.

Paper ND15: Unit 30

FOOD ADDITIVES

30.1 Food additives: Definitions, functions and uses in processed food products.

Intentional additives : Direct - (a) Preservatives (b) Nitrate (c) N-Nitroso compounds ; Indirect additives - (a) Residues and contaminants : (b) Antimicrobials and veterinary drugs (c) Pesticides (d) Polyhalogenated aromatic compounds (e) Polycyclic aromatic hydrocarbons (f) Packaging materials (g) Heavy metals

30.2 Categories of food additives: Chemical, technological and toxicological aspects of different categories of food additives - Acidity regulators , Anticaking agents , Antifoaming agents , Antioxidants , Bulking agents , Color retention agents , Emulsifiers , Flour treatment agents , Glazing agents, Humectants , Preservatives , Stabilizers, Thickeners, leavening agents ,salts and chelating/sequestering agents, firming agents, flour bleaching agents and bread improvers.

30.3 Sweetening agents: Artificial sweeteners, composition, uses.
Natural and synthetic colors: Colour of foods - Natural colours, certified artificial colours, Non-certified colors, Use and Optimum levels.

30.4 Food Flavors: natural flavors, artificial flavor and Spices. Flavoring constituents, flavors in food industries. Flavor profiling, Restriction and regulation of food flavoring

30.5 Determination and estimation of food additives: nitrites, boric acid, sorbic acid, sulphur dioxide, MSG, sodium chloride, natural and artificial food colors. Determination and estimation of adulterants in foods: honey, fats & oils, spices (turmeric and red chily powder). Estimation of trypsin inhibitor in foods, Carotenoid estimation in fruits and vegetables

Paper ND16: Unit 31

FOOD AND NUTRITION SERVICES IN HOSPITAL AND OTHER ORGANIZATIONS

31.1 Introduction to Food Service Organization: Definition, Principles and functions, Characteristics, Types of catering establishments, Goals of service management

Scope for food and nutrition services in hospitals- importance of nutritional care and food service in hospitals. Food services in Schools/Educational Institutes and Corporate offices

31.2 Role of nutrition support team- dietetic interns, dietitians (therapeutic, administrative and consultant dietitian) medical doctors and nurses. Team approach in patient care, Psychological considerations in patient care, Inter personal relationship with patients

31.3 Types of services- services in primary, secondary and tertiary health care setup, patients in different critical care centers, Post natal, pediatric and geriatric patients.

31.4 Basic quality management in nutrition services- : a) Personnel management – recruitment, training, placement, promotion, personnel records, work, appraisals. B) Material management – Principles of quantity food purchase- selection, buying and accounting of different foods. Inventory management- assessing requirements, receiving and release of stocks. Record maintenance. C) Hygiene and sanitation in preparation and serving area – Personal hygiene, types and sources total quality, structuring quality program in health care, assessment of quality of services.

31.5 Patient satisfaction- meeting patient needs and wants, managing customer's expectations, assessing patient's satisfaction as a mark of quality. Continuous quality improvement- strategies, training and monitoring, Continuous quality improvement- strategies, training and monitoring

Paper ND16: Unit 32

DRUG NUTRIENT INTERACTION AND NUTRIGENOMICS

32.1 Drugs and pharmaceutical compounds- natural and synthetic, use of recipients.

32.2 Characteristics of drugs action: Pharmacodynamics, pharmacokinetics, route and form of excretion. Drug abuse and drug resistance

32.3 Drug-nutrient interactions – effect of drugs on ingestion, digestion, absorption and metabolism of nutrients, effect on nutritional status, effect on organ function, drug dosage and efficacy.

32.4 Nutrient effects on drug therapy – effects of dietary composition, interactions between medication and milk, iron, fruit juices, antacids.

32.5 Nutrigenomics- definition, concepts and theories. Genetic materials, gene expression and inheritance. Molecular mechanisms of genetic variations linked to diet- role of diet, macro and micronutrients. Role of animal foods, Nutrigenomics as anti-aging

Part II: Practical

Paper ND17: Unit 33

DIET CHART- I

1. Preparation of diet chat for preschool children
2. Preparation of diet chat for school children
3. Preparation of diet chat for adolescents
4. Preparation of diet chat for old age
5. Preparation of diet chat for athletes
6. Preparation of diet chat for pregnant mother
7. Preparation of diet chat for lactating mother

Paper ND17: Unit 34

DIET CHART - II

1. Preparation of diet chat for Diabetic patients
2. Preparation of diet chat for hypertensive patients
3. Preparation of diet chat for patients with cardiovascular ailments
4. Preparation of diet chat for hyperurecic/ Gout patients
5. Preparation of diet chat for patients with renal diseases
6. Preparation of diet chat for patients with thyroid diseases
7. Preparation of diet chat for cancer patients
8. Prparation of diet chart for gastro intestinal disorders
9. Preparation of diet chat for nutritional disorders like – anemia, obesity, underweight

Paper ND18: Unit 35

NUTRITIONAL SURVEY AND NUTRIENT ANALYSIS

1. Determination of socioeconomic status
2. Determination of energy requirement of sedentary persons
3. Determination of energy requirement of light, moderate and heavy workers
4. Determination of nutritional consumption by questionnaire method
5. Determination of nutritional status by weighing method/ cooked food method
6. Study on nutritional status of the beneficiaries under National nutritional Programme
[*A field study should be arranged for the students to collect data on above topics from different communities under the guidance of the teachers. The students should submit a report on the basis of the collected data during examination. 15 marks is allotted for the field study report*]

Paper ND18: Unit 36

ADVANCED FOOD ANALYSIS

1. Ashing of food and preparation of ash solution.
2. Estimation of calcium in food.
3. Estimation of phosphorus in food.
4. Estimation of iron in food.
5. Estimation of ascorbic acid in food
6. Estimation of thiamine in food
7. Estimation of Food composition
8. Separation of amino acids from food protein by TLC and Paper chromatography

Paper ND19: Unit 37

STATISTICAL ANALYSIS IN NUTRITION

1. Computation of mean, median and mode of grouped and ungrouped data
2. Data representation by histogram and pie diagram
3. Computation of standard deviation and standard error of mean
4. Students t-test – a) for Independent group b) paired group
5. Chi square test
6. Mann-Whitney U test
7. Computation of Correlation coefficient
8. One way ANOVA

Paper ND19: Unit 38

COMPUTER APPLICATION IN NUTRITION

1. Analysis of nutritional data using computer – use of software packages
2. Use of Ms word – data representation in tabular form, manipulation of tables
3. Use of Ms Excel – data tabulation, data representation by charts
4. Statistical analysis of data by Ms Excel
5. Ms power point

Paper ND20: Unit 39

PROJECT WORK

An independent research project work undertaken by student under the guidance of a teacher, can either be a survey or Laboratory oriented research. The research should be submitted at the end of session in the form of a dissertation. The project work can be undertaken at University departments, affiliated research institutions, quality control laboratories, food industries or other institutions with prior approval.

Paper ND20: Unit 40

Viva-voce on Project

The student should appear before examiners board and the dissertation will be evaluated by means of viva-voce.

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