

**MANGALORE UNIVERSITY**  
**B.Sc. in FOOD NUTRITION and DIETETICS (B.Sc. FND)**  
**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	<b>a. Supportive to the discipline of study - Any ONE of the following to be opted</b>									
	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
<b>Total</b>									<b>16</b>	

**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>b. Providing an expanded scope - Any ONE of the following to be opted</b>									
	FNDFCE 187	Community Nutrition OR	1T	1x2	1x2	1x10	1x40	1x50	1x1	1
	FNDFCE 188	Food packaging OR								
	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									
	FNSDKL 181									
	FNDAEL 181									
b. Elective Foundation FNDHGF 181		1T	1x2	1x2	1x10	1x40	1x50	1x1	1	
Group IV	EC & CC		1T	1x2	1x2	50	-	50	1x1	1
Total									<b>16</b>	

### 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	<b>c. Nurturing students proficiency/skill - Any ONE of the following to be opted</b>									
	FNDFCE 237	Diet Counselling	1T	1x2	2	1x10	1x40	1x50	1x1	1
	FNDFCE 238	Nutritional Assessment and Surveillance								
	FNDFCE 239	Food Sanitation and Hygiene								
	OR									
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								
	FNSKSL 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	<b>d. Enabling an exposure to some other discipline/ domain - Any ONE of the following to be opted</b>									
	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	FNSKLL 281								
	b. Elective Foundation		1T	1x2	1x2	1x10	1x40	1x50	1x1	1
	FNDESDF 281									
Group IV	EC & CC		1T	1x2	1x2	50	-	50	1x1=1	1
									<b>Total</b>	<b>16</b>

**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								
<b>Total</b>									<b>18</b>	

**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)										
<b>Total</b>									<b>18</b>	
<b>Grand Total</b>									<b>100</b>	

BSc FND - I Semester  
**FNDFNC 131: HUMAN NUTRITION - I**  
**THEORY**

48 hrs - 4 hrs / week

**OBJECTIVES**

This course will enable the students to

- Understand the functions and sources of nutrients
- Apply the knowledge in maintenance of good health for the individual and the community
- Be familiar with factors affecting availability and requirements

**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

**FNDFNP 134: HUMAN NUTRITION - I PRACTICALS**

36 hrs - 3 hrs/week

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

**REFERENCES**

- Guthrie AH (1986) Introductory Nutrition, 6<sup>th</sup> 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  
WTO Technical Reports Series for Different Nutrients.  
Robinson CH, Lawler MR, Chenoweth WL, Garwick AE (1986) Normal and therapeutic nutrition, 17<sup>th</sup> 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. Pvt Ltd, New Delhi  
Srilakshmi B (2015) Nutrition science - 4<sup>th</sup> Ed., New age international Publ., New Delhi  
Shills ME, Shike M, Ross AC, Caballero B, Cousins RJ (2005) Modern Nutrition in health and disease – 10<sup>th</sup> Ed., Lippincott Williams and Wilkins



BSc FND - I Semester  
**FNDFNC 132: FOOD SCIENCE - I**  
**THEORY**

48 hrs - 4 hrs / week

**OBJECTIVES**

This course will enable the students to:

- Understand factors to be considered during selection of basic commodities, raw and processed and various aspects of their products and distribution
- Understand the principles underlying changes in food characteristics during cooking.
- Be familiar with evaluation of food products for their quality characteristics

**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

### **FNDFNP 135: FOOD SCIENCE - I PRACTICALS**

36 hrs - 3 hrs/week

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

### **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, 3<sup>rd</sup> Ed., Chapman and Hall, New York
- Charley H (1982) Food Science, 2<sup>nd</sup> Ed., John Wiley and Sons.
- Potter NN, Hotchkiss JH (1966) Food Science, 5<sup>th</sup> Ed, CBS Publisher and Distributors, Delhi

BSc FND - I Semester  
**FNDFNC 133: HUMAN PHYSIOLOGY - I**  
THEORY

48 hrs - 4 hrs / week

**OBJECTIVES**

This course will enable the students to:

- To understand the homoeostatic status of the human body
- To understand the physiological processes and functions as applicable to human nutrition

**UNIT I**

12 hrs

Introduction: Cell – structure and function of organelles, nucleus, chromosomes, genes, cell division, types of cell tissue transport, cell junctions homoeostasis 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 O<sub>2</sub>: direction, pressure gradient, forms of transportation, oxygenation of haemoglobin, quantity of O<sub>2</sub> 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

#### **FNDFNP 136: HUMAN PHYSIOLOGY - I PRACTICALS** 36 hrs - 3 hrs/week

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

#### 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

ELECTIVE COURSE – a. Supportive to the discipline of study

BSc FND - I Semester  
**FNDFCE 137: FOOD SERVICE MANAGEMENT  
THEORY**

24 hrs - 2hrs / week

**OBJECTIVES**

This course will enable the students to

- Understand the scope of food service management in commercial and welfare organizations.
- Acquire knowledge about the process of food preparation and service.
- Understand concepts of management, marketing and entrepreneurship with reference to 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,  
West BB, Wood L, Hager, VF, Shugart G (1987) Food Services in institutions, Wiley and Sons, New York,  
Bhojwani M (2007) Food service management: Principles and practice  
Eckel PJ (1985), College and University Food Service Management  
Delfakis H, Nancy L, Van Burns J (1992), Food Service Management  
Spears M. C, Vaden A. E (1985), Food Service Organizations - A management and systems approach  
Drummond K (1997) Nutrition for the Food Service Personnel  
National Association Institute (1998) Handbook for Food Service Management  
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 - 2hrs / week

**OBJECTIVES**

This course will enable the students to:

- Understand the application of biotechnology in food processing.
- Prepare fermented food products.

**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<sup>nd</sup> 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  
**FNDCE 139: FOOD TECHNOLOGY  
THEORY**

24 hrs - 2hrs / week

**OBJECTIVES**

This course will enable the students to:

- Understand concepts in food technology

**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) Encyclopaedia of Bioprocess Technology, A Wiley Inter Science Publ.
- Webb BH, Johnson AH (1988) Fundamentals of Dairy Chemistry, 3<sup>rd</sup> 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

**OBJECTIVES**

This course will enable the students to:

- Understand the functions and sources of nutrients
- Apply the knowledge in maintenance of good health for individual and the community.
- To be familiar with factors affecting availability and requirements

**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

**FNDFNP 184: HUMAN NUTRITION – II PRACTICALS**

36 hrs 3 hrs/week

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

**REFERENCES**

- Guthrie AH (1986): Introductory Nutrition, 6<sup>th</sup> Ed., The CV Mosby Co.
- 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
- WTO Technical Reports Series for Different Nutrients.
- Robinson CH, Lawler MR, Chenoweth WL, Garwick AE (1986) Normal and therapeutic nutrition, 17<sup>th</sup> 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. (2007) Text book of Human Nutrition, Oxford and IBH Publ. Co. Pvt Ltd, New Delhi
- Srilakshmi B (2015) Nutrition science - 4<sup>th</sup> Ed., New Age International Publ., New Delhi
- Shills ME, Shike M, Ross AC, Caballero B, Cousins RJ (2005) Modern Nutrition in health and disease – 10<sup>th</sup> Ed., Lippincott Williams and Wilkins



BSc FND - II Semester  
**FNDFNC 182: FOOD SCIENCE - II**  
**THEORY**

48 hrs - 4 hrs / week

**OBJECTIVES**

This course will enable the students to:

- Understand factors to be considered during selection of basic commodities, raw and processed and various aspects of their products and distribution
- Understand the principles underlying changes in food characteristics during cooking.
- Be familiar with evaluation of food products for their quality characteristics

**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

**FNDFNP 185: FOOD SCIENCE - II - PRACTICALS**

36 hrs 3 hrs/week

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

**REFERENCES**

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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, 3<sup>rd</sup> Ed., Chapman and Hall, New York

Charley H. (1982) Food Science, 2<sup>nd</sup> Ed., John Wiley and Sons.

Potter NN, Hotchkiss JH (1966) Food Science, 5<sup>th</sup> Ed., CBS Publisher and Distributors, Delhi

B.Sc. FND II SEMESTER  
**FNDFNC 183: HUMAN PHYSIOLOGY - II**  
**THEORY**

48 hrs - 4 hrs / week

**OBJECTIVES**

This course will enable the students to:

- To understand the homeostatic status of the human body
- Understand the physiological processes and functions as applicable to human nutrition

**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 concentration. 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

#### **FNDFNP 186: HUMAN PHYSIOLOGY – II PRACTICALS** 36 hrs - 3 hrs/week

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

#### 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 Publ.

ELECTIVE COURSE – b Providing an expanded scope

BSc FND - II Semester  
**FNDFCE 187: COMMUNITY NUTRITION  
THEORY**

24 hrs - 2hrs / week

**OBJECTIVES**

This course will enable students to:

- Be aware of the nutritional problems of the community with special emphasis on vulnerable sections.
- Understand the different methods of assessing nutritional status of the community.
- Recognize the deleterious effects of malnutrition in the development of our nation and means of combating the same.

**UNIT I**

12hrs

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**

12hrs

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.
- Goel SL (2001) Community Health Care (New Delhi) Deep and Deep Publication
- Goel SL (2001) Health Care System and Management. Vol 1-4, New Delhi: Deep and Deep Publication
- Gopaldas T, Seshadri S (1987) Nutrition monitoring and assessment Delhi: Oxford Univ. Press.
- Jelliffe D (1966) The assessment of Nutritional Status of the Community. Geneva WHO.
- Osman SR (1991) Nutrition and Poverty (Ltd.) Oxford; Oxford University Press
- Rajlaxmi R (1981) Applied Nutrition, New Delhi: Oxford and IBH
- Shukla P (1982) Nutritional Problems of India, New Delhi Prentice Hall of India.
- Swaminathan M (1985) Essential of Food and Nutrition Vol I and II Bangalore, Bangalore Printing and Publ. Ltd.
- Wadhwa A, Sharma S (2003) Nutrition in the Community, New Delhi: Elite Publ. House Pvt. Ltd.

ELECTIVE COURSE – b Providing an expanded scope

BSc FND - II Semester  
**FNDFCE 188: FOOD PACKAGING  
THEORY**

24 hrs - 2hrs / week

**OBJECTIVES**

This course will enable the students to:

- Understand the need for food packaging
- Know recent trends in packaging materials and labeling.
- Learn and gain knowledge on food packaging
- Know its applications during transportation.

**UNIT I**

12 hrs

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**

12 hrs

Biodegradable packaging material – biopolymer based edible firm. 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.  
Paine FA, Paine HY, Hill L (1992) A hand book of food packaging. Blackie Academic & Professional Publ.  
Paine FA (Ed.) (2012) The packaging user's handbook, Blackie Academic & Professional Publ.  
Sacharow S (1976) Handbook of packaging materials. Avi Pub Co. Westport.  
Crosby NT (1981) Food packaging materials. Applied Science pub Ltd. London.  
Paine FA (1977) The packaging media. Blackie & Sons Ltd. London.  
NIIR (2012) Food packaging technology Handbook, Delhi.

ELECTIVE COURSE – b Providing an expanded scope

BSc FND - II Semester  
**FNDFCE 189: FUNCTIONAL FOODS AND NUTRACEUTICALS  
THEORY**

24 hrs - 2hrs / week

**OBJECTIVES**

To enable the students to:

- Understand the benefits and role of Functional Foods and Nutraceuticals
- Understand phytochemical components and its management on health
- Prioritize the inclusion of nutraceuticals in menu planning.

**UNIT I**

12 hrs

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, poly unsaturated 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**

12 hrs

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
- Mazza G (1998) Functional Foods Biochemical Processing Aspects and Culinary and Hospitality Industry Publications
- Goldberg I (2001) Functional Foods Designer Foods Pharma Food, Nutraceuticals Culinary and Hospitality Industry Publications
- Wildman REC (2001) Handbook of Nutraceuticals and functional Foods Culinary and Hospitality Industry Publications
- Watson DH (2003) Performance Functional Foods Culinary and Hospitality Industry Publications
- Chadwick R, Hensen S, Moseley B, Koenen G, Liakopoulos M, Midden C, Palou A, Rechkemmer G, Shroeder D, von Wright A (2003) Functional Foods, Springer Publ.
- Nath KG, Vijayalakshmi D (2014) Nutraceuticals: Challenges and opportunities in 21st century, Agrotech Publ. Academy, Udaipur.
- Mangaraj S, Tripathi MK, Ali Nawab (2013) Handbook of Nutraceuticals and functional foods- Soybean as an example, Satish serial Publ. house, Delhi.
- Wildman REC (Ed) (2006) Handbook of Nutraceuticals and Functional Foods, 2<sup>nd</sup> Ed. CRC Press Taylor and Francis Group
- Ferguson LR (2013) Nutrigenomics and Nutrigenetics in Functional Foods and Personalized Nutrition, CRC Press Taylor and Francis Group

BSc FND – III Semester  
**FNDFNC 231: LIFE SPAN NUTRITION – I**  
**THEORY**

48 hrs - 4 hrs / week

**OBJECTIVES**

This course will enable the students to:

- Understand the process of growth and development from birth till adolescence
- Familiarize with nutritional needs at different stages of growth.
- Understand the concept of growth promotion

**UNIT I**

12 hrs

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**

12 hrs

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**

12 hrs

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**

12 hrs

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.

**FNDFNP 234: LIFE SPAN NUTRITION – I PRACTICALS**

36 hrs 3 hrs/week

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

**REFERENCES**

Mahan K L, Escott-Stump S (2012) Krause's Food and the Nutrition Care Process, 13<sup>th</sup> Ed., Elsevier, Missouri



Ghosh (1992) The feeding and care of infants and young children, VHAI, 6<sup>th</sup> 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, 9<sup>th</sup> 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

BSc FND - III Semester  
**FNDFNC 232: CHEMISTRY - I**  
**THEORY**

48 hrs - 4 hrs / week

**OBJECTIVES**

This course will enable the students to

- Enrich the knowledge about the basic principles, fundamental concepts and unique mechanistic steps involved in chemical and biochemical reactions
- Provide an introduction to key concepts of modern analytical methods and to equip the students to handle the modern analytical instruments
- Expose the students to the rapid development and enormous expansion of every phase of chemistry

**UNIT I:**

12 hrs

Structure and Bonding - Chemical bonding, types of chemical bonds – ionic, covalent, coordinate. Hybridization – sp, sp<sup>2</sup>, sp<sup>3</sup>, 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:**

12 hrs

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:**

12 hrs

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. Trimethyl amine – water and nicotine water systems. Lower and upper consolute temperature. Effect of impurity on consolute temperature, steam distillation – principle and applications.

**UNIT IV**

12 hrs

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, hemolytic 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

### **FNDFNP 235: CHEMISTRY - I PRACTICALS**

36 hrs - 3 hrs/week

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

### **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, 2<sup>nd</sup> Ed. CBS Publ. and distributors

BSc FND – III Semester  
**FNDFNC 233: DIETETICS – I**  
**THEORY**

48 hrs - 4 hrs / week

**OBJECTIVES**

This course will enable the students to:

- Know the principles of diet therapy
- Understand the modifications of normal diet for therapeutic purposes
- Understand the role of dietician

**UNIT I**

12 hrs

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**

12 hrs

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**

12 hrs

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**

12 hrs

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 236: DIETETICS – I PRACTICALS**

36 hrs - 3 hrs/week

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, 17<sup>th</sup> Ed., JB Lippincott and Co., Philadelphia
- Antia FP (1973) Clinical dietetics and nutrition, 2<sup>nd</sup> Ed, Oxford Univ. Press, Delhi
- Williams SR (1989) Nutrition and diet therapy, 6<sup>th</sup> Ed, Time, Mirror, Mosby College Publ.

Raheen Begum (1989) A textbook of foods, nutrition and dietetics, Sterling Publ., Delhi  
Joshi SA, (1992) Nutrition and dietetics, Tata McGraw Hill Publications, New Delhi  
Srilakshmi B (2011) Dietetics, 6<sup>th</sup> 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

**OBJECTIVES**

This course will enable the students to:

- Understand the principles of nutritional or dietary counselling.
- Gain knowledge about the arts of a Counsellor.
- Apply the use of computers to collate and analyse information.

**UNIT I**

12 hrs

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**

12 hrs

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**

- 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 10<sup>th</sup> 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, 2<sup>nd</sup> Ed., Oxford: New York, 1995.  
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., New Delhi

ELECTIVE COURSE – c Nurturing students proficiency / skill

BSc FND - III Semester

**FNDFCE 238: NUTRITIONAL ASSESSMENT AND SURVEILLANCE  
THEORY**

24 hrs - 2hrs / week

**OBJECTIVES**

This course will enable the students to:

- Assess nutritional status

**UNIT I**

12 hrs

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**

12 hrs

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 10<sup>th</sup> 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, 2<sup>nd</sup> Ed., Oxford: New York, 1995.  
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., New Delhi

ELECTIVE COURSE – c Nurturing students proficiency / skill

BSc FND - III Semester  
**FNDFCE 239: FOOD SANITATION AND HYGIENE  
THEORY**

24 hrs - 2hrs / week

**OBJECTIVES**

This course will enable the students to:

- Obtain an insight into various aspects of hygiene and sanitation
- Gain knowledge on purification of water
- Understand food contamination and poisoning

**UNIT I**

12 hrs

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**

12 hrs

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.  
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Park K (2015) Park Textbook of preventive & social medicine 24<sup>th</sup> 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, 2<sup>nd</sup> 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

**OBJECTIVES**

This course will enable the students to:

- Understand the process of growth and development and the concept of growth promotion
- Get familiar with nutritional needs at different stages of growth.

**UNIT I**

12 hrs

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**

12 hrs

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**

12 hrs

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

**UNIT IV**

12 hrs

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

**FNDFNP 284: LIFE SPAN NUTRITION - II - PRACTICALS**

36 hrs 3 hrs/week

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

**REFERENCES**

- Ghosh (1992) The feeding and care of infants and young children, VHAI, 6<sup>th</sup> 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, 9<sup>th</sup> 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, 6<sup>th</sup> Ed., New Age International Publ., New Delhi

BSc FND - IV Semester  
**FNDFNC 282: CHEMISTRY - II**  
**THEORY**

48 hrs - 4 hrs / week

**OBJECTIVES**

This course will enable the students to:

- Enrich the knowledge about the basic principles, fundamental concepts and unique mechanistic steps involved in chemical and biochemical reactions
- Provide an introduction to key concepts of modern analytical methods and to equip the students to handle the modern analytical instruments
- Expose the students to the rapid development and enormous expansion of every phase of chemistry

**UNIT I**

12 hrs

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**

12 hrs

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  $^{14}\text{C}$  dating. Biological effects of radiation, safety measurements in handling radio isotopes

**UNIT III**

12 hrs

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**

12 hrs

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<sub>2</sub> and HBr. Polymerization, Diels alder reaction Alkynes: Acidity of alkynes, ozonolysis, polymerization. Alkyl halides: SN1 and SN2 reactions. Mechanism with one example for each. Concept of elimination reactions. E1 and E2 mechanisms.

## **FNDFNP 285: CHEMISTRY – II PRACTICALS**

36 hrs 3 hrs/week

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<sub>2</sub>SO<sub>4</sub> in the given solution (Phenolphthalein)
4. Preparation of standard Oxalic acid solution. Standardization of KmNO<sub>4</sub> and estimation of H<sub>2</sub>O<sub>2</sub> in the given solution
5. Preparation of K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub>. Standardization of Na<sub>2</sub>S<sub>2</sub>C<sub>3</sub> and estimation of CuSO<sub>4</sub> in the given solution (starch)
6. Preparation of ZnSO<sub>4</sub>. Standardization of EDTA and estimation of total hardness of water using Eriochrome black T indicator
7. Preparation of K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub> 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

## **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, 2<sup>nd</sup> Ed. CBS Publ., and distributors



BSc FND - IV Semester  
**FNDFNC 283: DIETETICS - II**  
**THEORY**

48 hrs - 4 hrs / week

**OBJECTIVES**

This course will enable the students to

- Know the principles of diet therapy
- Understand the modifications of normal diet for therapeutic purposes
- Understand the role of the indication.

**UNIT I**

12 hrs

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**

12 hrs

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. Constipation- 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**

12 hrs

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, nutritional treatment. Gluten intolerance – symptoms, dietary treatment, foods included and excluded, nutritional treatment. Nutrient-drug interaction

**UNIT IV**

12 hrs

Nutritional deficiency: Protein – energy malnutrition- aetiology, types, symptoms, dietary treatment and prevention, hospital treatment, domiciliary rehabilitation. 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

**FNDFNP 286: DIETETICS - II - PRACTICALS**

36 hrs 3 hrs/week

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

#### REFERENCES

- Anderson L, Dibble MV, Turkki PR, Mitchall HS, Rynbergin HJ (1982): Nutrition in health and disease, 17<sup>th</sup> Ed., JB Lippincott and Co., Philadelphia
- Antia FP (1973) Clinical dietetics and nutrition, 2<sup>nd</sup> Ed., Oxford Univ. Press, Delhi
- Williams SR (1989) Nutrition and diet therapy, 6<sup>th</sup> 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, 6<sup>th</sup> Ed, New Age International Publ., New Delhi
- Mahan LK, Arlin MT (1992) Krause's Food, Nutrition and Diet Therapy, 8<sup>th</sup> Ed., W.B Saunders Company, London
- Robinson CH, Lawler MR, Chenoweth WL, Garwick AE (1986) Normal and therapeutic nutrition, 17<sup>th</sup> Ed, Macmillan Publ. Co.

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

**OBJECTIVES**

To enable the students to:

- Know the composition of various foods.
- Understand the effects of cooking on nutritive value.

**UNIT - I**

12 hrs

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**

12 hrs

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, 2<sup>nd</sup> 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. 2<sup>nd</sup> 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

**OBJECTIVES**

To enable the students to:

- Understand the importance of public nutrition.
- Take part in programs targeted to improve the nutritional status of the public.

**UNIT-I**

12 hrs

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 XII<sup>th</sup> five-year plan; ICDS- objectives and services; Public Distribution System; Anthyodaya 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**

12 hrs

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, 5<sup>th</sup> 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

**OBJECTIVES**

To enable the students to:

- Identify and describe lifestyle related diseases
- Differentiate between controllable risk factors and uncontrollable risk factors for lifestyle diseases.
- Understand the importance of physical activity in managing lifestyle diseases

**UNIT - I**

12 hrs

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

**UNIT - II**

12 hrs

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, 11<sup>th</sup> Ed., Saunders, Elsevier  
Shils ME, Shike MS, Ross AC, Cabarellero B, Cousins RJ. (Eds.) (2005) Modern Nutrition in health and disease – 10<sup>th</sup> Ed., Lippincott Williams and Wilkins  
Srilakshmi B (2011) Dietetics, 6<sup>th</sup> Ed., New Age International Ltd., New Delhi  
Robinson CH, Lawler MR, Chenoweth WL, Garwick AE (1986) Normal and therapeutic nutrition, 17<sup>th</sup> Ed., Macmillan Publ. Co.

B.Sc. FND V SEMESTER  
**FNDFNC 331: NUTRITIONAL BIOCHEMISTRY I**  
**THEORY**

36 hrs - 3 hrs / week

**OBJECTIVES**

This course will enable the students to:

- Understand the principles of biochemistry (as applicable to human nutrition).
- Obtain an insight into the chemistry of major nutrients and physiologically important compounds.
- Understand the biological processes and systems as applicable to human nutrition.
- 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 –  $\beta$ -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

**FNDFNP 337: NUTRITIONAL BIOCHEMISTRY I - PRACTICALS**

36 hrs - 3 hrs/week

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  $\alpha$ -amylase activity

**REFERENCES**

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

B.Sc. FND V SEMESTER  
**FNDFNC 332: QUALITY CONTROL - I**  
**THEORY**

36 hrs - 3 hrs / week

**OBJECTIVES**

This course will enable students to:

- Gain an insight into quality of food
- Know the adulterants added to foods
- Familiarize international and national food laws, regulations and standards

**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

**FNDFNP 338: QUALITY CONTROL - I - PRACTICALS**      36 hrs - 3 hrs/week

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

**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 manufacturer and buyer

B.Sc. FND V SEMESTER  
FNDFNC 333: CHEMISTRY - III  
THEORY

36 hrs - 3 hrs / week

OBJECTIVES

This course will enable the students to

- Enrich the knowledge about the basic principles, fundamental concepts and unique mechanistic steps involved in chemical and biochemical reactions
- Provide an introduction to key concepts of modern analytical methods and to equip the students to handle the modern analytical instruments
- Expose the students to the rapid development and enormous expansion of every phase of chemistry

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

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  $\text{HNO}_2$  and Schiff's base formation. Distinguishing reactions of primary, secondary and tertiary amines

### **FNDFNP 339: CHEMISTRY - III - PRACTICALS**

36 hrs - 3 hrs/week

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 ( $\text{NaCl}$ ) in water – phenol system by miscibility temperature method
12. Rate constant of decomposition of  $\text{H}_2\text{O}_2$  using  $\text{KMnO}_4$
13. Density of a liquid using specific gravity bottle and surface tension
14. Enthalpy of ionization of weak acid

### **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, 2<sup>nd</sup> Ed., CBS Publ., and distributors.

BSc FND – V Semester  
**FNDFNC 334: THERAPEUTIC NUTRITION - I**  
**THEORY**

36 hrs - 3 hrs / week

**OBJECTIVES**

This course will enable students to:

- Understand the role of the dietician in preventive, promotive and curative health care
- Be able to make appropriate dietary modification for various disease conditions based on the Physiology
- Understand the role of the dietician

**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 (HbA1c). 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.

#### **FNDFNP 340: THERAPEUTIC NUTRITION - I - PRACTICALS** 36 hrs 3 hrs/week

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

#### 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, 2<sup>nd</sup> Ed., Oxford Univ. Press, Delhi

Williams SR (1989) Nutrition and diet therapy, 6<sup>th</sup> 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, 6<sup>th</sup> Ed., New Age International Publ., New Delhi

BSc FND - V Semester  
**FNDFNC 335: FOOD MICROBIOLOGY – I**  
**THEORY**

36 hrs - 3 hrs / week

**OBJECTIVES**

This course will enable students to:

- Understand the nature of microorganisms involved in food - spoilage, food infections and intoxications
- Understand the importance of microorganisms in food industry

**UNIT I**

9 hrs

Definition and history of microbiology - Contributions of Antonie van Leewenhoek, Louis Pasteur, Lazarro 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.

**FNDFNP 341: FOOD MICROBIOLOGY – I - PRACTICALS**

36 hrs 3 hrs/week

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.
10. Sampling of air by Plate exposure method.



## REFERENCES

- Frazier WC, Westoff DC (1998), Food Microbiology 4<sup>th</sup> Ed., Tata Mc Graw Hill Publ. Co. Ltd.  
Jay J M (1986) Modern Food microbiology, 3<sup>rd</sup> 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.

B.Sc. FND V SEMESTER  
**FNDFNC 336: FOOD PRESERVATION - I**  
**THEORY**

36 hrs - 3 hrs / week

**OBJECTIVES**

This course will enable students to:

- Understand the basic concepts and parameters of preservation techniques
- Know the types and variety of foods available in the markets
- Learn to purchase and preserved different foods
- Learn various quality and preservation techniques used in various foods

**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

**FNDFNP 342: FOOD PRESERVATION – I - PRACTICALS** 36 hrs - 3 hrs/week

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

## REFERENCES

Frazier WC, Westoff DC (1998) Food Microbiology 4<sup>th</sup> 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

B.Sc. FND VI SEMESTER  
**FNDFNC 381: NUTRITIONAL BIOCHEMISTRY - II**  
**THEORY**

36 hrs - 3 hrs / week

**OBJECTIVES**

This course will enable the students to:

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

**UNIT I**

12 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**

12 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.

**FNDFNP 387: NUTRITIONAL BIOCHEMISTRY - II – PRACTICALS**

36 hrs - 3 hrs/week

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

**REFERENCES**

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

B.Sc. FND VI SEMESTER  
**FNDFNC 382: QUALITY CONTROL - II**  
**THEORY**

36 hrs - 3 hrs / week

**OBJECTIVES**

This course will enable the students to:

- Gain an insight into quality of food
- Know the importance and uses of food additives
- Know how food is fortified and enriched with certain nutrients
- Be familiar with the sensory evaluation of various quality parameters of food.

**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

**FNDFNP 388: QUALITY CONTROL - II - PRACTICALS**      36 hrs - 3 hrs/week

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

**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 manufacturer and buyer

B.Sc. FND VI SEMESTER  
FND FNC 383: CHEMISTRY - IV  
THEORY

36 hrs - 3 hrs / week

OBJECTIVES

This course will enable the students to:

- Enrich the knowledge about the basic principles, fundamental concepts and unique mechanistic steps involved in chemical and biochemical reactions
- Provide an introduction to key concepts of modern analytical methods and to equip the students to handle the modern analytical instruments
- Expose the students to the rapid development and enormous expansion of every phase of chemistry

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, lonosterol, 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. Rf values. TLC, Column chromatography, Principles of gel chromatography, ion exchange chromatography and their applications.

**FNDFNP 389: CHEMISTRY - IV - PRACTICALS**

36 hrs - 3 hrs/week

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

**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  
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, 2<sup>nd</sup> Ed. CBS Publ., and distributors

B.Sc. FND VI SEMESTER  
**FNDFNC 384: THERAPEUTIC NUTRITION - II**  
**THEORY**

36 hrs - 3 hrs / week

**OBJECTIVES**

This course will enable students to:

- Know the principles of diet therapy
- Understand the modifications of normal diet for therapeutic purposes

**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



## **FNDFNP 390: THERAPEUTIC NUTRITION - II – PRACTICALS**

36 hrs - 3 hrs / week

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

### **REFERENCES**

Anderson L, Dibble MV, Turkki PR, Mitchall HS, Rynbergin HJ (1982): Nutrition in health and disease, 17<sup>th</sup> Ed., JB Lippincott and Co., Philadelphia

Antia FP (1973) Clinical dietetics and nutrition, 2<sup>nd</sup> Ed., Oxford Univ. Press, Delhi

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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, 6<sup>th</sup> Ed., New Age International Publ., New Delhi

B.Sc. FND VI SEMESTER  
**FNDFNC 385: FOOD MICROBIOLOGY - II**  
**THEORY**

36 hrs - 3 hrs / week

**OBJECTIVES**

This course will enable the students to:

- Understand the principles of various methods used in the prevention and control of microorganisms in foods
- Understand the criteria for microbiological safety in various food operations to avoid public health hazards due to contaminated foods

**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 III**

9 hrs

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

**FNDFNP 391: FOOD MICROBIOLOGY -II – PRACTICALS** 36 hrs - 3 hrs / week

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 spoilt 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.

**REFERENCES**

Frazier WC, Westoff DC (1998) Food Microbiology 4<sup>th</sup> Ed., Tata Mc Graw Hill Publ. Co. Ltd  
Jay JM (1986) Modern Food microbiology, 3<sup>rd</sup> 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.

B.Sc. FND VI SEMESTER  
**FNDFNC 386: FOOD PRESERVATION - II**  
**THEORY**

36 hrs - 3 hrs / week

**OBJECTIVES**

This course will enable students to:

- Understand basic concepts and parameters of preservation techniques
- Know the types and variety of foods available in the markets
- Learn to purchase and preserve different foods
- Learn various quality preservation techniques used in various foods

**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 4<sup>th</sup> Ed., Tata Mc Graw Hill Publ. Co. Ltd  
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  
Potter NN, Hotchkiss JH (1966) Food Science, 5<sup>th</sup> Ed., CBS Publisher and Distributors, Delhi  
Prescott SC, Proctor BE (1937) Food Technology, McGraw Hill  
Johnson R, Anderson MT (2012) Food Preservation,  
Manay NS, Shadaksharaswamy M (2010) Foods - Facts and principles, New Age International Publ.,  
New Delhi

## VI SEMESTER

### **FNDFNP 392: INTERNSHIP / PROJECT WORK / INDUSTRIAL PRACTICUM**

#### OBJECTIVES

To enable the students to:

- Assess nutritional status and dietary pattern of patients
- Plan and prepare therapeutic diets
- Develop skills in feeding patients and supervise food service
- Develop skills in diet counselling
- Take up dietetics as a profession
- Carry out project work on food/nutrition/diet/hygiene/sanitation related aspects
- Work in the industry sector to gain experience in industry
- Work in the industry sector to venture into entrepreneurship
- FSSAI-based modules to be used for training in villages/schools/SHGs etc.

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

#### 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. | g  |
| b. | h. |
| c. | i. |
| d. | j. |
| e. | k. |
| f. | 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.

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MODEL QUESTION PAPER

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.

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