



MANGALORE UNIVERSITY
B.Sc. in FOOD NUTRITION and DIETETICS (B.Sc. FND)
CHOICE BASED CREDIT SYSTEM (CBCS)

Program Outcomes (POs)

After successful completion of this program, graduates of Food Nutrition and Dietetics will have the following attributes:

1. Scientific Knowledge: Apply the knowledge of food science, chemistry, nutrition, physiology and dietetics in a competent manner to innovate in the field of nutrition and dietetics.
2. Design and Development of Solutions: Design nutrition and dietetics strategies as per the specified requirements of regulatory bodies related to food, health, environment, hospitals, families and communities.
3. Problem Analysis: Identify, formulate, rationalise, and analyse nutrition-related problems in the community and hospitals so as to reach substantiated diet-based conclusions using the principles of food nutrition and dietetics.
4. Modern Tool usage: Create, select, and apply modern nutrition and dietetics tools, techniques, and resources of relevance in nutrition and dietetics.
5. Environment and Sustainability: Evolve nutrition and dietetics approaches in the context of food security and environmentally sustainable development goals.
6. Teamwork: Function objectively as an individual and as a member in diverse teams.
7. Communication: Effectively document and communicate nutrition and dietetics approaches and plans with individuals, patients and communities.
8. Lifelong learning: Independently engage in continuous learning to adapt to newer concepts in nutrition and dietetics.

Program Specific Outcomes (PSOs):

After successful completion of this program, graduates of Food Nutrition and Dietetics will have the following specific attributes:

- Utilize the knowledge from the physical and biological sciences as a basis for understanding the role of food and nutrients in health and disease processes
- Evaluate the food product and the application of necessary preservation techniques to increase the shelf life of the product and also be a part in the auditing industry
- Work in Research laboratories on the fortification and enrichment of existing product as well as the development of new product
- Apply the nutrition and dietetics-based knowledge and skills in the planning and assessment of suitable diets for individuals of every age, patients and the community in a sustainable manner.
- Provide nutrition counselling and education to individuals, groups, and communities throughout the lifespan using a variety of communication strategies
- Apply technical skills, knowledge of health behaviour, clinical judgment, and decision-making skills when assessing and evaluating the nutritional status of individuals and communities and their response to nutrition intervention.
- Implement strategies for food access, procurement, preparation, and security for individuals, families, and communities.

- Apply food science knowledge to describe functional properties of food ingredients.
- Apply the knowledge of principles and techniques of nutrition and dietetics for research-based approaches.
- Apply skills gained in nutrition and dietetics for research, development, and entrepreneurship.

CHOICE BASED CREDIT SYSTEM (CBCS) - SCHEME and SYLLABUS

I Semester

Group	Code	Course	No. of courses	Instruction hrs/week	Duration of Exam (hrs)	Marks			Credits	Total/ Sem
						IA	Exam	Total		
Group I Core	FNDFNC 131	Human Nutrition – I	3T	3x4	3x3	3x20	3x80	3x100	3x2	6
	FNDFNC 132	Food Science - I								
	FNDFNC 133	Human Physiology - I								
	FNDFNP 134	Human Nutrition – I	3P	3x3	3x3	3x10	3x40	3x50	3x1	3
	FNDFNP 135	Food Science - I								
	FNDFNP 136	Human Physiology - I								
Group II Elective	a. Supportive to the discipline of study - Any ONE of the following to be opted									
	FNDFCE 137	Food Service Management	1T	2	1x2	1x10	1x40	1x50	1x1	1
	FNDFCE 138	Food Biotechnology								
	FNDFCE 139	Food Technology								
Group III Foundation Course	a. Foundation Languages – TWO		2L	2x4	2x3	2x20	2x80	2x100	2x2	4
	FNDENL 131									
	FNDKAL 131									
	FNDMLL 131									
	FNDFRL 131									
	FNDHDL 131									
	FNDKNL 131									
FNSDKL 131										
b. Elective Foundation		1T	1x2	1x2	1x10	1x40	1x50	1x1	1	
FNDCIF 131										
Group IV	EC & CC		1T	1x2	1x2	50	-	50	1x1	1
									Total	16

II Semester

Group	Code	Course	No. of courses	Instruction hrs/week	Duration of Exam(hrs)	Marks			Credits	Total/ Sem
						IA	Exam	Total		
Group I Core	FNDFNC 181	Human Nutrition – II	3T	3x4	3x3	3x20	3x80	3x100	3x2	6
	FNDFNC 182	Food Science - II								
	FNDFNC 183	Human Physiology – II								
	FNDFNP 184	Human Nutrition – II	3P	3x3	3x3	3x10	3x40	3x50	3x1	3
	FNDFNP 185	Food Science – II								
	FNDFNP 186	Human Physiology – II								
Group II Elective	b. Providing an expanded scope - Any ONE of the following to be opted									
	FNDFCE 187	Community Nutrition	1T	1x2	1x2	1x10	1x40	1x50	1x1	1
	FNDFCE 188	Food packaging								
	FNDFCE 189	Functional Foods and Nutraceuticals								
Group III Foundation Course	a. Foundation Languages – TWO		2L	2x4	2x3	2x20	2x80	2x100	2x2	4
	FNDENL 181									
	FNDKAL 181									
	FNDMLL 181									
	FNDFRL 181									
	FNDHDL 181									
	FNDKNL 181									
	FNSKSL 181									
	FNDAEL 181									
b. Elective Foundation		1T	1x2	1x2	1x10	1x40	1x50	1x1	1	
FNDHGF 181										
Group IV	EC & CC		1T	1x2	1x2	50	-	50	1x1	1
Total									16	

III Semester

Group	Code	Course	No. of courses	Instruction hrs/week	Duration of Exam (hrs)	Marks			Credits	Total/Sem
						IA	Exam	Total		
Group I Core	FNDFNC 231	Lifespan Nutrition – I	3T	3x4	3	3x20	3x80	3x100	3x2	6
	FNDFNC 232	Chemistry – I								
	FNDFNC 233	Dietetics – I								
	FNDFNP 234	Lifespan Nutrition – I	3P	3x3	3	3x10	3x40	3x50	3x1	3
	FNDFNP 235	Chemistry – I								
	FNDFNP 236	Dietetics – I								
Group II Elective	c. Nurturing students proficiency/skill - Any ONE of the following to be opted									
	FNDFCE 237	Diet Counselling	1T	1x2	2	1x10	1x40	1x50	1x1	1
	FNDFCE 238	Nutritional Assessment and Surveillance								
FNDFCE 239	Food Sanitation and Hygiene									
Group III Foundation Course	a. Foundation Languages – TWO		2L	2x4	3	2x20	2x80	2x100	2x2	4
	FNDENL 231 FNDKAL 231 FNDAEL 231 FNDMLL 231 FNDHDL 231 FNDKNL 231 FNDSKL 231									
	b. Elective Foundation		1T	1x2	2	1x10	1x40	1x50	1x1	1
	FNDGEF 231									
Group IV	EC & CC		1T	1x2	2	50	-	50	1x1	1
Total									16	

IV Semester

Group	Code	Course	No. of courses	Instruction hrs/week	Duration of Exam (hrs)	Marks			Credit	Total/Sem
						IA	Exam	Total		
Group I Core	FNDFNC 281	Life span Nutrition – II	3T	3x4	3x3	3x20	3x80	3x100	3 x 2	6
	FNDFNC 282	Chemistry – II								
	FNDFNC 283	Dietetics – II								
	FNDFNP 284	Life span Nutrition – II	3P	3x3	3x3	3x10	3x40	3x50	3 x 1	3
	FNDFNP 285	Chemistry – II								
	FNDFNP 286	Dietetics – II								
Group II Elective	d. Enabling an exposure to some other discipline/ domain - Any ONE of the following to be opted									
	FNDFOE 287	Food for Health	1T	1x2	1x2	1x10	1x40	1x50	1x1	1
	FNDFOE 288	OR Public Health Nutrition								
	FNDFOE 289	OR Life Style Disorders								
Group III Foundation Course	a. Foundation Languages – TWO		2L	2x4	2x3	2x20	2x80	2x100	2x2=4	4
	FNDENL 281 FNDFRL 281 FNDAEL 281 FNDKAL 281 FNDMLL 281 FNDHDL 281 FNDKNL 281 FNDSKL 281									
	b. Elective Foundation FNDESf 281		1T	1x2	1x2	1x10	1x40	1x50	1x1	1
Group IV	EC & CC		1T	1x2	1x2	50	-	50	1x1=1	1
Total									16	

V Semester

Group	Code	Course	No. of courses	Instruction hrs/week	Duration of Exam(hrs)	Marks			Credits	Total/Sem
						IA	Exam	Total		
Group I Core	FNDFNC 331	Nutritional Biochemistry – I	6T	6x3	6x3	6x20	6x80	6x100	6x2	12
	FNDFNC 332	Quality Control – I								
	FNDFNC 333	Chemistry – III								
	FNDFNC 334	Therapeutic Nutrition – I								
	FNDFNC 335	Food Microbiology – I								
	FNDFNC 336	Food Preservation - I								
	FNDFNP 337	Nutritional Biochemistry – I	6P	6x3	6x3	6x10	6x40	6x50	6x1	6
	FNDFNP 338	Quality Control – I								
	FNDFNP 339	Chemistry – III								
	FNDFNP 340	Therapeutic Nutrition – I								
	FNDFNP 341	Food Microbiology – I								
	FNDFNP 342	Food Preservation - I								
Total									18	

VI Semester

Group	Course	Title	No. of courses	Instruction hrs/week	Duration of Exam(hrs)	Marks			Credits	Total/Sem
						IA	Exam	Total		
Group I Core	FNDFNC 381	Nutritional Biochemistry – II	6T	6x3	6x3	6x20	6x80	6x100	6x2	12
	FNDFNC 382	Quality Control – II								
	FNDFNC 383	Chemistry – IV								
	FNDFNC 384	Therapeutic Nutrition – II								
	FNDFNC 385	Food Microbiology – II								
	FNDFNC 386	Food Preservation – II								
	FNDFNP 387	Nutritional Biochemistry – II	6P*	6x3*	6 x 3	6x10	6x40	6*x50	6x1	6
	FNDFNP 388	Quality Control – II								
	FNDFNP 389	Chemistry – IV								
	FNDFNP 390	Therapeutic Nutrition – II								
	FNDFNP 391	Food Microbiology – II								
	FNDFNP 392	Food Preservation – II								
* Internship / Project Work / Industrial Practicum in the VI semester in lieu of Food preservation practical (IA=10 + Written report = 20 + Viva = 20)										
									Total	18
									Grand Total	100

BSc FND - I Semester
FNDFNC 131: HUMAN NUTRITION (THEORY)

48 hrs - 4 hrs / week

Course Outcomes:

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

- CO 1. Comprehend nutritional classification of food and methods of assessing nutritional status and energy requirements
- CO 2. Understand the functions and sources of nutrients
- CO 3. Apply the knowledge of human nutrition in maintenance of good health for the individual and the community
- CO 4. Assess the factors affecting availability and requirements of nutrients

UNIT I (12 hrs)

Nutritional Status: The relation of good nutrition to normal physical development and sound health. Definitions of the terms – Nutrition, Health, Nutrients, Nutritional status, Malnutrition, RDA. Methods of assessing nutritional status – Population sampling, collection of data on the nutritional adequacy of diet consumes, anthropometric measurements, clinical examination, biochemical assessment. Diet surveys – methods. Energy - Definition of health and nutrition, Definition of calorie and joule, Measurement of calorific values of foods. Basal Metabolic Rate (BMR) - Factors affecting. Specific Dynamic Action (SDA) of foods. Energy needs of the body. Measurement of energy balance of the body. Direct and indirect calorimetry. Calculation of energy requirements. The ideal proportion of calories from protein, carbohydrates and fats

UNIT II (12 hrs)

Carbohydrates: Classification, Basic structure, chemistry, digestion, absorption, Transport, brief overview of metabolism, functions, sources and requirements

UNIT III (12 hrs)

Proteins: Classification, Structure, chemistry, digestion, absorption, brief overview of metabolism, functions, sources and requirements. Essential amino acids, evaluation of protein quality, Factors affecting bio-availability, supplementation and deficiency state

UNIT IV (12 hrs)

Lipids / Fats: Classification, chemistry, digestion, absorption, brief overview of metabolism, functions, sources and requirements. Saturated and unsaturated fatty acids and effects of deficiency. Nutritional significance of SFA, MUFA, PUFA, Omega-3

REFERENCES

- Guthrie AH (1986) Introductory Nutrition, 6th Ed., The CV Mosby Company
- Swaminathan M (1985) Essentials of food and nutrition, Vol I and II, Ganesh and Co, Madras
- Gopalan C (1991) Nutrition value of Indian foods, ICMR
- WHO Technical Reports Series for Different Nutrients.
- Robinson CH, Lawler MR, Chenoweth WL, Garwick AE (1986) Normal and therapeutic nutrition, 17th Ed., Macmillan Publ. Co.
- Agarwal A, Udipi SA (2014) Text book of human nutrition, Jaypee Bros. Medical Publ., New Delhi
- Bamji M, Rao NP, Reddy V (1996) Text book of Human Nutrition, Oxford and IBH Publ.

Co. PvtLtd, New Delhi

- Srilakshmi B (2015) Nutrition science - 4th Ed., New age international Publ., New Delhi
- Shills ME, Shike M, Ross AC, Caballero B, Cousins RJ (2005) Modern Nutrition in health and disease – 10th Ed., Lippincott Williams and Wilkins

BSc FND - I Semester
FNDFNC 132: FOOD SCIENCE – I (THEORY)

48 hrs - 4 hrs / week

Course Outcomes:

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

- CO 1. Understand factors to be considered during selection of basic commodities, raw and processed and various aspects of their products and distribution
- CO 2. Comprehend the principles underlying changes in overall quality of food characteristics during cooking.
- CO 3. Evaluate food products based on their quality characteristics
- CO 4. Assess methods and media of cooking, nutritive value and processing, storage, preservation of both plant and animal-based foods

UNIT I (12 hrs)

Introduction to food science. Definition of food science. Food as a source of nutrients. Food groups: ICMR Five Food Group System. Eleven Food Group System. Nutritional Classification of foods. Cooking: advantages of cooking. Methods of cooking: Moist heat methods – Water/steam as a media of cooking: Boiling, simmering, poaching, stewing, steaming and pressure cooking – definition, advantages and disadvantages of each method. Dry heat method. Air as a media of cooking - grilling, roasting and baking. Fat as media of cooking – stir frying, sautéing, shallow and deep fat frying. Definition, advantages and disadvantages of each method. Combination of cooking methods – braising. Microwave cooking – mechanism of microwave cooking, construction of a microwave oven, advantages and disadvantages

UNIT II (12 hrs)

Cereals: Structure of a cereal grain. Composition and nutritive value of cereal grain. Specific cereals – nutritive value, composition and milling of rice and wheat. Parboiling – processes for parboiling, its advantages and disadvantages. Cereal protein gluten – process of gluten formation, factors that affect gluten formation. Characteristics of cereal starch – Amylose and Amylopectin. Effect of moist heat. Gelatinization of starch – process of gelatinisation, gelatinisation temperature, factors affecting gelatinisation. Changes in cooked starches – gel formation, retrogradation, syneresis. Modified starch

UNIT III (12 hrs)

Pulses, nuts, oilseeds and oils: Nutritive value and composition of pulses, nuts, oil seeds, fats and oils. Processing of pulses – effects of decortication, soaking, germination, fermentation, parching and puffing, extrusion. Toxic constituents of pulses. Pulse cookery – effect of cooking, factors that affect cooking quality. Processing of nuts and oil seeds. Specific nuts and oilseeds – groundnuts, coconut. Types of fats and oils: Vegetable oil – coconut, groundnut, sunflower and soybean. Animal fats – lard, margarine and butter. Processing of fats and oils – rendering, pressing, solvent extraction, hydrogenation and refining. Changes during cooking – effect of heating, changes in fat on heating. Storage, spoilage, rancidity. Role of fats and oils in cookery

UNIT IV (12 hrs)

Fruits: Classification of fruits and nutritive value. Post harvest changes and storage. Pectin substances. Ripening of fruits. Enzymatic and non-enzymatic browning, prevention of enzymatic browning. Vegetables: Classification, nutritive value and composition. Pigments – water insoluble and soluble. Organic acids, enzymes, flavour compounds, bitter compounds. Vegetable cookery: Preliminary preparation – washing, peeling and blanching. Changes during cooking – oxidation, chemical composition, water content and cellulose. Role of nutrients – mechanical losses, solvent action of water, oxidation and chemical composition. Enzymes and non-enzymatic browning, its prevention. Flavor compounds

REFERENCES

- Manay NS, Shadaksharaswamy M (2010) Foods - Facts and principles, New Age International Publ., New Delhi
- Levies (1988) Food commodities, Heinemann Ltd., London
- Hughes and Bennion M (1970) Introductory Foods, Macmillan and Co, New York
- Dowell P, Bailey A (1980) The Book of ingredients, Dorling Kindersley Ltd., London
- Roseville LJ, Viera ER (1992) Elementary food science, 3rd Ed., Chapman and Hall, New York
- Charley H (1982) Food Science, 2nd Ed., John Wiley and Sons.
- Potter NN, Hotchkiss JH (1966) Food Science, 5th Ed, CBS Publisher and Distributors, Delhi

BSc FND - I Semester FNDFNC 133: HUMAN PHYSIOLOGY - I (THEORY)

48 hrs - 4 hrs / week

Course Outcomes:

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

- CO 1. Understand the homeostatic status of the human body
- CO 2. Comprehend the physiological processes and functions of various vital organs as applicable to human nutrition
- CO 3. Apply the knowledge of physiological states to therapeutic diets
- CO 4. Assess malfunctioning of vital organs or systems

UNIT I (12 hrs)

Introduction: Cell – structure and function of organelles, nucleus, chromosomes, genes, cell division, types of cell tissue transport, cell junctions homeostasis and body fluids. Blood: Red blood cells – Erythropoiesis, stages of differentiation, function, counts, physiological variation. Hemoglobin – structure, function, concentration, physiological variation. White blood cells – production, function, life span, counts, differential counts. Platelets – origin, normal count, morphology, functions. Plasma proteins – production, concentration, types, albumin, globulin, fibrinogen. Haemostasis and blood coagulation. Haemostasis – definition, normal haemostasis, clotting factors, mechanism of clotting, disorders of clotting factors. Blood Bank - Blood groups – ABO system, Blood grouping and typing, cross matching. Rh system – Rh factor, Rh incompatibility. Blood transfusion – Indication, universal donor and recipient concept. Complications of blood transfusion and cross matching. Selection criteria of a blood donor, transfusion reactions. Anticoagulants – examples and uses. Anaemia – classification – morphological and etiological effects of anaemia on body. Blood indices – colour index, MCH, MCV, MCHC. Erythrocyte sedimentation rate (ESR) and packed cell volume. Blood volume – normal value, determination of blood volume and regulation of blood volume. Lymph – composition and function.

UNIT II (12 hrs)

Cardiovascular system: Heart – physiological anatomy, nerve supply, properties of cardiac muscle, cardiac cycle – systole, diastole, conduction system. Cardiac output. Heart sounds: Normal heart sounds, areas of auscultation. Blood pressure – Definition, normal value, clinical measurement of blood pressure. Physiological variations, regulation of heart rate, cardiac shock, hypotension, hypertension, radial pulse. Heart Sounds – Normal heart sounds, characteristics and signification (significance), heart rate. Electrocardiogram (ECG) – significance, coronary, cerebral circulation and capillary circulation

UNIT III (12 hrs)

Digestive System: Physiological anatomy of gastro-intestinal tract, functions of digestive system. Salivary glands – structure and functions, deglutition, mastication – stages and regulation of saliva, functions of saliva. Stomach – structure and functions. Gastric secretion – composition, function, regulation of gastric juice secretion. Pancreas – structure, function, composition and regulation of pancreatic juice. Liver – functions of liver. Bile secretion - composition, function, regulation of bile secretion, bilirubin metabolism, types of bilirubin, jaundice – types, significance. Gall bladder – functions. Intestine – small intestine and large intestine. Small intestine - functions, digestion, absorption, movements. Large intestine – functions, digestion and absorption of carbohydrates, proteins, fats, lipids. Defecation

UNIT IV (12 hrs)

Respiratory System: Function of respiratory system - physiological anatomy of respiratory system, respiratory tract, respiratory muscles, respiratory organs – lungs, alveoli, respiratory membrane, stages of respiration. Mechanism of normal and rigorous respiration, intra pulmonary pleural pressure, surface tension. Transportation of respiratory gases: Transportation of O₂: direction, pressure gradient, forms of transportation, oxygenation of haemoglobin, quantity of O₂ transported. Lung volumes and capacities. Regulation of respiration, mechanisms of regulation, nervous and chemical regulation, respiratory centre. Hypoxia, cyanosis, asphyxia, dyspnoea, dysbarism, artificial respiration, apnoea

REFERENCES

- Guyton AC, Hall JE (1996): Textbook of Medical Physiology, 9th Ed., Prism Books Pvt Ltd., Bangalore
- Chatterjee CC (1988) Human Physiology, Calcutta, WB
- Wilson (1989) Anatomy and Physiology in Health and Illness, Edinburgh Churchill Livingstone
- Sembulingam K, Sembulingam P (2012) Essentials of medical physiology, Jaypee Bros. Medical Publ., New Delhi

FNDFNP 134: HUMAN NUTRITION - I (PRACTICALS)

36 hrs - 3 hrs/week

Course Outcomes:

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

- CO 1. Screen foods for various proteins
- CO 2. Assay protein levels in food products
- CO 3. Quantify glucose levels in food products
- CO 4. Measure lipid content in foods

1. Qualitative tests for proteins
2. Quantitative estimation of glucose
3. Estimation of total lipid in egg yolk

FNDFNP 135: FOOD SCIENCE - I (PRACTICALS)

36 hrs - 3 hrs/week

Course Outcomes:

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

CO 1. Determine food groups

CO 2. Assess ingredients and percentage of edible portion

CO 3. Apply methods of cooking to cereals, pulses

CO 4. Prepare vegetable- and fruit-based recipes

1. Food groups - Methods of measuring ingredients
2. Determination of the percentage of edible portion
3. Cereal cookery: Methods of cooking fine and coarse cereals, Preparation of selection Indian cereal recipes,
4. Pulses cookery: Cooking of soaked and raw pulses - Effects of adding salt, acid and alkali on cooking. Preparation of selected common recipes.
5. Vegetables and fruits: Browning reaction, Effect of acid and alkali, Preparation of selected common recipe

FNDFNP 136: HUMAN PHYSIOLOGY - I (PRACTICALS)

36 hrs - 3 hrs/week

Course Outcomes:

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

CO 1. Record blood pressure using various methods

CO 2. Estimate hemoglobin

CO 3. Carry out blood grouping

CO 4. Assess histological sections of various organs

1. Record of blood pressure – Sphygmomanometer, palpatory method, auscultatory method, variation of BP
2. Haemoglobin estimation
3. Blood grouping
4. Histology of Cartilage, bone, adipose tissue, skin, muscle

ELECTIVE COURSE – a. Supportive to the discipline of study

BSc FND - I Semester

FNDFCE 137: FOOD SERVICE MANAGEMENT (THEORY)

24 hrs - 2 hrs / week

Course Outcomes:

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

- CO 1. Understand the scope of food service management in commercial and welfare organizations.
- CO 2. Learn the concepts and skills of management, marketing and entrepreneurship with reference to food service
- CO 3. Acquire knowledge about the process of food preparation and service.
- CO 4. Design an optimal kitchen layout for food service

UNIT I (12 hrs)

Development and growth of the food service Industry. Classification of food service operations. Recent trends in food service. Systems approach to food service organizations. Types of food service systems. Menu Planning. Types of Menus, Menu presentation, Writing, Design and format Menu Marketing. Concept of Food flow. Procurement, Concept of Market, Buyer, Vendor and Marketing Channel Purchasing: Methods of purchasing, purchasing process. Receiving: Facilities needed for good receiving practices. Storage and Inventory. Production: Recipe formulation, Standardisation, Forecasting, Scheduling and control. Energy Management and Conservation

UNIT II (12 hrs)

Kitchen Design and Layout. Service Factors affecting the choice of distribution systems. Styles of service and Service management. Food Safety and hygiene. Control of microbial quality of food throughout the food flow. Food Handling and prevention of food borne illness. Personal Hygiene. Environmental Sanitation. Waste disposal and pest control. Standards for food safety and sanitation

REFERENCES:

- Longree K, Balaker BC (1979) Sanitary Techniques in Food Service, Wiley, New York,
- Longree K (1973) Food Service Sanitation, John Wiley and Sons.
- Sethi M, Malham S (1987) Catering Management – an Integrated approach, Wiley Eastern limited, New Delhi,
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- Drummond K (1997) Nutrition for the Food Service Personnel
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- Verghese B (1999) Professional Food and Beverage Service Management
- Singh YP (2001) Effective Food Management, Anmol Publications Pvt. Ltd.
- Fox A (1971) Hygiene and Food Production, Churchill Livingstone

ELECTIVE COURSE – a. Supportive to the discipline of study

BSc FND - I Semester

FNDFCE 138: FOOD BIOTECHNOLOGY (THEORY)

24 hrs - 2 hrs / week

Course Outcomes:

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

- CO 1. Understand the application of biotechnology in food processing.
- CO 2. Learn about the new trends in biotechnological applications in food items
- CO 3. Prepare fermented food products
- CO 4. Comprehend regulations and guidelines pertaining to biotechnology and IPR.

UNIT I (12 hrs)

Biotechnology- Meaning and importance, history of biotechnology- traditional and modern biotechnology. Genetically modified foods- Definition and examples, advantages, disadvantages and safety aspects of foods produced by genetic engineering. Food biotechnology- Single cell protein, algae and spirulina: production and uses; Mushroom production and processing. Genomics and proteomics- Meaning, types and future; bioinformatics- meaning, sequences and nomenclature; information sources; uses. Bioethics: Necessity of bioethics, different paradigms of bioethics- national and international.

UNIT II (12 hrs)

Enzymes- Role in food processing, importance; applications- industrial application of microbial enzymes; production of amylase, lipase and pectinase; immobilized enzymes and their applications. Fermentation- Types, advantages, factors controlling; batch fermentation and continuous fermentation; Fermented products- citric acid, lactic acid, vinegar, wine, beer, oriental fermented foods- tempeh and tofu. Biotechnology and biosafety- Introduction to Intellectual Property Rights, IP laws; TRIPS. Forms of IPR like patent, design and copyright trademark

REFERENCES

- Dubey RC (2005) A text book of Biotechnology, S. Chand and company, New Delhi,
- Tripathy SN (2006) Food biotechnology, Dominant Publ., and distributors,
- Kumar HD (2004) A text book of Biotechnology, 2 nd Ed., Affiliated East-West Press Pvt. Ltd., New Delhi,
- Kumaresan V (2005) Biotechnology, Saras Publication

ELECTIVE COURSE – a. Supportive to the discipline of study

BSc FND - I Semester

FNDFCE 139: FOOD TECHNOLOGY (THEORY)

24 hrs - 2hrs / week

Course Outcomes:

After successful completion of this course, students will have been enabled to:

- CO 1. Understand concepts in food technology
- CO 2. Evaluate the various types of food preservation and packaging
- CO 3. Differentiate techniques used in milk processing
- CO 4. Use sensory evaluation to study the quality of foods

UNIT I (12 hrs)

Introduction to food technology, Physico-chemical properties of food, classification of food

groups, Food ingredients, different techniques and equipments used in preservation of food: Drying, refrigeration, thermal treatments. Innovative techniques used in food processing: RTE, RTS, edible coatings, edible film, instant premixes. Different packaging requirements and its importance.

UNIT II (12 hrs)

Milk: Definition, different techniques used in processing of milk products: UHT, Pasteurization, Clarifications. Different types of milk products and processing. Sensory evaluation of the food products its importance, E-Nose & E-tongue. Application of enzymes for production in biochemical and food processing industries, Food regulations and licencing requirements.

REFERENCES

- Flickinger MC, Drew SW (1999) Encyclopedia of Bioprocess Technology, A Wiley Inter Science Publ.
- Webb BH, Johnson AH (1988) Fundamentals of Dairy Chemistry, 3rd Ed., CBS Publ., New Delhi
- Robinson RK (2012) Modern Dairy Technology, Springer-Science

BSc FND - II Semester

FNDFNC 181: HUMAN NUTRITION – II (THEORY)

48 hrs - 4 hrs / week

Course Outcomes:

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

- CO 1. Understand the functions and sources of nutrients
- CO 2. Apply the knowledge in maintenance of good health for individual and the community.
- CO 3. Evaluate factors affecting availability and requirements of minerals and vitamins
- CO 4. Assess the role of water and fibre in nutrition

UNIT I (12 hrs)

Macro minerals: Calcium, Phosphorus, Magnesium, Sodium, Potassium, Chlorine and Sulphur- functions, sources, requirements and effects of deficiency, Bioavailability

UNIT II (12 hrs)

Macro minerals: Copper, Cobalt, Zinc, Iodine, Manganese, Fluorine, Molybdenum, Selenium, Chromium, Iron- functions, sources, requirements and effects of deficiency, Bioavailability

UNIT III (12 hrs)

Vitamins: Classification on the basis of solubility, Vitamin A, D, E, K, Ascorbic acid, Thiamine, Riboflavin, Niacin, Folic acid, Vitamin B12, Pantothenic acid, Pyridoxine- functions, sources, absorption, requirements and deficiency

UNIT IV (12 hrs)

Water: Importance, distribution in the body, functions, oedema, dehydration, sources, water balance and requirements. Fibre: Definition, classification, sources and role of fibre in human nutrition

REFERENCES

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BSc FND - II Semester
FNDFNC 182: FOOD SCIENCE – II (THEORY)

48 hrs - 4 hrs / week

Course Outcomes:

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

- CO 1. Understand methods used in processing of milk and milk products
- CO 2. Assess the nutritional qualities of egg and changes in characteristics during cooking.
- CO 3. Evaluate composition of meat, processing and storage
- CO 4. Enumerate the nutritive value of eggs, fish and the use of major spices in processing

UNIT I (12 hrs)

Milk and milk products: Composition and nutritive value. Physical properties of milk. Effect of heat on milk constituents – nutrients, colour, flavour, digestibility, microorganisms, scum formation, scorching of milk. Processing of milk – clarification, pasteurization and homogenization. Preparation of cheese, butter, curd and ice cream. Problems encountered in cooking milk. Milk products – Vitamin D milk, skim milk, concentrated milk and cream

UNIT II (12 hrs)

Egg: Structure and nutritive value. Composition – egg white and egg yolk proteins. Pigments in egg shell, white and yolk. Vegetarian egg. Egg quality – evaluation of egg quality, egg grading and deterioration of egg quality. Egg beating and factors affecting foaming. Egg cookery – Effects of heat and coagulation of egg proteins, microorganisms, effect of ingredients on egg protein. Egg prepared in the shell – boiled eggs – hard and soft. Egg prepared out of the shell – poached egg, fried egg, scrambled egg and omelette. Products based on egg as thickening agent – Custard. Products based on egg as emulsifying agent – Meringues. Preservation – freezing, cold storage, drying. Storage of egg

UNIT III (12 hrs)

Meat: Structure, composition and nutritive value of meat. Classes of meat. Gelatin. Cuts and grades of meat and their selection. Post mortem changes, storage and changes during cooking. Ageing of meat and curing of meat. Factors affecting tenderness of meat. Meat cookery and changes during cooking, methods of cooking – dry heat and moist heat.

UNIT IV (12 hrs)

Poultry, fish and spices: Classification and nutritive value. Processing and preservation. Selection and storage. Methods of cooking poultry and fish cookery. Spoilage of fish. Spices and condiments – Composition, flavouring extracts, adulteration and medicinal values. Processing and uses of major spices – Pepper (white and green), cardamom, ginger and turmeric

REFERENCES

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- Potter NN, Hotchkiss JH (1966) Food Science, 5th Ed., CBS Publisher and Distributors, Delhi

B.Sc. FND II SEMESTER
FNDFNC 183: HUMAN PHYSIOLOGY – II (THEORY)

48 hrs - 4 hrs / week

Course Outcomes:

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

- CO 1. Understand the role played by hormones in metabolism and associated disorders.
- CO 2. Comprehend the structure and function of neuromuscular systems and disorders
- CO 3. Understand excretory physiology and its importance in nutrient retention
- CO 4. Differentiate between male and female reproductive physiology and changes due to pregnancy and lactation.

UNIT I (12 hrs)

Endocrine System: Definition, classification of endocrine glands and their hormones, properties of hormones. Thyroid gland hormones – regulation of secretion. Disorders – hypo and hypersecretion of hormone. Adrenal gland - physiological anatomy. Adrenal cortex, cortical hormones – functions and regulation. Adrenal medulla – hormones, regulation and secretion. Functions of adrenaline and nor-adrenalin. Pituitary hormones – anterior and posterior pituitary hormones, secretion, function. Pancreas – hormones of pancreas. Insulin – secretion, regulation, function and action. Diabetes mellitus – regulation of blood glucose level. Parathyroid gland – function, action, regulation of secretion of parathyroid hormone. Calcitonin – function, action, Ca metabolism and hormone regulating Ca metabolism

UNIT II (12 hrs)

Neuro-muscular system: Vision – function of different parts of eye, light reflex, refractive errors, colour blindness, night blindness, accommodation. Hearing –function of ear, deafness, vestibular apparatus. Taste buds – functions, smell physiology, receptors. Nervous system: Functions of nervous system, neuron structure, classification and properties, neuroglia. Nerve fibre, classification, conduction of impulses, factors affecting conduction. Synapse - structure, types, properties. Receptors - definition, classification, properties. Reflex action - reflex arc, properties of reflex action. Spinal cord nerve tracts - function. Functions of medulla, pons, hypothalamus. Cerebral cortex, lobes and functions, sensory cortex, motor cortex. Cerebellum - functions. Basal ganglia - functions, EEG, Parkinson's disease. Cerebro Spinal Fluid (CSF) - formation, circulation, properties, composition and functions, lumbar puncture, sleep, types of sleep. Muscle nerve physiology: Classification of muscle, structure of skeletal muscle, sarcomere, contractile proteins. Neuromuscular junction, transmission across neuromuscular junction, excitation contraction coupling. Mechanism of muscle contraction muscle tone, fatigue. Rigor mortis, isometric and isotonic contraction. Autonomic nervous system: Sympathetic and parasympathetic distribution and functions.

UNIT III (12 hrs)

Excretory system: Excretory organs - Kidney: function, structural and functional unit - nephrons, vasarecta, cortical and juxtamedullary nephrons - comparison, juxtaglomerular apparatus - structure and function. Renal circulation peculiarities. Mechanism of urine formation – ultrafiltration, criteria for filtration, GFR, plasma fraction, determination of GFR. Selective reabsorption - sites of reabsorption, substance reabsorbed, mechanisms of reabsorption. Tubular secretion, properties and composition of normal urine output. Abnormal constituents of urine. Counter-current mechanisms: micturition, innervations of bladder, cystourethrogram. Diuretics: water, diuretics, osmotic diuretics, artificial kidney, renal function tests

UNIT IV (12 hrs)

Skin - function. Body temperature measurement, physiological variation, regulation of body temperature by physical, chemical and nervous mechanisms. Hypothermia and fever. Reproductive system and puberty. Male reproductive system - functions of testis, spermatogenesis, spermiogenesis - stages, factors influencing semen, endocrine functions of testis. Androgens - Testosterone - structure and functions. Female reproductive system - ovulation, menstrual cycle, physiological changes during pregnancy, pregnancy test. Lactation: Composition of milk factors controlling lactation. Contraception

REFERENCES

- Guyton AC, Hall JE (1996) Textbook of Medical Physiology, 9th Ed., Prism Books Pvt Ltd., Bangalore
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- Sembulingam K, Sembulingam P (2012) Essentials of medical physiology, Jaypee Publ

FNDFNP 184: HUMAN NUTRITION – II PRACTICALS

36 hrs 3 hrs/week

Course Outcomes:

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

- CO 1. Carry out qualitative test for minerals and Vitamins
- CO 2. Prepare ash solutions for nutritive assessments
- CO 3. Assay inorganic ions in foods
- CO 4. Assess Calcium in milk samples

1. Qualitative test for minerals
2. Quantitative estimation of Ascorbic acid using any two different samples
3. Preparation of ash solution
4. Quantitative estimation of Calcium, Phosphorus, Iron using any two different samples
5. Estimation of Calcium from types of milk

FNDFNP 185: FOOD SCIENCE - II – PRACTICALS

36 hrs 3 hrs/week

Course Outcomes:

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

- CO 1. Assess smoking point of fats and oils
- CO 2. Prepare common recipes
- CO 3. Experiment on preparation of different milk, cheese and curd varieties
- CO 4. Develop skills to experiment on different preparations of egg for value added products

1. Fats and oils - Smoking point, Preparation of common recipes
2. Milk cookery - Experimental cookery on milk, Common preparations with milk, cheese and curds
3. Egg cookery - Evaluation of fresh egg. Experimental cookery – boiled egg, poached egg, omelette and custard. Preparation of selected common recipes with milk

FNDFNP 186: HUMAN PHYSIOLOGY – II PRACTICALS

36 hrs - 3 hrs/week

Course Outcomes:

After successful completion of this course, students will have been enabled to:

- CO 1. Estimate bleeding and clotting time of blood
- CO 2. Quantitative assess blood cells
- CO 3. Differentiate between RBCs and WBCs
- CO 4. Develop skills in use of hematological instruments

- 1. Bleeding time
- 2. Clotting time
- 3. Total leucocyte count,
- 4. RBC count
- 5. Differential WBC count
- 6. Instruments used in haematology

ELECTIVE COURSE – b. Providing an expanded scope
B.Sc. FND II SEMESTER
FNDFCE 187: COMMUNITY NUTRITION (THEORY)

24 hrs - 2hrs / week

Course Outcomes:

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

- CO 1. Understand nutritional indicators and agencies involved nationally and globally in improving community nutrition
- CO 2. Identify community nutritional problems with special emphasis on vulnerable sections
- CO 3. Assess nutritional status of a community and recognize the deleterious effects of malnutrition in the development of our nation and means of combating the same.
- CO 4. Differentiate between different methods of assessing nutritional status of the community.

UNIT I (12hr)

Concept of community nutrition and malnutrition. Indicators of malnutrition - Infant mortality rate, Child Mortality. Maternal mortality rate, Birth rate, Death rate. Identification of vulnerable groups - Pregnant women, Nursing mother, Infants, Children with Special emphasis to girl child (including adolescents). Health agencies - FAO, WHO, ICMR, ICDS, ICAR, CSIR, ANP, VHAI, NIN and CFTRI. Role of voluntary health organisation in the improvement of Community health

UNIT II (12hr)

Assessment of Nutritional Status of a community: Anthropometry - Measurement of height, weight, head and chest circumferences, mid upper arm, circumference, skin fold thickness, interpretation of measurements and comparison with standards (NCHS, ICMR), classification according to grades of malnutrition. Biochemical parameters for assessing nutrition status. Clinical signs and symptoms of PEM, mineral and vitamin deficiencies. Diet Surveys and Sampling techniques. Definition, objectives of nutrition education. Methods of imparting nutrition education. Communication for behavioural change, planning, conducting, evaluating the nutrition education programmes Nutritional Intervention programmes to combat malnutrition. Concept of food fortification and food enrichment.

REFERENCES

- Beredict A (1997) Preventive Nutrition – The Comprehension guide to health professionals (Ed.) New Jersey: Humana Press Inc.
- Ebrahim GJ (1983) Nutrition in mother and child health – London Mac Millan and Co.
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- Wadhwa A, Sharma S (2003) Nutrition in the Community, New Delhi: Elite Publ. House Pvt Ltd.

ELECTIVE COURSE – b. Providing an expanded scope

**B.Sc. FND II SEMESTER
FNDFCE 188: FOOD PACKAGING (THEORY)**

24 hrs - 2hrs / week

Course Outcomes:

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

- CO 1. Understand requirements and types of food packaging
- CO 2. Know about recent trends in packaging materials and labeling.
- CO 3. Develop insights into biodegradable and aseptic food packaging
- CO 4. Become skilled in labelling standards and regulations

UNIT I (12hr)

Food packaging Definition, functions of packaging materials for different foods, characteristics of packaging material. Food packages – bags, pouches, wrappers, tetra packs- applications. Packaging materials Packaging materials - Introduction, purpose, requirements, types of containers. Modern packaging materials and forms-Glass containers, metal cans, composite containers, aerosol containers, rigid plastic packages, semi rigid packaging, flexible packaging. Packages of radiation stabilized foods Introduction, rigid containers, flexible containers, general methods for establishing radiation stabilization. Radiation- measurement of radiations.

UNIT II (12hr)

Biodegradable packaging material – biopolymer based edible film. Packages of dehydrated products Orientation, metallization, co-extrusion of multilayer films, stretch, package forms and techniques. Aseptic packaging, retortable containers, modified and controlled atmosphere packaging, skin, shrink and cling film packaging, micro-ovenable containers, other package forms and components of plastics. Packaging of finished goods Weighing, filling, scaling, wrapping, cartooning, labelling, marking and trapping. Labelling: Standards, purpose, description types of labels, labelling regulation barcode, nutrition labelling, health claims, and mandatory labelling provision.

REFERENCES

- Khader V (2001) Text book of food science and technology, ICAR, New Delhi,
- Sacharow S, Griffin RC (1980). Principles of food packaging 2nd Ed. Avi pub Co. Westport.
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ELECTIVE COURSE – b. Providing an expanded scope

B.Sc. FND II SEMESTER

FNDFCE 189: FUNCTIONAL FOODS AND NUTRACEUTICALS (THEORY)

24 hrs - 2hrs / week

Course Outcomes:

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

- CO 1. Understand the health benefits of primary and secondary metabolites
- CO 2. Comprehend the role of nutraceuticals and prioritize their inclusion in menu planning
- CO 3. Understand antioxidants and their role in health management
- CO 4. Assess role of functional foods, pro, pre and syn-biotics

UNIT I (12hr)

Definition, primary metabolites – pigments, sources, classification, functions. Flavor and odor components, pheromones, fatty acids and structural lipids. Secondary metabolites: alkaloids, terpenoids, glycosides, natural phenols – resveratrol. Isoprenoid derivatives. Polyphenols – sources, classification and functions. Action of nutraceuticals: Health benefits of functional ingredients existing in food- dietary fibre, oligosaccharides, sugar alcohols, polyunsaturated fatty acids, peptides and proteins, glycosides, isoprenoids and vitamins, alcohols and phenols, cholines, lactic acid bacteria, minerals and others. Biological effects of commonly used functional foods.

UNIT II (12hr)

Functional Foods: millets, infant formula, fibre rich foods, beverages, herbal foods, probiotic foods – sources and health benefits. Antioxidants: sources, classification and functions; Antioxidant paradox. Definition, characteristics, spectrum of activity, health claim, dosage, safety, and role as functional ingredient with examples of Prebiotics, Probiotics and Synbiotics. Functional dairy foods: Bioactive peptide- definition, sources; probiotic and bioactive peptide based functional foods.

REFERENCES

- Schmidl MK, Labuza TP (2000) Essential of functional Foods Culinary and Hospitality Industry Publications Services
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- Ferguson LR (2013) Nutrigenomics and Nutrigenetics in Functional Foods and Personalized Nutrition, CRC Press Taylor and Francis Group

B.Sc. FND III SEMESTER
FNDFNC 231: LIFE SPAN NUTRITION – I (THEORY)

48 hrs - 4 hrs / week

Course Outcomes:

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

- CO 1. Comprehend the concept of a balanced diet
- CO 2. Understand the role of nutrition in growth and development processes from birth till adolescence
- CO 3. Formulate nutritional needs of people at different stages of growth
- CO 4. Formulate diets for various nutrition-related health conditions

UNIT I (12hr)

Basic principles of meal planning: Explanation of terms: Health, RDA, Adequate intake, Balanced diet. Food exchange list, food guide pyramid. Vegetarian diets - classification of vegetarianism. Quality of various nutrients - proteins, fats, minerals, vitamins, fibres and antioxidants. Principles of planning meals. Factors affecting meal planning

UNIT II (12hr)

Nutrition during infancy: Growth and development. Use of growth chart to monitor development. Advantages of breast feeding. Nutrition factors of human milk. Difference between human and animal milk. Artificial feeding. Factors to be considered in bottle feeding. Feeding problems. Nutritional requirements. Weaning: Need and use. Points to be considered in introducing weaning foods. Problems in weaning. Types of supplementary foods

UNIT III (12hr)

Nutritional needs for children: Pre School - Factors to be considered in planning meals for preschool children. Factors affecting nutritional status. Pica. Dietary guidelines. Nutritional requirements. Diet planning
School children - Meal planning for school children. Feeding problems. School lunch programmes. Factors affecting feeding programmes. Nutritional requirements.

UNIT IV (12hr)

Nutritional needs for adolescents: Special needs for girls during menarche - Food habits. Dietary guidelines. Nutritional problems- obesity, eating disorder, osteoporosis, anaemia, under nutrition, premenstrual syndrome, PCOD. Nutritional requirements.

REFERENCES

- Mahan K L, Escott-Stump S (2012) Krause's Food and the Nutrition Care Process, 13th Ed., Elsevier, Missouri
- Ghosh (1992) The feeding and care of infants and young children, VHAI, 6th Ed., New Delhi
- WHO (1978) A growth chart for international use in maternal and child health care, Geneva
- Gopalan C (1993) Recent trends in nutrition, 9th Ed., Oxford Univ. Press
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- Swaminathan M (1985) Essentials of food and nutrition, Vol I and II, Ganesh and Co, Madras

BSc FND - III Semester
FNDFNC 232: CHEMISTRY – I (THEORY)

48 hrs - 4 hrs / week

Course Outcomes:

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

- CO 1. Understand basic principles, fundamental concepts and unique mechanistic steps involved in chemical and biochemical reactions
- CO 2. Comprehend key concepts of modern analytical methods
- CO 3. Develop skills to handle modern analytical instruments
- CO 4. Know the rapid developments and enormous expansion of every phase of chemistry

UNIT I: (12hr)

Structure and Bonding - Chemical bonding, types of chemical bonds – ionic, covalent, coordinate. Hybridization – sp, sp², sp³, bond length, bond angles, bond energy, van der Waals interactions, Hydrogen bonding – inter and intramolecular and their significance – anomalous properties of water. Solvents - Types of solvents and their characteristics, weak interactions in aqueous solutions, interaction between water and polar solutes, solubility of ionic solids and its dependence on lattice energy and solvation energy. Explanation for solubility of alcohols and sugars in water

UNIT II: (12hr)

Methods of analysis - Qualitative, quantitative volumetry, gravimetry and instrumental methods of analysis. Errors in quantitative analysis, minimization of errors. Accuracy, precision, significant figures, measurement of accuracy – absolute error, relative error, measurement of precision – standard deviation, variance. Viscosity and surface tension - Definition, effect of temperature, determination, applications. Reaction Kinetics - Molecularity and order of reactions, second order reactions, differential integral equations, methods of determining order of a reaction, theories of reaction rates – collision theory and transition state theory, parallel and consecutive reactions with examples

UNIT III: (12hr)

Acids and bases: Arrhenius, Bronsted Lowry, solvent system and Lewis concept of acids and bases. Hard and soft acids and bases. Ionic product of water, common ion effect and applications, pH scale, buffers, buffer capacity, Henderson's equation, preparation of acidic and basic buffers, buffers in biological system – blood plasma, RBC and tissue fluids, theory of acid-base indicators, pH titration curves and isoelectric pH of amino acids. Choice of indicators of acid base titrations. Binary Liquid mixtures - Liquid-liquid mixtures, ideal liquid mixtures, non ideal liquid mixtures. Azeotropes HCl – water, ethanol-water systems. Principle of fractional distillation, partially miscible liquids – phenol water system. Trimethylamine – water and nicotine water systems. Lower and upper consolute temperature. Effect of impurity on consolute temperature, steam distillation – principle and applications.

UNIT IV (12hr)

Introduction to Organic Chemistry - Classification, unique characteristics, IUPAC nomenclature of organic compounds, isomerism. Investigation of organic compounds. Detection and quantitative estimation of elements Nitrogen, Sulphur, Phosphorus and Halogens (problems to be solved). Field effects and reaction intermediates. Resonance, hyper conjugation, aromaticity inductive and field effects, homolytic and heterolytic bond breaking,

electrophiles, nucleophiles, energy consideration, reactive intermediates, carbo – cations, carbanions free radicals, carbenes with examples. Arenes: Structure of benzene, mechanism of nitration and Friedel-Crafts reaction. Electronic interpretation of orienting influence of the substituents in the electrophilic substitution of chlorobenzene, toluene, nitrobenzene and phenol.

REFERENCES

- Soni PL (1988) A textbook of Inorganic chemistry, Sulthan Chand & Sons
- Lee JD (1988) Concise Inorganic Chemistry, Blackwell Science
- Skoog DA, West DM, Holler JF (1993) Fundamentals of Analytical Chemistry, New York CBS Publ.
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- Soni PL (2000) A textbook of Organic chemistry, Sulthan Chand & Sons
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- Vogel AI (1994) Textbook of quantitative chemical analysis, ELBS Ed.
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- Madan RL, Tuli GD (2001) Physical Chemistry, Sulthan Chand & Sons
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- Lehninger AL, Nelson DL, Cox MM (1993) Principles of Bio Chemistry, 2nd Ed. CBS Publ. and Distributors

BSc FND – III Semester FNDFNC 233: DIETETICS – I

48 hrs - 4 hrs / week

Course Outcomes:

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

- CO 1. Know the principles of diet therapy
- CO 2. Understand the modifications of normal diet for therapeutic purposes
- CO 3. Learn the role of a registered dietician
- CO 4. Identify the roles of others who collaborate in delivery of food and nutrition services

UNIT I (12hr)

Concept of therapy and meal planning: Reference man and woman. Balanced diet. Recommended dietary allowances [RDA] and its approaches of assessing nutrient requirements. Objectives of diet therapy. Growth and scope of dietetics. Characteristics and role of dietician. Food prescription.

UNIT II (12hr)

Routine hospital diets: Liquid diet, semi-solid, regular and bland diet. Modification of normal diets. Types of feeding - oral feeding and tube feeding - enteral and parental

UNIT III (12hr)

Diets in obesity and underweight: Obesity - Etiology, assessment, types. Regional distribution of fat in the body. Metabolic changes in obesity. Modification, dietary treatment. Nutritional requirements. Diet management – objectives, macronutrients, micronutrients, general considerations, foods allowed/not allowed. Under weight - Aetiology, Symptoms and complications, Dietary management - objectives, macronutrients, micronutrients, general considerations, foods allowed/not allowed

UNIT IV (12hr)

Diet in infections and febrile conditions: Fever: Development, types and metabolic changes. Acute and chronic fevers. Causes and dietary management of typhoid, influenza, malaria, tuberculosis. Dietary management of all fevers - objectives, macronutrients, micronutrients, general considerations, foods allowed/ not allowed. Chronic infection- HIV (Human Immunodeficiency Virus) infection and AIDS (Acquired Immune Deficiency Syndrome). Stages of HIV infection. Aetiology, diagnosis. Malnutrition and AIDS: Dietary management - objectives, macronutrients, micronutrients, general considerations

FNDFNP 234: LIFE SPAN NUTRITION – I (PRACTICALS)

36 hrs 3 hrs/week

Course Outcomes:

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

- CO 1. Plan, prepare and calculate diets for different age groups from weaning to adolescence
- CO 2. Calculate the major nutrients for balanced nutrition
- CO 3. Differentiate between nutritional needs from weaning to pre-school
- CO 4. Differentiate between nutritional needs from school to adolescence

Planning, preparing and calculating the major nutrients of the following (Two planned diets with different age groups)

1. Weaning
2. Normal diet
3. Infancy
4. Preschool Child
5. School going Child
6. Adolescents

FNDFNP 235: CHEMISTRY - I PRACTICALS

36 hrs - 3 hrs/week

Course Outcomes:

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

- CO 1. Carry out qualitative analysis of organic compounds
- CO 2. Use analytical instruments
- CO 3. Apply the techniques to food analysis
- CO 4. Use these techniques to detect the compounds in different food samples.

Qualitative analysis of organic compounds

1. Urea
2. Benzamide
3. Aniline
4. Acetophenone
5. O-cresol
6. Nitro benzene
7. Chlorobenzene
8. Benzoic acid
9. Resorcinol benzyl alcohol
10. Benzaldehyde

FNDFNP 236: DIETETICS – I PRACTICALS

36 hrs - 3 hrs/week

Course Outcomes:

After successful completion of this course, students will have been enabled to:

- CO 1. Plan fluid diets
- CO 2. Plan diets for metabolism related disorders
- CO 3. Plan diet for febrile conditions
- CO 4. Assess the modifications of normal diet for therapeutic purposes

Planning, preparing and calculating the following diets (Two case studies)

- 1. Fluid diets.
- 2. Obesity.
- 3. Underweight.
- 4. Febrile conditions

REFERENCES

- Anderson L, Dibble MV, Turkki PR, Mitchall HS, Rynbergin HJ (1982) Nutrition in health and disease, 17th Ed., JB Lippincott and Co., Philadelphia
- Antia FP (1973) Clinical dietetics and nutrition, 2nd Ed, Oxford Univ. Press, Delhi
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- Joshi SA, (1992) Nutrition and dietetics, Tata McGraw Hill Publications, New Delhi
- Srilakshmi B (2011) Dietetics, 6th Ed., New Age International Publ., New Delhi

ELECTIVE COURSE – c. Nurturing students proficiency/skill

BSc FND – III Semester

FNDFCE 237: DIET COUNSELLING (THEORY)

24 hrs - 2hrs / week

Course Outcomes:

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

- CO 1. Understand the principles of nutritional or dietary counselling.
- CO 2. Gain knowledge about the arts and skills of a Counsellor.
- CO 3. Apply the use of computers to collate and analyse information.
- CO 4. Demonstrate diet counselling techniques to facilitate behaviour change and lifestyle modification

UNIT I (12hr)

Nutrition counselling - Definition, expectations, goals, scope and limits. Practical consideration in giving dietary advice and counselling - Factors affecting and individual food choice, Communication of dietary advice, Consideration of behaviour modification, motivation
Dietitian – Classification, code of ethics, responsibilities. The Counselling Process - Techniques for obtaining relevant information- Clinical Information, Medical History and General Profile, nutritional assessment,

UNIT II (12hr)

Dietary counselling - Assessing food and nutrient intakes, Lifestyles, physical activity, stress. Implementation - Counselling the client/patient – client concurrence, co-ordination of care plans-the provision of learning experience. Evaluation - Measuring the success of performance of client and evaluating the counselling process. Computer application - Use of computers by dietitian, dietary computations, dietetic management, education/ training, information storage and administration, Research, Execution of software packages. Straight line, frequency table, bar diagram, pie chart, Preparation of dietary charts for patients. Statistical computation- mean, median, standard deviation

REFERENCES

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- Thomas B (1995) Blackwell Manual of Dietetic practice, 2nd Ed., Oxford: New York
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ELECTIVE COURSE – c. Nurturing students proficiency/skill

BSc FND – III Semester

FNDFCE 238: NUTRITIONAL ASSESSMENT AND SURVEILLANCE (THEORY)

24 hrs - 2hrs / week

Course Outcomes:

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

- CO 1. Assess nutritional status using rapid assessment procedures
- CO 2. Use anthropometrics and interpret the same
- CO 3. Develop nutritional assessment and surveillance protocols in the community, carry out data survey and analysis and develop dietary counselling strategies
- CO 4. Perform role of professional dietician

UNIT I (12hr)

Nutritional status assessment and surveillance - Meaning, need, objectives and importance. Community, regional, national and international surveillance systems. Rapid assessment procedures - Need, importance, techniques, interpretation and steps in RAP. Sources of secondary health data - sources of relevant vital statistics, importance of infant, child, maternal mortality rates, and epidemiology of nutrition related disease. Growth chart - Meaning, WHO Chart, and charts used in India, uses, use of growth charts for various age groups. meaning of reference curve and growth curve. Anthropometry: Need, importance, standards for reference, techniques of measuring height, weight, head circumference, chest circumference, mid-arm circumference, skin fold thickness, waist hip ratio, calculation of BMI, interpretation of the measurements

UNIT II (12hr)

Nutritional assessment - Diet Surveys: need, importance, methods, interpretation, concept of conception unit, intra inter individual distribution in the family, verifying the adequacy of the diet with respect to RDA, concept of family food security. Clinical signs, biochemical and biophysical methods: need, importance, identifying signs of deficiency diseases, interpretation of the clinical signs, biochemical and biophysical values in major diseases. Nutritional care process - Medical History assessment. Assessment of patient needs. Dietary counselling - Evaluation of the effectiveness of counselling. Education of the patient and follow up. Role of Dietitian – Professional code and ethics of a dietitian. Problems in feeding children at the hospitals. Psychology of feeding the patient

REFERENCES

- Antia FP (2008) Clinical dietetics and nutrition., Oxford University Press, New Delhi.
- Mahan LK, Escott-Stump S (2000) Krause's Food Nutrition and Diet Therapy 10th Ed., W.B. Saunders Ltd.
- Zeeman FJ (1998) Applications of clinical nutrition. Englewood cliffs: Prentice Hall International Inc.
- Thomas B (1995) Blackwell Manual of Dietetic practise, 2nd Ed., Oxford: New York
- Robinson, (2006) Normal and therapeutic nutrition, Macmillan Pub. Company New York
- Mudambi SR, Rajagopal MV (2015) Fundamental of food, nutrition and diet therapy. New age International Publ., New Delhi,
- Srilakshmi B (2014) Dietetics, New age international Publ.

ELECTIVE COURSE – c. Nurturing students proficiency/skill

BSc FND – III Semester

FNDFCE 239: FOOD SANITATION AND HYGIENE (THEORY)

24 hrs - 2hrs / week

Course Outcomes:

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

- CO 1. Develop insights into various aspects of hygiene and sanitation
- CO 2. Understand requirement for purification of water and standards of water quality
- CO 3. Enumerate the agents and modes of food contamination
- CO 4. Assess the disease outcome of contaminated foods

UNIT I (12hr)

Personal Hygiene & Importance of Water: General principles of food hygiene. Necessity for personal health and Hygiene (Hands and skin, hair, nose, mouth and ears, cuts, boils etc), medical checkup. Habits, Importance of Rest, Exercise and Recreation. Protective Clothing. GMP & GLP and Sanitary aspects of building and equipment. Equipment for personal hygiene. Sources of water, contamination of water. Importance of water and Purification of Water, Different methods of purification, potable water. Water quality standards, Criteria for judging water quality. Sanitary aspects of water supply, water sewage treatment

UNIT – II (12hr)

Food Contamination, Poisonings Food borne diseases: Different Types of contamination - Bacterial, Physical, Chemical Food Poisoning - common types and its symptoms (Salmonella, *Clostridium perfringens*, Botulism, Staphylococcus). Prevention of food poisoning. Cross contamination in food plants. Food Borne Diseases/ Illness - Amoebiasis, Acute diarrhoea /dysentery, Typhoid

REFERENCES

- Johns N (1991) Managing Food Hygiene, Palgrave Macmillan.
- Sprenger RA (2000) The Food Hygiene Handbook, High Field Publication
- Park K (2015) Park Textbook of preventive & social medicine 24th Ed., Banarsidas Bhanot Publ.
- Bedi YP (1977) A handbook of social and preventive medicine, Anand Publ.
- Roday S (2011) Food Hygiene and Sanitation with case studies, 2nd Ed., TATA McGraw Hill Education Pvt. Ltd. New Delhi.

BSc FND – IV Semester
FNDFNC 281: LIFE SPAN NUTRITION – II (THEORY)

48 hrs - 4 hrs / week

Course Outcomes:

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

- CO 1. Understand the process of growth and development and the concept of growth promotion
- CO 2. Comprehend nutritional needs at different stages of growth.
- CO 3. Evaluate nutritional needs during pregnancy and lactation
- CO 4. Apply nutritional requirements for the aged taking their physiology into account

UNIT I (12hr)

Nutritional needs of adults: Reference man and reference woman in relation to occupation. Dietary guidelines to reduce the cost of a meal. Nutritional requirements.

UNIT II (12hr)

Nutrition during pregnancy: Normal growth and weight gain. Physiological changes. Dietary modifications. General dietary problems. Complications during various stages of pregnancy. Nutritional requirements. Diet planning

UNIT III (12hr)

Nutritional needs during lactation: Physiology of lactation. Milk output and factors affecting it. Dietary guidelines. Nutritional requirements. Diet planning

UNIT IV (12hr)

Nutritional needs during old age: Physiological changes, RDA, Nutritional guidelines, nutritional, health concerns & complications and their management. Dietary modifications. Factors contributing to longevity

REFERENCES

- Ghosh (1992) The feeding and care of infants and young children, VHAI, 6th Ed., New Delhi
- WHO (1978) A growth chart for international use in maternal and child health care, Geneva
- Gopalan C (1993) Recent trends in nutrition, 9th Ed., Oxford Univ. Press
- McLaren DS, Meguid MM (1998) Nutrition and its disorders, Churchill Livingstone
- Swaminathan M (1985) Essentials of food and nutrition, Vol I and II, Ganesh and Co, Madras
- Srilakshmi B (2011) Dietetics, 6th Ed., New Age International Publ., New Delhi

BSc FND – IV Semester
FNDFNC 282: CHEMISTRY – II (THEORY)

48 hrs - 4 hrs / week

Course Outcomes:

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

- CO 1. Comprehend basic principles, fundamental concepts and unique mechanistic steps involved in chemical and biochemical reactions
- CO 2. Understand key concepts of modern analytical methods
- CO 3. Be equipped to handle the modern analytical instruments
- CO 4. Update knowledge based on rapid developments and enormous expansion of every phase of chemistry

UNIT I (12hr)

Bioinorganic Chemistry - Essential and trace elements in biological systems, functions of Sodium, Potassium, Calcium, Magnesium. Importance of compounds of Sulphur and Selenium in biological system. Toxicity of lead, mercury, cadmium and arsenic. Importance of phosphorus and nitrogen compounds in biological systems. Nitrogen and phosphorus cycles. Metal ions in Biological systems: Examples of naturally occurring complex compounds in living systems. Role of Iron in Hemoglobin, myoglobin and cytochromes, copper in hemocyanin, magnesium in chlorophyll, cobalt in Vitamin B12, molybdenum in nitrogenase, metalloenzymes – example and importance

UNIT II (12hr)

Adsorption: Types, Freundlich adsorption isotherm, Langmuir's adsorption isotherm applications of adsorption, adsorption indicators in precipitation titrations. Colloidal State: Solids in liquids (sols), properties, kinetic optical and electrical, stability of colloids, protective action, Hardy Schulze law, Gold number, Liquids in liquids (emulsions), Types of emulsions, preparation, emulsifiers. Liquids in solids (gels). Classification, preparation and properties, Inhibition of gels – general applications of colloids. Radio chemistry: Nuclear stability, n/p ratio, Natural radioactivity, characteristics of radioactive elements, radioactive decay series, artificial transmutation using protons, neutrons, deuterons, induced radio activity, disintegration constant, half life. Radiation dosimetry. Fricke and Ferric sulphate dosimeter. Application of radio isotopes in medicine, agriculture and study of reaction mechanism and ^{14}C dating. Biological effects of radiation, safety measurements in handling radio isotopes

UNIT III (12hr)

Photochemistry: Laws of photochemistry – Grothus and Draper law, Einstein's law of photochemical equivalence, quantum efficiency, high and low quantum efficiency, photosensitization, photoinhibition, fluorescence, phosphorescence, chemiluminescence, bioluminescence with examples, photosynthesis. Techniques: Lambert's law, Beer's law, Beer-Lambert's law, molar absorption, molar extinction coefficient, transmittance and absorbance, their relationship, colorimeter, UV-Vis spectroscopy - instrumentation, working, applications. Flame photometry – instrumentation, working, applications

UNIT IV (12hr)

Alkenes: Preparation of alkenes: Chemical reactions of alkenes: oxidation, ozonolysis, hydration, hydroxylation, polymerization, addition of HBr to propene, Markownikoff's rule. Dienes: Classification, types with examples, butadiene, methods of preparation. Chemical reactions, mechanism of addition of Br_2 and HBr. Polymerization, Diels alder reaction Alkynes: Acidity of alkynes, ozonolysis, polymerization. Alkyl halides: SN_1 and SN_2 reactions. Mechanism with one example for each. Concept of elimination reactions. E_1 and E_2 mechanisms.

REFERENCES

- Soni PL (1988) A textbook of Inorganic chemistry, Sulthan Chand & Sons
- Lee JD (1988) Concise Inorganic Chemistry, Blackwell Science
- Skoog DA, West DM, Holler JF (1993) Fundamentals of Analytical Chemistry, New York CBS Publ.
- Gurudeep Raj (2001) A text book of Inorganic chemistry, Goel Publ. house, Meerut
- Soni PL (2000) A textbook of Organic chemistry, Sulthan Chand & Sons
- Bahl A, Bahl BS (2000) Advanced organic chemistry, Sulthan Chand & Sons

- Vogel AI (1994) Textbook of quantitative chemical analysis, ELBS Ed.
- Agarwal OP (1998) Chemistry of natural products, Goel Sulthan Chand & Sons Publ. House, Meerut
- Madan RL, Tuli GD (2001) Physical Chemistry, Sulthan Chand & Sons
- Raj Gurudeep (2001) Textbook of advanced Physical chemistry, Goel Publ. House, Meerut
- Lehninger AL, Nelson DL, Cox MM (1993) Principles of Bio Chemistry, 2nd Ed. CBS Publ., and distributors

BSc FND – IV Semester
FNDFNC 283: DIETETICS – II (THEORY)

48 hrs - 4 hrs / week

Course Outcomes:

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

- CO 1. Understand the principles of diet therapy for various ailments and diseases
- CO 2. Work out the modifications of normal diet for therapeutic purposes
- CO 3. Assess food allergies, intolerance and nutrient-drug interactions for appropriate dietetics approaches
- CO 4. Evaluate nutritional requirements for deficiencies and develop suitable dietary treatments

UNIT I (12hr)

Diet in burns injury and surgery conditions: Burns- definition, classification, complications: Dietary management - objectives, macronutrients, micronutrients, general considerations. Injury/ Trauma- definition. Metabolic, physiological and hormonal response to Injury: Dietary management - objectives, macronutrients, micronutrients, general considerations. Surgery- definition. Metabolic, physiological and hormonal response to surgery: Dietary management - objectives, preoperative and postoperative nutritional care, macronutrients, micronutrients, general considerations

UNIT II (12hr)

Gastro-intestinal tract ailments: Diarrhoea- definition, classification, consequences. Treatment of diarrhoea- Fluid management- Oral Rehydration Therapy (ORT). Dietary management - objectives, macronutrients, micronutrients, general considerations, low residue and low fiber foods. Definition, symptoms, classification, complications and dietary management - objectives, macronutrients, micronutrients, general considerations, foods allowed and not allowed for the following: Constipation, Gastro Oesophageal Reflux Disease (GERD), Gastritis- acute and chronic, Peptic ulcer, Irritable bowel syndrome, Steatorrhoea, Ulcerative colitis, Diverticulosis.

UNIT III (12hr)

Food Allergy: Definition, types of allergy, common food as allergens. Signs and Symptoms, tests for allergy. Dietetic treatment. Food intolerance: Definition, causative factors, diagnosis, treatment – elimination diet. Lactose intolerance symptoms, causative foods and stages according to severity, foods included and excluded, nutrition treatment. Gluten intolerance – symptoms, dietary treatment, foods included and excluded, nutritional treatment. Nutrient- drug interaction

UNIT IV (12hr)

Nutritional deficiency: Protein – energy malnutrition- aetiology, types, symptoms, dietary treatment and prevention, hospital treatment, domiciliary rehabilitation. Aetiology, clinical features, dietary treatment and prevention, prophylaxis programmes of the following: Iodine Deficiency disease and Vitamin A deficiency. Nutritional Anaemia - Aetiology, clinical features, types, dietary treatment and prevention of the following: Iron deficiency Anaemia / Disorder (IDD), Megaloblastic Anaemia, Folate Deficiency, Pernicious Anaemia

REFERENCES

- Anderson L, Dibble MV, Turkki PR, Mitchall HS, Rynbergin HJ (1982): Nutrition in health and disease, 17th Ed., JB Lippincott and Co., Philadelphia
- Antia FP (1973) Clinical dietetics and nutrition, 2nd Ed., Oxford Univ. Press, Delhi
- Williams SR (1989) Nutrition and diet therapy, 6th Ed., Time, Mirror, Mosby College Publ. St Louis
- Raheen Begun (1989) A textbook of foods, nutrition and dietetics, Sterling Publ., New Delhi
- Joshi SA, (1992) Nutrition and dietetics, Tata McGraw Hill Publications, New Delhi
- Srilakshmi B (2011) Dietetics, 6th Ed, New Age International Publ., New Delhi
- Mahan LK, Arlin MT (1992) Krause's Food, Nutrition and Diet Therapy, 8th Ed., W.B Saunders Company, London
- Robinson CH, Lawler MR, Chenoweth WL, Garwick AE (1986) Normal and therapeutic nutrition, 17th Ed, Macmillan Publ and Co.

FNDFNP 284: LIFE SPAN NUTRITION - II – PRACTICALS

36 hrs 3 hrs/week

Course Outcomes:

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

- CO 1. Plan, prepare and calculate major nutrients in diets
- CO 2. Understand the role of nutrition in growth and development processes from adult hood to old age
- CO 3. Formulate nutritional needs of people at different stages of growth
- CO 4. Formulate diets for pregnancy and lactation stages

Planning, preparing diets and calculating the major nutrients of following (Standard with two planned diets of different calories and activities)

1. Adult
2. Pregnancy
3. Lactation
4. Old age

FNDFNP 285: CHEMISTRY – II PRACTICALS

36 hrs 3 hrs/week

Course Outcomes:

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

- CO 1. Use analytical balance
- CO 2. Calibrate a pipette
- CO 3. Prepare standard solutions for volumetric analysis
- CO 4. Estimate Vitamin C, Glucose and Amino acid

Volumetric analysis

1. Use of analytical balance and calibration of pipette
2. Preparation of standard Sodium carbonate solution and estimation in the given solution
3. Preparation of standard Oxalic acid solution. Standardization of NaOH and estimation of H_2SO_4 in the given solution (Phenolphthalein)
4. Preparation of standard Oxalic acid solution. Standardization of KMnO_4 and estimation of H_2O_2 in the given solution
5. Preparation of $\text{K}_2\text{Cr}_2\text{O}_7$. Standardization of $\text{Na}_2\text{S}_2\text{C}_3$ and estimation of CuSO_4 in the given solution (starch)
6. Preparation of ZnSO_4 . Standardization of EDTA and estimation of total hardness of water using Erichrome black T indicator
7. Preparation of $\text{K}_2\text{Cr}_2\text{O}_7$ solution. Estimation of Ferrous/Ferric ions in a mixture using diphenylamine indicator
8. Preparation of standard potassium bisulphate. Standardization of NaOH and estimation of HCl in the given solution (Phenolphthalein)
9. Estimation of alkali content in antacid tablet by using HCl
10. Estimation of Vitamin C
11. Estimation of Glucose
12. Estimation of amino acid

FNDFNP 286: DIETETICS - II – PRACTICALS

36 hrs 3 hrs/week

Course Outcomes:

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

- CO 1. Plan diet for burns cases
- CO 2. Plan diets for digestive-system related disorders
- CO 3. Plan diet for deficient conditions
- CO 4. Assess the modifications of normal diet for therapeutic purposes

Planning, preparing and serving the following diets (two case studies)

1. Burns
2. Constipation
3. Peptic ulcer
4. Protein – deficiency
5. Iron – deficiency
6. Vitamin A deficiency

ELECTIVE COURSE – d. Enabling an exposure to some other discipline/ domain

BSc FND – IV Semester

FNDFOE 287: FOOD FOR HEALTH (THEORY)

24 hrs - 2hrs / week

Course Outcomes:

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

- CO 1. Enumerate the composition of foods.
- CO 2. Understand the effects of cooking on nutritive value of cereals
- CO 3. Evaluate the best method of cooking to prevent loss of nutrients
- CO 4. Classify fruits, vegetables based on nutritive value and assess methods of cooking and loss of nutritive value

UNIT – I (12hr)

Introduction to Food Science- Functions of food; food guide based on basic five food groups, cooking – objectives and methods. Cereals- Composition and nutritive value of rice and wheat. Best method of cooking, loss of nutrients during cooking; Advantages of par boiling. Pulses - Composition, nutritive value, best method of cooking, loss of nutrients during cooking, germination and its advantages.

UNIT – II (12hr)

Vegetables – Classification, nutritive value, loss of nutrients during cooking and methods of reducing nutrient loss during cooking. Fruits- Classification, nutritive value and changes during ripening. Fleshy foods- Meat, fish, egg and milk: Nutritive value.

REFERENCES

- Mudambi SR, Rao SM, Rajagopal MV (2006) Food Science, 2nd Ed., New Age International Pvt. Ltd. Publ., New Delhi
- Swaminathan N (1992) Food Science and Experimental foods, The Bangalore printing and Publ. Co. Ltd. Bangalore,
- Srilakshmi B (2006) Food Science, New Age International Pvt. Ltd, New Delhi, Reprint
- Manay SN, Shadaksharaswamy M (2005) Foods - Facts and Principles. 2nd Ed., New Age International (P) Ltd, New Delhi

ELECTIVE COURSE – d. Enabling an exposure to some other discipline/ domain

BSc FND – IV Semester

FNDFOE 288: PUBLIC HEALTH NUTRITION (THEORY)

24 hrs - 2hrs / week

Course Outcomes:

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

- CO 1. Understand the importance of public nutrition.
- CO 2. Enumerate the various national and international agencies involved in combating malnutrition and their importance
- CO 3. Assess programs targeted to improve the nutritional status of the public.
- CO 4. Describe diseases associated with under nutrition and preventive measures in cases of food contamination and poisoning

UNIT-I (12hr)

Definition of public health nutrition and health promotion; public health nutrition cycle; public health approaches- socio ecological approach, life style approach and biological approach.

Assessment of nutritional status in individuals and population. Assessment of physical activity. Nutrition related policies and programs: Health, nutrition and family welfare through XIIth five-year plan; ICDS- objectives and services; Public Distribution System; Annyodaya Anna Yojana; National Food Security Act; National Food for Work Program. National and international agencies in combating malnutrition: International- WHO, FAO, UNICEF Aim and functions. National - ICAR, ICMR, NIN, NFI, FNB, CFTRI, NNMB, NSI, DFRL- Aims and functions.

UNIT-II (12hr)

Communicable and non-communicable disease- causes, modes of transmission and preventive measures (general only). Immunization: Importance and Immunization schedule for children and adults. Public health aspects of over and under nutrition: BMI criteria by WHO; Obesity as a determinant of mortality and morbidity; under nutrition - definitions, clinical syndromes and public health consequences of under nutrition. General idea about the contamination of food (Chemical and microbial) - Sources and transmission, Elementary ideas about food toxins, aflatoxin & food toxicology with reference to Lead, Cadmium & Zinc. Contamination of water and prevention of contamination, different methods of water purification, water-borne diseases, elementary idea of microbiology of water-borne pathogens, diarrhoea, dysentery, typhoid, hepatitis, preventive measures and dietary management of such diseases.

REFERENCES

- Gibney MJ, Margetts BM, Kearney JM, Arab L (2005) Public health nutrition, Blackwell.
- Lawrence M, Worsley T (2008) Public health nutrition from principles to practice, Chennai microprint (P) Ltd., Chennai.
- Srilakshmi B (2016) Nutrition science, 5th Ed., New age international (P) limited.
- Park K (1997) Text book of preventive and social medicine, Banarsidas Bhanot Publ. Jabalpur

ELECTIVE COURSE – d. Enabling an exposure to some other discipline/ domain

BSc FND – IV Semester

FNDFOE 289: LIFE STYLE DISORDERS (THEORY)

24 hrs - 2hrs / week

Course Outcomes:

After successful completion of this course, students will have been enabled to:

- CO 1. Identify and describe lifestyle related diseases
- CO 2. Differentiate between controllable risk factors and uncontrollable risk factors for lifestyle diseases.
- CO 3. Understand the importance of physical activity in managing lifestyle diseases
- CO 4. Formulate special diets for cardiovascular conditions

UNIT – I (12hr)

Obesity - Aetiology, Theories, Assessment complications - Principles and Dietary Modifications. Obesity and physical activity. Diabetes Mellitus - Prevalence, Etiology, Symptoms, complications, Diagnosis, Management

UNIT – II (12hr)

Atherosclerosis: Causes, Role of fat in the development of atherosclerosis, risk factors, Dietary guidelines and Management, Principles of diet, Importance of functional foods in management. Hypertension - Causes, types, Symptoms, Dietary Management with Principles of Diet - DASH

Diet, importance of minerals and foods exclusion.

REFERENCES

- Mahan LM, Sylvia ES (2004) Krause's Food Nutrition and Diet Therapy, 11th Ed., Saunders, Elsevier
- Shils ME, Shike MS, Ross AC, Cabarellero B, Cousins RJ. (Eds.) (2005) Modern Nutrition in health and disease – 10th Ed., Lippincott Williams and Wilkins
- Srilakshmi B (2011) Dietetics, 6th Ed., New Age International Ltd., New Delhi
- Robinson CH, Lawler MR, Chenoweth WL, Garwick AE (1986) Normal and therapeutic nutrition, 17th Ed., Macmillan Publ. Co.

BSc FND – V Semester
FNDFNC 331: NUTRITIONAL BIOCHEMISTRY I (THEORY)

36 hrs - 3 hrs/week

Course Outcomes:

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

- CO 1. Understand the principles of biochemistry (as applicable to human nutrition).
- CO 2. Obtain an insight into the chemistry of major nutrients and physiologically important compounds.
- CO 3. Comprehend the biological processes and systems as applicable to human nutrition.
- CO 4. Apply the knowledge acquired to human nutrition and dietetics

UNIT I (9 hrs)

Carbohydrates: Nomenclature, Classification of carbohydrates – monosaccharides, oligosaccharides, polysaccharides – examples and structure. Metabolism – Glycolysis, TCA cycle, HMP Shunt, Glycogenesis, Glycogenolysis. Carbohydrate digestion and absorption. Importance of carbohydrates.

UNIT II (9 hrs)

Lipids: Nomenclature, Classification of simple lipids – fats, oils, waxes. Complex lipids – phospholipids, glycolipids. Derived lipids – steroids, terpenes, carotenoids with examples, structure and function. Digestion and absorption. Fatty acids – classification – essential and non-essential fatty acids, examples, properties, functions. Metabolism – β -oxidation of saturated fatty acids. Biosynthesis and catabolism of cholesterol

UNIT III (9 hrs)

Biological oxidation and enzymes: Compounds of ETC, mechanism, oxidative phosphorylation, high energy phosphate – ATP-ADP cycle and energy conservation.

UNIT IV (9 hrs)

Enzymes: Definition, nomenclature, types and classification of enzymes. Active site. Definition, types of coenzymes, specificity of enzymes. Isoenzymes, enzyme kinetics, factors affecting velocity of enzymes catalysed reactions. Regulation of enzyme activity, enzyme inhibition

REFERENCES

- West ES, Todd WR, Mason HS, Van Bruggen JT (1974) Text book of Biochemistry, 4th Ed., Amerind Publ. Co. Pvt. Ltd.,
- Lehninger AL, Nelson DL, Cox MM (1993) Principles of Bio Chemistry, 2nd Ed., CBS Publ., and distributors.
- Devlin TM (1986) Textbook of Biochemistry with clinical correlations, 2nd Ed., John Wiley & Sons.
- Stryer L (1995) Biochemistry, Freeman WH and Co.
- Jain JL (2012), Fundamentals of Biochemistry, S. Chand and Company Ltd.

BSc FND – V Semester
FNDFNC 332: QUALITY CONTROL (THEORY)

36 hrs - 3 hrs / week

Course Outcomes:

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

- CO 1. Understand international and national food laws, regulations and standards governing the safety of the food from field to fork
- CO 2. Able to locate and interpret government regulations regarding the manufacture and sale of food products.
- CO 3. Describe the use of adulterants added to foods
- CO 4. Discuss the application of biotechnological techniques and evaluate packaging requirements of diverse foods

UNIT I (9 hrs)

Food Laws: PFA - Mode of work and duties of food inspectors. Essential commodities act: fruit product order, milk and milk product order, meat product order, cold storage order, the vegetable oil product order, standard and weight measurement act, the infant milk substitute, feeding bottles and infant food act.

UNIT II (9 hrs)

Food standards: ISI, AGMARK, Export inspection council, consumer protection act, CODEX Alimentarius, FSSAI. HACCP - Importance. Principles. Determination of CCP. Problems in implementing HACCP. Importance of TQM, GMP and GLP

UNIT III (9 hrs)

Adulteration of food: Definition. Types. Contamination of food by incidental adulteration by microorganisms, packing materials and other sources. Tests to detect common adulterants

UNIT IV (9 hrs)

Food technology: Biotechnology in food: Application, GM foods. Nutraceuticals. Organic foods. Packaging of foods: Classification, types of packaging materials – paper, plastics, glass, tins and metals, packaging of different food products – bakery, dairy, dehydrated, fresh fruits and vegetables, fats and oils, frozen food products

REFERENCES

- Keister DC (1977) Food and beverage control, Prentice Hall Inc, New Jersey
- Coltman MM (1977) Food and beverage cost control, Prentice Hall Inc, New Jersey
- Kotas R (1973) An approach to food costing, Nelson Thornes, London
- Ranjanna S (1985) Handbook of analysis and quality control for fruit and vegetable products
- Martin EH (1986) Standard methods for the examination of dairy products
- Lees R (1978) Food analysis, analytical and quality control methods for food manufacturers and buyers

BSc FND – V Semester
FNDFNC 333: CHEMISTRY – III (THEORY)

36 hrs - 3 hrs / week

Course Outcomes:

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

- CO 1. Understand basic principles, fundamental concepts and unique mechanistic steps involved in chemical and biochemical reactions
- CO 2. Comprehend key concepts of modern analytical methods
- CO 3. Handle the modern analytical instruments
- CO 4. Apply rapid developments in organic chemistry to food.

UNIT I (9 hrs)

Co-ordination Compounds: Transition metals, properties (colour, oxidation states, magnetic properties, catalytic properties, complexation tendency). Double and complex salts - differences with examples. Postulates of Werner's theory (to be illustrated using Cobalt amine complexes). Types of ligands - uni, bi, poly-dentate, ambidentate with examples, coordination number, stability of complexes, factors influencing stability of complexes, Valence bond theory, structure and magnetic properties of some complexes. Applications of complex formation, metal complexes as therapeutic agents - Platinum, gold, copper complexes. Organometallic Chemistry - Definition, nomenclature and classification, preparation, properties, bonding and applications of alkyls and aryls of Li, Hg, and Al, metal carbonyls and nature of bonding

UNIT II (9 hrs)

Dilute solutions: Dilute solutions and colligative properties. Ideal and non-ideal solutions, methods of expressing concentrations of solutions. Colligative properties, osmotic pressure and its measurement by Berkley and Hartley's method. Laws of osmotic pressure. Importance of osmotic pressure on living cells - hypotonic, hypertonic, isotonic solutions. Donnan membrane equilibrium, Raoult's law, relative lowering of vapour pressure. Molecular weight determination from osmotic pressure and relative lowering of vapour pressure. Elevation of boiling point, depression in freezing point, experimental methods for determining various colligative properties. Vant Hoff's factor. Abnormal molecular weight.

UNIT III (9 hrs)

Alcohols: Classification, monohydric alcohols – general reactions, distinguishing reaction for 1,2 and 3 alcohols. Dihydric alcohols – Glycol preparation reactions and uses. Trihydric alcohols: Glycerol, synthesis, reactions, uses. Phenols: Acidity of phenols, effects of substituents on acidity on phenols. Reactivity of phenols towards electrophiles, uses. Carbonyl compounds: Synthesis of aldehydes and ketones. Structure, reactivity and properties of carbonyl group, nucleophilic addition reactions, aldol condensation, Perkins reaction, Cannizzaro reaction (mechanism).

UNIT IV (9 hrs)

Carboxylic acids: Synthesis of monocarboxylic acids, acidity of carboxylic acids, effect of substituents on acidity of carboxylic acids - Hydroxy acids and dicarboxylic acids: Structure, preparation and properties of lactic acid, tartaric acid, citric acid, Succinic acid, maleic acid, fumaric acid, Pyruvic acid, alpha ketoglutaric acid, oxaloacetic acid. Effects of heat and aliphatic and aromatic amines, separation of primary, secondary and tertiary amines and structural features affecting basicity of amines. Reactions, acylation with HNO₂ and Schiff's base formation. Distinguishing reactions of primary, secondary and tertiary amines dehydrating

agents on hydroxy acids. Amines: Classification, properties, synthesis of aliphatic and aromatic amines, separation of primary, secondary and tertiary amines and structural features affecting basicity of amines. Reactions, acylation with HNO₂ and Schiff's base formation. Distinguishing reactions of primary, secondary and tertiary amines.

REFERENCES

- Soni PL (1988) A textbook of Inorganic chemistry, Sulthan Chand & Sons
- Lee JD (1988) Concise Inorganic Chemistry, Blackwell Science
- Skoog DA, West DM, Holler JF (1993) Fundamentals of Analytical Chemistry, New York CBS Publ.
- Gurudeep Raj (2001) A text book of Inorganic chemistry, Goel Publ. house, Meerut
- Soni PL (2000) A textbook of Organic chemistry, Sulthan Chand & Sons
- Bahl A and Bahl BS (2000) Advanced organic chemistry, Sulthan Chand & Sons
- Vogel AI (1994) Textbook of quantitative chemical analysis, ELBS Ed.
- Agarwal OP (1998) Chemistry of natural products, Goel Sulthan Chand & Sons Publ. House, Meerut
- Madan RL, Tuli GD (2001) Physical Chemistry, Sulthan Chand & Sons
- Raj Gurudeep (2001) Textbook of advanced Physical chemistry, Goel Publ. House, Meerut
- Lehninger AL, Nelson DL, Cox MM (1993) Principles of Bio Chemistry, 2nd Ed., CBS Publ., and distributors

BSc FND – V Semester

FNDFNC 334: THERAPEUTIC NUTRITION – I (THEORY)

36 hrs - 3 hrs / week

Course Outcomes:

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

- CO 1. Understand the role of the dietician in preventive, promotive and curative health care
- CO 2. Appropriate dietary modification for various disease conditions based on physiology
- CO 3. Interpret the role of the dietician through dietary management in disorders associated with pancreas, liver and gall bladder.
- CO 4. Assay the role of dietician through dietary management in kidney dysfunction

UNIT I (9 hrs)

Definition of metabolic disorders. Definition of Diabetes mellitus. Classification and types – IDDM, NIDDM, Gestational Diabetes and MRDM, impaired Glucose tolerance (IGT), Prediabetes, MODY. Insulin resistance. Aetiology and symptoms. Diagnosis tests – Urinary sugar test, Glycosuria, Ketonuria RBS, OGTT, Glycosylated Hemoglobin test (HbA_{1c}). Metabolism. Complications in diabetes - Acute complication, hypoglycaemia, hyperglycaemia, ketoacidosis; Chronic complications –heart disease, diabetic retinopathy, diabetic nephropathy, diabetic neuropathy, infections and wound healing. Treatment – biochemical criteria: urine sugar testing and blood glucose monitoring. Drug therapy –commonly used hypoglycaemic drugs, Insulin and its types. Management of diet in Diabetes – objectives, factors to be considered for planning diabetic diet, macronutrients, micronutrients, dietary fiber, foods permitted/avoided. Glycemia index (GI): definition, formula for GI, factors affecting GI, glycaemic indices of some common foods, Glycaemic load. Special concerns – alcohol, hypoglycaemia, illness or sick days, travel, eating out, stress. Diabetes and physical activity. Artificial sweeteners – low calorie sweeteners and non-calorie sweeteners. Dietary guidelines

UNIT II (9 hrs)

Functions of liver. Agents responsible for liver damage. Damage caused to the liver. Malnutrition in liver disease. Infective hepatitis: definition, viruses responsible for hepatitis, aetiology for acute and chronic hepatitis. Dietary management – objectives, macronutrients, micronutrients, general considerations, foods allowed/not allowed. Cirrhosis of liver. Definition, aetiology, symptoms. Pathogenesis of alcoholic liver disease (ALD). Complications – ascites, portal hypertension, oesophageal varices, hepatic coma: Dietary management – objectives, macronutrients, micronutrients, general considerations, foods allowed/not allowed. Hepatic coma – Definition, aetiology, symptoms. Clinical stages: Dietary management – objectives and recommendations.

UNIT III (9 hrs)

Gall bladder diseases: terms – cholestasis, cholelithiasis, cholecystitis, cholecystectomy, biliary sludge. Functions of gall bladder. Cholecystitis – definition, types – acute and chronic phases, risk factors. Types of gallstones – Cholesterol stones, pigment stones and mixed stones. Dietary management – objectives, macronutrients, micronutrients, general considerations, foods allowed/not allowed. Pancreatitis – definition, clinical features. Acute pancreatitis – aetiology, symptoms, complications and dietary management. Chronic pancreatitis – aetiology, symptoms, dietary management, special considerations and guidelines.

UNIT IV (9 hrs)

Functions of the kidney. Glomerulonephritis (Nephritis) – acute and chronic: definitions, causes, symptoms and metabolic changes. Dietary management – objectives, macronutrients, micronutrients, general considerations, foods allowed/not allowed. Renal failure – acute and chronic – definition, causes, symptoms and metabolic changes. Dietary management – objectives, macronutrients, micronutrients, general considerations, foods allowed/not allowed. Nephrotic syndrome – definition, symptoms, metabolic changes. Dietary management – objectives, macronutrients, micronutrients, general considerations, foods allowed/not allowed. Urolithiasis (Kidney stones / uremia) – definition, causes, symptoms, types of kidney stones. Dietary management – objectives, macronutrients, micronutrients, general considerations, foods allowed/not allowed. Dialysis – definition, types of dialysis. Dietary management – objectives, macronutrients, micronutrients, general considerations, foods allowed/not allowed.

REFERENCES

- Anderson L, Dibble MV, Turkki PR, Mitchall HS, Rynbergin HJ (1982): Nutrition in health and disease, 17th Ed., JB Lippincott and Co., Philadelphia
- Antia FP (1973) Clinical dietetics and nutrition, 2nd Ed., Oxford Univ. Press, Delhi
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- Raheen Begum (1989) A textbook of foods, nutrition and dietetics, Sterling Publ., New Delhi
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- Srilakshmi B (2011) Dietetics, 6th Ed., New Age International Publ., New Delhi

BSc FND – V Semester

FNDFNC 335: FOOD MICROBIOLOGY – I (THEORY)

36 hrs - 3 hrs / week

Course Outcomes:

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

- CO 1. Understand the nature of microorganisms involved in food - spoilage, food infections and intoxication
- CO 2. Comprehend the significance of microorganisms and methods used in food industry to sterilize
- CO 3. Discuss the relevance of bacteria in food and understand life cycle of viruses
- CO 4. Appreciate the importance of yeast and the problem of molds in food.

UNIT I (9 hrs)

Definition and history of microbiology - Contributions of Antonie van Leewenhoek, Louis Pasteur, Lazzaro Spallanzani, Robert Koch, Joseph Lister, Edward Jenner, Alexander Fleming, MW Beijerinck and Dmitri Ivanowsky to the development of microbiology. Culture media used in the isolation and culturing of microorganisms. The common nutrient requirement for bacteria - macro and micronutrients.

UNIT II (9 hrs)

Instrumentation in microbiology - Construction and working principles of autoclave, hot air oven, pH meter, laminar air flow, incubator, bacterial colony counter, spectrophotometer and membrane filter unit. Sterilization - Physical methods - heat, irradiation, filtration, solarisation, ultrasonic vibration. Chemical methods - alcohol, aldehydes, dyes, halogens, phenols, metallic salts, surface active agents, gases

UNIT III (9 hrs)

Bacteria - classification according to Bergey's manual upto levels of section, ultrastructure, reproduction - asexual and sexual methods, importance of bacteria in food. Viruses - structure and classification - plant, animal, bacterial and cyanophycean viruses, life cycle in virus - lytic and lysogenic cycle.

UNIT IV (9 hrs)

Yeast - morphology, reproduction - haplobiontic, diplobiontic and haplodiplobiontic cycle, physiology and nutrition in yeast. Importance of yeast in food. Mold - outlines of classification and reproduction - asexual and sexual modes. Type study of *Aspergillus*, *Penicillium*, *Rhizopus* and *Mucor*. Importance of molds in food.

REFERENCES

- Frazier WC, Westoff DC (1998), Food Microbiology 4th Ed., Tata Mc Graw Hill Publ. Co. Ltd.
- Jay J M (1986) Modern Food microbiology, 3rd Ed., Van No Strand Reinhold Co. Inc.
- Pelezer ML, Reid RD (1978) Microbiology, McGraw Hill Book Co., New York
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BSc FND – V Semester FNDFNC 336: FOOD PRESERVATION – I (THEORY)

36 hrs - 3 hrs / week

Course Outcomes:

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

- CO 1. Understand the basic concepts, principles, methods and parameters of food preservation
- CO 2. Describe the types and variety of foods based on spoilage and factors that favour the growth of microbes

- CO 3. Differentiate between the various preservation techniques based on food type
CO 4. Evaluate factors affecting preservation and effects on food quality

UNIT I (9 hrs)

Definition, Importance of food preservation. Causes of food spoilage - microorganisms, enzymes, insects, parasites and rodents, environmental factors and measures to control them. Classification of food by ease of spoilage. General principles of food preservation. Methods of food preservation - asepsis (keeping out of microorganisms), maintenance of aseptic condition, removal of microorganisms - clarification, filtration, centrifugation, thermal processing (blanching, pasteurization, sterilization and microbial death time), food drying and dehydration, cooling and freezing, food preservation using chemicals, irradiation and other emerging techniques (CAP, MAP, genetic engineering). Classification of food for processing.

UNIT II (9 hrs)

Preservation with high concentrations: Concept of food concentration. Sugar concentrates - general principles. Methods of preparation of jam, jellies and marmalade, tests of doneness, problems in jam and jelly preparation. Theory of gel formation. Factors affecting gel formation. Definition, preservation and preparation of crystallized and glazed fruits, squashes and syrups. Types of syrups. Temperature test for syrups and candies. Salt concentrates - general principles. Role of ingredients in preparation of pickles. Types of pickles. Definitions and preparation of sauerkraut, dill and common Indian pickles

UNIT III (9 hrs)

Irradiation: Definition, principles, Sources of radiation, mechanism of irradiation, Units of irradiation, Dosimetry, mode of action. Use of radioisotopes in irradiation, Effects on foods and nutrients, Advantages and disadvantages. Uses, Effect of food irradiation on food quality.

UNIT IV (9 hrs)

Drying: Definition, General Principle, Methods of drying – Sun/solar drying, artificial drying. Types of driers: air convection drier, drum/roller drier, vacuum drier, freeze drier, vacuum belt driers, osmotic drying. Factors controlling drying and dehydration. Dehydration: Definition, principles, pre-treatments for drying, changes during drying, effects of drying on nutritive value, Factors influencing dehydration, Sun drying vs. artificial drying

REFERENCES

- Frazier WC, Westoff DC (1998) Food Microbiology 4th Ed., Tata Mc Graw Hill Publ. Co. Ltd
- Prescott SC, Proctor BE (1937) Food Technology, McGraw Hill
- Desroier NV (1963) The technology of food preservation, AVI Pub. Co
- Lal G, Siddappa GS, Tandon GL (1960) Preservation of food and vegetables, ICAR, New Delhi Manay NS, Shadaksharaswamy M (2010) Foods - Facts and principles, New Age International Publ., New Delhi

FNDFNP 337: NUTRITIONAL BIOCHEMISTRY I - PRACTICALS

36 hrs - 3 hrs/week

Course Outcomes:

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

- CO 1. Estimate carbohydrates in food samples
CO 2. Assay blood glucose, cholesterol and urea in serum

- CO 3. Determine enzyme activity
CO 4. Evaluate the various factors that affect enzyme activity

1. Qualitative analysis for carbohydrates - Glucose, Fructose, Maltose, Lactose, Sucrose, Starch and Galactose
2. Quantitative analysis in blood and serum - Blood glucose, cholesterol, urea
3. Enzymes – effect of pH on human salivary α -amylase activity

FNDFNP 338: QUALITY CONTROL - I - PRACTICALS

36 hrs - 3 hrs/week

Course Outcomes:

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

- CO 1. Detect common adulterants found in food samples
CO 2. Evaluate the quality of egg based on certain indices
CO 3. Determine water parameters
CO 4. Evaluate moisture content in foods
1. Detection of common adulterants present in the food sample – spices and condiments, food grains, sugars, preserves, fats and oils
 2. Quality analysis of egg – Candling, yolk index, albumin index
 3. Detection of hardness of water by titration method
 4. Determination of moisture content of various food stuff

FNDFNP 339: CHEMISTRY - III – PRACTICALS

36 hrs - 3 hrs/week

Course Outcomes:

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

- CO 1. Prepare organic compounds of importance in food
CO 2. Determine density and viscosity of liquids
CO 3. Assess physico-chemical parameters using analytical tools
CO 4. Determine molecular weight of compounds

Organic preparations

1. Acetanilide from aniline
2. M-dinitro benzene
3. Parabromo acetanilide
4. Benzoic acid from toluene
5. Benzoic acid from ethyl benzoate
6. Aspirin from salicylic acid

Physical chemistry experiments

7. Determination of density of a liquid using specific gravity bottle
8. Viscosity using Ostwald's method
9. Molecular weight of non-volatile substance by Walker Lumsden method
10. Critical solution temperature of phenol water system
11. Percentage of given electrolyte (NaCl) in water – phenol system by miscibility temperature method
12. Rate constant of decomposition of H_2O_2 using $KmNO_4$
13. Density of a liquid using specific gravity bottle and surface tension
14. Enthalpy of ionization of weak acid

FNDFNP 340: THERAPEUTIC NUTRITION - I – PRACTICALS

36 hrs 3 hrs/week

Course Outcomes:

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

- CO 1. Plan, prepare and calculate major nutrients in therapeutic nutrition
- CO 2. Carry out the 24 hrs recall method
- CO 3. Formulate diet for Diabetes mellitus and kidney dysfunction/renal disease
- CO 4. Prepare diets for pancreatic and gall bladder disease

Planning, preparing and calculating the major nutrient of the following (2 case studies)

1. 24 hrs recall method
2. Diabetes mellitus
3. Liver disease
4. Renal disease
5. Pancreatic disease
6. Gall bladder disease

FNDFNP 341: FOOD MICROBIOLOGY – I - PRACTICALS

36 hrs 3 hrs/week

Course Outcomes:

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

- CO 1. Practice and note the importance of good laboratory practices in biological/microbiological laboratories
- CO 2. Use the microscope to study microorganisms
- CO 3. Carry out culture techniques and staining procedures for microorganisms
- CO 4. Perform serial dilution and hanging drop techniques

1. Introduction –Good laboratory Practices. Study of apparatus used in microbiology lab
 2. Study of compound microscope.
 3. Cleaning and sterilisation of glassware.
 4. Preparation of culture media-Nutrient agar, Potato Dextrose Agar, EMB agar.
 5. Culturing of micro-organisms –point inoculation, streak inoculation, spread plate method,pour plate method and swab method.
 6. Simple staining of bacteria. Gram staining of bacteria. Negative staining of bacteria.
 7. Wet mount of fungi using lactophenol blue stain.
 8. Study of bacterial motility by hanging drop technique.
 9. Sampling of soil-Serial dilution technique.
- Sampling of air by Plate exposure method

FNDFNP 342: FOOD PRESERVATION – I - PRACTICALS

36 hrs - 3 hrs/week

Course Outcomes:

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

- CO 1. Perfect preservation techniques for fruits and vegetables
- CO 2. Estimate acidity in fruit juices
- CO 3. Prepare food stuffs using preservation techniques learnt
- CO 4. Understand the role and functioning of food industry

1. Prepare the following recipes – jellies, jams, squashes, pickles, dehydrated vegetables

2. To estimate the acidity of fruit juice
3. Prepare the following: Tutti frutti, ketchups & sauces, Chutneys, Chutney powder, Frozen fruits and vegetables
4. Visit to food industry

BSc FND – VI Semester
FNDFNC 381: NUTRITIONAL BIOCHEMISTRY – II (THEORY)

36 hrs - 3 hrs / week

Course Outcomes:

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

- CO 1. Obtain an insight into the biochemistry of major nutrients and physiologically important compounds such as proteins and hormones
- CO 2. Understand the principles of biochemistry (as applicable to human nutrition).
- CO 3. Appreciate types and changes in protein structure and associated malnutrition
- CO 4. Comprehend the role of vitamins and minerals and associated disorders

UNIT 1 (9 hrs)

Proteins – Amino acids, chemical bonds (peptide, ionic, hydrogen bonds, van der Waal's forces and hydrophobic interactions) involved in protein structure, Protein configuration – primary, secondary, tertiary and quaternary structures with suitable examples, biological role of proteins. Classification of proteins – simple, conjugated proteins, derived proteins with examples. Biosynthesis, protein digestion and absorption, protein malnutrition.

UNIT II (9 hrs)

Nucleic acids: Introduction, components, nucleosides, nucleotides - DNA, base composition, double helical structure, DNA – Denaturation, DNA replication mechanism, DNA Repair Mechanisms, Transcription – requirements and mechanism. RNA – Types, structure and functions

UNIT III (9 hrs)

Hormones: Biological role of hormones of pituitary, adrenal Cortex and Medulla, Thyroid Parathyroid and Pancreas.

UNIT IV (9 hrs)

Vitamins: Chemistry and biochemical role of fat soluble vitamins – A,D,E and K. Water soluble vitamins B1,B2, B3, B6 and C. Storage of vitamins in the body, daily human requirements, deficiency disorders. Minerals: Biochemical role of inorganic elements, deficiency disorders.

REFERENCES

- West ES, Todd WR, Mason HS, Van Bruggen JT (1974) Text book of Biochemistry, 4th Ed., Amerind Publ. Co. Pvt. Ltd.,
- Lehninger AL, Nelson DL, Cox MM (1993) Principles of Bio Chemistry, 2nd Ed. CBS Publ., and distributors.
- Devlin TM (1986) Text book of Biochemistry with clinical correlations, 2nd Ed., Wiley and sons.
- Stryer L (1995) Biochemistry, Freeman WH and Co.
- Jain JL (2012) Fundamentals of Biochemistry, S. Chand and Company Ltd.

BSc FND – VI Semester
FNDFNC 382: QUALITY CONTROL – II (THEORY)

36 hrs - 3 hrs / week

Course Outcomes:

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

- CO 1. Gain an insight into quality of food and importance of quality control
- CO 2. Understand the role of food additives, colouring and flavoring agents
- CO 3. Describe principles of enhancement and fortification of foods

CO 4. Conduct appropriate sensory evaluation tests to answer specific questions regarding food attributes or consumer preferences

UNIT I (9 hrs)

Food quality and quality control: Definitions. Principles of quality control. Food quality. Sample and sampling methods. Industrial quality control: Raw material control, Process control, Finished. Product control and inspection.

UNIT II (9 hrs)

Food additives, fortification and enrichment: Definitions. Principles and objectives. Classification and uses. Colouring agents: Natural, Synthetic and non-certified colours. Leavening agents: Classification and uses. Flavouring agents: Natural and Synthetic flavours.

UNIT III (9 hrs)

Food fortification and enrichment: Definition and importance. Principles. Commonly fortified and enriched foods. Non-nutritional constituents and food safety: naturally occurring toxicants, microbial toxins, bacterial food poisoning and contamination arising from processing

UNIT IV (9 hrs)

Sensory evaluation of food quality: Sensory characteristics of food, Types of tests. Objective evaluation: Types of tests, Texture evaluation. Conducting sensory tests and preparation of evaluation card

REFERENCES

- Keister DC (1977) Food and beverage control, Prentice Hall Inc, New Jersey
- Coltman MM (1977) Food and beverage cost control, Prentice Hall Inc, New Jersey
- Kotas R (1973) An approach to food costing, Nelson Thornes, London
- Ranjanna S (1985) Handbook of analysis and quality control for fruit and vegetable products
- Martin EH (1986) Standard methods for the examination of dairy products
- Lees R (1978) Food analysis, analytical and quality control methods for food manufacturers and buyers

BSc FND – VI Semester

FNDFNC 383: CHEMISTRY – IV (THEORY)

36 hrs - 3 hrs / week

Course Outcomes:

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

- CO 1. Comprehend basic principles, fundamental concepts, unique mechanistic steps involved in chemical and biochemical reactions and use of analytical techniques
- CO 2. Understand key concepts of electrochemistry and stereochemistry of organic compounds
- CO 3. Outline heterocyclic compounds, alkaloids and polymers
- CO 4. Assess environmental pollution in soil, air and water and control through treatment and other methods

UNIT I (9 hrs)

Electrochemistry: Specific equivalent and molar conductance, Kohlrausch's law, electrodes, electrode potential. Nernst equation. Reference electrode, Hydrogen electrode and calomel electrode, Quinhydrone electrode, glass electrode. Determination of equivalent conductance of NaCl. Conductometric titrations. Potentiometric titration. Determination of pKa values of weak

acids by potentiometric method. Determination of pH using quinhydrone electrode. Chemical equilibrium: Second and third law of thermodynamics, concept of entropy, Equilibrium constant and energy, Lechatelier's principle and its applications

UNIT II (9 hrs)

Stereochemistry of organic compounds: Stereoisomerism, types of stereoisomerism, optical isomerism. Elements of symmetry, asymmetric, atom molecular dissymmetry, chirality, optical isomerism in glyceraldehydes, lactic acid and tartaric acid, Enantiomers, diastereomers, meso compounds resolution of enantiomers and racemisation. Geometrical isomerism – condition, examples, geometrical isomerism in oximes. Conformational isomerism: conformational analysis of ethane and butane, Newman projection difference between configuration and conformation.

UNIT III (9 hrs)

Heterocyclic compounds: Occurrence, structural formula and importance of furan, pyrrole, thiophene, pyridine, purine, indole, imidazole, quinoline and isoquinoline, aromatic characteristics of pyrrole, furan, thiophene, pyridine, reactions. Terpenes: Classification isoprene rule, structure, occurrence and importance of limonene, menthol, camphor, santonin, phytol, Ionosterol, dolichols. Alkaloids: Classification biological functions with examples, structure and physiological action of LSD, morphine, nicotine, atropine. Polymers: Classification, polymerization process, number average and weight average molecular weights, properties of polymers, preparation and applications of PET, nylon-6,6, Bakelite, PVC, polythene, polypropylene, polystyrene

UNIT IV (9 hrs)

Environmental Chemistry: Air pollution – air pollutants, their sources, effects and control. Water pollution: Types of water pollutants, biodegradation, dissolved oxygen level of water, Biochemical Oxygen Demand (BOD) of water, Chemical Oxygen Demand (COD) of water. Determination of DO, BOD and COD of waste water, industrial effluents, their effects, treatment of polluted water and sewage treatment. Soil pollution: pollutants, agricultural animal manures, crop harvesting. Pesticides. Use of fertilizers. Radioactive wastes. Control of soil pollution. Chromatography: General principles, adsorption and partition techniques Paper chromatography, ascending and circular. R_f values. TLC, Column chromatography, Principles of gel chromatography, ion exchange chromatography and their applications.

REFERENCES

- Soni PL (1988) A textbook of Inorganic chemistry, Sulthan Chand & Sons
- Lee JD (1988) Concise Inorganic Chemistry, Blackwell Science
- Skoog DA, West DM, Holler JF (1993) Fundamentals of Analytical Chemistry, New York CBS Publ.
- Gurudeep Raj (2001) A text book of Inorganic chemistry, Goel Publ. house, Meerut
- Soni PL (2000) A textbook of Organic chemistry, Sulthan Chand & Sons
- Bahl A and Bahl BS (2000) Advanced organic chemistry, Sulthan Chand & Sons
- Vogel AI (1994) Textbook of quantitative chemical analysis, ELBS Ed.
- Agarwal OP (1998) Chemistry of natural products, Goel Sulthan Chand & Sons Publ. House, Meerut
- Madan RL, Tuli GD (2001) Physical Chemistry, Sulthan Chand & Sons
- Raj Gurudeep (2001) Textbook of advanced Physical chemistry, Goel Publ. House, Meerut
- Lehninger AL, Nelson DL, Cox MM (1993) Principles of Bio Chemistry, 2nd Ed. CBS Publ., and distributors

BSc FND – VI Semester
FNDFNC 384: THERAPEUTIC NUTRITION – II (THEORY)

36 hrs - 3 hrs / week

Course Outcomes:

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

- CO 1. Understand the modifications of normal diet for therapeutic purposes by applying principles of diet therapy to cardiovascular diseases
- CO 2. Formulate dietary management for cancer after thorough understanding of cancer progression
- CO 3. Prepare diets for specific genetic and metabolic disorders
- CO 4. Evolve dietary management approaches for neurological disorders

UNIT I (9 hrs)

Diseases of the Cardiovascular system: Definition of coronary heart disease (CHD) - Clinical features and Risk factors - modifiable and non-modifiable. Common disorders of Coronary heart disease: Dyslipidaemia/ hyperlipidaemia/ hypercholesterolemia - Definition, classes of lipoproteins and other parameters in CHD, aetiology, symptoms - xanthoma, complications. Dietary management- objectives, macronutrients, micronutrients, foods allowed/ not allowed. Atherosclerosis - Definition, aetiology, Role of fat in the development of atherosclerosis - Cholesterol, Saturated fatty acids, Trans fatty acids, Physical activity and heart diseases. Functional foods. Dietary guidelines. Hypertension: Definition, classification and stages. Pathogenesis, aetiology, symptoms, complications. Dietary management- objectives, macronutrients, micronutrients, foods allowed/ not allowed, High and low sources of sodium. Lifestyle modifications to manage hypertension; Dietary Approach to Stop Hypertension (DASH)

UNIT II (9 hrs)

Cancer: Definition, Steps in development of cancer, characteristics of cancer, tumours - benign and malignant. Classification of malignant tumours. Risk factors, dietary and non- dietary factors. Symptoms of specific cancers. Metabolic alterations and its associated nutritional problems. Carcinogenic foods. Role of food in the prevention of cancer. Nutrition problems of cancer therapy. Feeding problems in cancer patients. Dietary management - objectives, macronutrients, micronutrients.

UNIT III (9 hrs)

Genetic and metabolic disorders: Definition of metabolic disorders. Gout - definition, aetiology, metabolic changes, clinical features and symptoms, Dietary management- objectives, macronutrients, micronutrients, foods allowed/ not allowed. Inborn errors of metabolism. Galactosemia – Definition, metabolic changes, diagnosis, Aetiology and dietary management - objectives, macronutrients, micronutrients, galactose containing foods and low galactose foods.

UNIT IV (9 hrs)

Genetic and neurological disorders: Phenylketonuria (PKU) - Definition, aetiology, metabolic changes, diagnosis, Prognosis, Dietary management- objectives, macronutrients, micronutrients, low phenylalanine foods, PKU formulae. Neurologic disorders- nutritional and non-nutritional. Epilepsy – definition, aetiology, clinical features. Dietary Management- Ketogenic diet- mechanism of the diet, short term and long term side effects, foods allowed and not allowed

REFERENCES

- Anderson L, Dibble MV, Turkki PR, Mitchall HS, Rynbergin HJ (1982): Nutrition in health and disease, 17th Ed., JB Lippincott and Co., Philadelphia
- Antia FP (1973) Clinical dietetics and nutrition, 2nd Ed., Oxford Univ. Press, Delhi
- Williams SR (1989) Nutrition and diet therapy, 6th Ed., Time, Mirror, Mosby College Publ., St Louis
- Raheen Begum (1989) A textbook of foods, nutrition and dietetics, Sterling Publ., New Delhi
- Joshi SA (1992) Nutrition and dietetics, Tata McGraw Hill Publications, New Delhi
- Srilakshmi B (2011) Dietetics, 6th Ed., New Age International Publ., New

BSc FND – VI Semester

FNDFNC 385: FOOD MICROBIOLOGY – II (THEORY)

36 hrs - 3 hrs / week

Course Outcomes:

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

- CO 1. Understand the important pathogens and spoilage microorganisms in foods, and the most likely sources of these organisms.
- CO 2. Evaluate water quality based on microbiological content and apply treatment procedures.
- CO 3. Apply preventive measures based on an understanding of the factors affecting growth of microorganisms in food
- CO 4. Describe food contaminants, food poisoning and food borne infections caused by microorganisms

UNIT I (9 hrs)

General principles underlying spoilage of food - Fitness and unfitness of food for consumption; Causes for spoilage. Microbiology of air borne diseases - bacterial and fungal.

UNIT II (9 hrs)

Microbiology of water – sources, bacteriological examinations, total count, test for *E.coli*. Purification of water – filtration, sedimentation, disinfection. Water borne diseases - bacterial, viral, protozoan. Microbiology of sewage and sewage disposal.

UNIT II (9 hrs)

Factors affecting kinds and numbers of microorganisms in food. Factors affecting the growth of microorganisms in food. Contamination and kinds of organisms causing spoilage of fruits and vegetables. Contamination and kinds of organisms causing spoilage of meat, poultry, fish and eggs. Contamination and kinds of organisms causing spoilage of milk and milk products. Contamination and spoilage of fats and oils, bottled beverages, spices and condiments.

UNIT IV (9 hrs)

Food poisoning - Staphylococcal poisoning, Streptococcal poisoning, botulism, salmonellas, Shigellosis. Food borne infections - *Clostridium perfringens*, *Vibrio*, EPEC, *Bacillus cereus*, *Campylobacter*, *Listeria*, yersiniosis.

REFERENCES

- Frazier WC, Westoff DC (1998) Food Microbiology 4th Ed., Tata Mc Graw Hill Publ. Co. Ltd
- Jay JM (1986) Modern Food microbiology, 3rd Ed., Van No Strand Reinhold Co. Inc.
- Pelezer ML, Reid RD (1978) Microbiology, McGraw Hill Book Co., New York
- Brown A, Smith H (2015) Benson's Microbiological applications, McGraw Hill Publ

BSc FND – VI Semester FNDFNC 386: FOOD PRESERVATION – II (THEORY)

Course Outcomes:

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

- CO 1. Understand basic concepts of food preservation by increasing or decreasing temperature
- CO 2. Assess the types of heating and high temperatures to understand the advantages in food preservation
- CO 3. Evaluate types of freezing suitable for food preservation
- CO 4. Understand and describe chemical preservation of foods including impacts on health

UNIT I (9 hrs)

Types of heating: Conduction and convection heating. Microwave heating – advantages and disadvantages. Preservation of semi-moist foods / intermediate moist foods. Non-thermal Processing-Definition, principles, application, merits and demerits of Ohmic heating, Infrared heating, High pressure processing, Pulsed electric field. Hurdle Technology-Principles, application, advantages and disadvantages

UNIT II (9 hrs)

Preservation by use of low temperature: Refrigeration: Definition, general principles, selection of refrigerant. Chilling injury to food, approaches to control chilling injury. Freezing: Definition, general principles, advantages of frozen fruits and vegetables, limitations, methods of freezing, pre-treatment prior to freezing, air freezing, indirect freezing, direct contact freezing, immersion freezing, ice formation. Selection and preparation of foods for freezing. Changes during freezing, Freezer burn. Thawing. Effects of freezing on nutritive value.

UNIT III (9 hrs)

Preservation by use of high temperature: High temperature: Effect of heat on texture, composition- nutrient and microbial. Definition, methods, advantages and disadvantages– Blanching, pasteurization and sterilization. Canning – definition, General principles, steps in canning / bottling of any one fruit and vegetable, Advantage and disadvantages of canning, Storage of canned foods. Process evaluation, thermal death time and heat penetration

UNIT IV (9 hrs)

Preservation with chemicals: Characteristics of chemical preservatives, Classification of preservatives, Types and mode of action of organic and inorganic preservatives, uses, natural preservatives, antibiotics, antioxidant, anti-browning, cleaning, sanitizing and fungicidal agents – mode of action, uses. Health impacts use to excessive use of chemical preservatives

REFERENCES

- Frazier WC, Westoff DC (1998), Food Microbiology 4th Ed., Tata Mc Graw Hill Publ. Co. Ltd
- Desroier NV (1963) The technology of food preservation, AVI Pub. Co
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- Johnson R, Anderson MT (2012) Food Preservation,
- Manay NS, Shadaksharaswamy M (2010) Foods - Facts and principles, New Age International Publ., New Delhi

FNDFNP 387: NUTRITIONAL BIOCHEMISTRY - II – PRACTICALS

36 hrs - 3 hrs/week

Course Outcomes:

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

- CO 1. Perform qualitative tests to study reactions of proteins in proteinaceous foods
- CO 2. Estimate constituents in serum and urine samples
- CO 3. Evaluate ascorbic acid content in foods
- CO 4. Determine A/G ratio and DNA content

1. Qualitative analysis for proteins - Egg albumin, Gelatin, Peptone and Casein
2. Quantitative analysis - Serum inorganic phosphate, Serum protein, Creatinine in urine,
3. Estimation of Ascorbic acid content of foods by colorimetric method,
Estimation of DNA and A/G ratio

FNDFNP 388: QUALITY CONTROL - II – PRACTICALS

36 hrs - 3 hrs/week

Course Outcomes:

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

- CO 1. Perform quality evaluation on milk samples and detect adulteration
- CO 2. Evaluate foods based on sensory evaluation
- CO 3. Determine fat content in foods
- CO 4. Evaluate quality of oils using standard methods

1. Quality evaluation of milk – lactometer reading and tests to detect adulteration of milk
2. Iodine test
3. Determination of fat using butyrometer
4. Sensory evaluation of foods - Sweet, sour, bitter, salt. Different tests employed
in sensory evaluation
5. Quality of fats and oil. Iodine value. Acid number
6. Visit to a food industry

FNDFNP 389: CHEMISTRY - IV – PRACTICALS

36 hrs - 3 hrs/week

Course Outcomes:

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

- CO 1. Extract biomolecules from food material
- CO 2. Conduct experiments to assess physico-chemical parameters such as pH
- CO 3. Assay biomolecules on the basis of Beer-Lambert's law
- CO 4. Use chromatography to separate and identify biomolecules in food samples

Extraction of bio-molecules

1. Starch from potato
2. Caffeine from tea leaves
3. Casein from milk

Physical chemistry experiments (instrumental)

4. Conductometric titration of strong acid and strong base
5. Conductometric titration of acid mixture against strong base.
6. Verification of Beer-Lambert's law by colorimeter.
7. Potentiometric titration of Mohr's salt against Potassium dichromate.
8. Determination of pH of buffer by pH meter or potentiometer.
9. Determination of equivalent conductance of strong electrolyte. Chromatography experiments
10. Identification of amino acids by circular paper chromatography
11. Separation of green leaf pigments by column chromatography

FNDFNP 390: THERAPEUTIC NUTRITION - II – PRACTICALS

36 hrs - 3 hrs / week

Course Outcomes:

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

- CO 1. Plan, prepare and calculate major nutrients in diets for therapeutic nutrition
- CO 2. Formulate therapeutic diet for cardiovascular problems
- CO 3. Formulate nutritional needs of people at different stages of cancer progression
- CO 4. Formulate diets for genetic and neurological disorders

Planning, preparing and calculating the major nutrient of the following (2 case studies) –

1. Cardiovascular diseases- atherosclerosis
2. Dyslipidaemia
3. Hypertension
4. Cancer
5. Phenylketonuria
6. Galactosemia
7. Epilepsy

FNDFNP 391: FOOD MICROBIOLOGY -II – PRACTICALS

36 hrs - 3 hrs / week

Course Outcomes:

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

- CO 1. Perform qualitative and analytical techniques for milk
- CO 2. Master appropriate laboratory techniques to isolate, identify and enumerate microorganisms in foods.
- CO 3. Assess quality of water
- CO 4. Develop skills in food safety, food standards and food handling

1. Estimation of lactic acid in milk
2. Iodometric estimation of milk lactose.
3. Quality tests for milk-Methylene Blue Reduction Test, Resazurin test, Phosphatase test, Turbidity test.
4. Isolation of micro-organisms from food samples and spoiled vegetables
5. Sampling of water-Membrane filtration technique.

6. Standard Plate Count for water and milk samples.
7. Coliform count for water and milk samples.
8. Sampling of food handlers.
9. Determination of microbial count of milk products.

BSc FND – VI Semester

FNDFNP 392: INTERNSHIP / PROJECT WORK / INDUSTRIAL PRACTICUM

A candidate shall undergo dietetics internship in hospital or carry out project work on food related aspects or do an internship in the food industry (industrial training) during the mid-term vacation and submit the report

Course Outcomes:

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

- CO 1. Assess nutritional status and dietary pattern of patients
- CO 2. Plan and prepare therapeutic diets
- CO 3. Develop skills in feeding patients and supervise food service
- CO 4. Develop skills in diet counselling
- CO 5. Take up dietetics as a profession
- CO 6. Carry out project work on food/nutrition/diet/hygiene/sanitation related aspects
- CO 7. Work in the industry sector to gain experience in industry
- CO 8. Work in the industry sector to venture into entrepreneurship
- CO 9. Create FSSAI-based modules to be used for training in villages/schools/SHGs etc.
- CO 10. Use research methodologies for continued learning and research

DISTRIBUTION OF MARKS

Internal Assessment	- 10
Project report	- 20
Viva	- 20
Total	- 50

MODEL QUESTION PAPER
CREDIT BASED SEMESTER B.Sc. DEGREE EXAMINATION – MONTH, YEAR
CORE COURSE
(CODE NO): TITLE OF THE COURSE

Time: 3 Hours

Max. Marks: 80

I. Answer any ten of the following:

(10x2=20)

- a.
- b.
- c.
- d.
- e.
- f.
- g.
- h.
- i.
- j.
- k.
- l.

II. Answer the following questions:

(4x15=60)

- 2
- a
 - b
 - c

OR

- 3
- a
 - b
 - c

- 4
- a
 - b
 - c

OR

- 5
- a
 - b
 - c

- 6
- a

b
c

OR

7
a
b
c

8
a
b
c

OR

9
a
b
c

CREDIT BASED SEMESTER B.Sc. DEGREE EXAMINATION - MONTH, YEAR
ELECTIVE COUSE
(CODE NO): TITLE OF THE COURSE

Time: 1 ½ Hours

Max. Marks: 40

I. Answer any **five** of the following:

(5x2=10)

- a.
- b.
- c.
- d.
- e.
- f.

II. Answer the following questions:

(2x15=30)

- 2
- a
 - b
 - c

OR

- 3
- a
 - b
 - c

- 4
- a
 - b
 - c

OR

- 5
- a
 - b
 - c
