

**BHARATHIAR UNIVERSITY: COIMBATORE – 641 046**  
**M. Sc. FOOD AND NUTRITION DEGREE COURSE**  
**(with effective from the academic year 2014 - 15)**

**SCHEME OF EXAMINATION**

Sem	Study Components	Course Title	Ins. Hrs week	Exam					
				Dur. Hrs.	Internal	External	Total	Credit	
I	Paper I	Food Science	5	3	25	75	100	4	
	Paper II	Nutrition through life cycle	5	3	25	75	100	4	
	Paper III	Nutritional Biochemistry	6	3	25	75	100	4	
	Paper IV	Nutrition in Disease - I	5	3	25	75	100	4	
		Elective Paper I		3	3	25	75	100	4
		Practical I	Food Analysis Practical	6	3	40	60	100	4
II	Paper V	Food Processing	5	3	25	75	100	4	
	Paper VI	Research Methodology and Statistics	5	3	25	75	100	4	
	Paper VII	Macronutrients	5	3	25	75	100	4	
	Paper VIII	Nutrition in Disease – II	5	3	25	75	100	4	
	Paper IX	Nutraceuticals and functional foods	4	3	25	75	100	4	
		Practical II	Nutrition in Disease Practical	3	3	40	60	100	4
			Elective Paper II	3	3	25	75	100	4
III	Paper X	Micronutrients	6	3	25	75	100	4	
	Paper XI	Community Nutrition	4	3	25	75	100	4	
	Paper XII	Physiological Aspects of Nutrition	6	3	25	75	100	4	
	Practical III	Biochemical Analysis Practical	6	3	40	60	100	4	
		Paper XIII	Software Programming in Nutrition Theory	2	3	10	40	50	2
			Practical	3	3	20	30	50	2
IV		Elective Paper III	3	3	25	75	100	4	
	Paper XIV	Food Biotechnology	6	3	25	75	100	4	
		Mini Project*	-	-	-	-	50*	2	
		Elective Paper IV - Practical	3	3	40	60	100	4	
	Project work (Project work : 80 & Viva-voce : 20 marks)		21				100	4	
	Total						2250	90	

15 days training in multi specialty hospital to qualify for the degree

\* One month training in Food industry and submit a mini project.

For Project work: 40 marks & Viva-voce:10 marks

**List of Group Elective papers :**

**Colleges can choose any one of the Group papers as electives)**

	GROUP A	GROUP B
Paper I/ Sem I	Convenience foods	Institutional Food Management
Paper II/Sem II	Food packaging	Food Product Development and Marketing
Paper III/Sem III	Food quality control	Culinary Techniques
Paper IV/Sem IV	Food quality control - Practical	Food Service Management Practical

**SEMESTER - I**  
**PAPER – I**  
**FOOD SCIENCE**  
**HOURS OF INSTRUCTION / WEEK: 5**

**Objectives**

To enable students

1. Gain knowledge on composition and nutritive value of foods
2. Develop skills in cooking

**UNIT I**

**Properties of Foods** - Physical properties, chemical bonds in foods, chemical reactions in foods - enzymatic reaction and non enzymatic reaction.

**Food Colloids** - Structure, formation, mechanisms, stabilization, factors affecting stabilization.

**Millets** -Products, composition, structure and nutritive value.

**Cereal and their Uses**

Structure of the grain, composition of seed parts, storage of grains.

**WHEAT**

Structure, composition, nutritive value. Wheat flour — types, functionality of components, baking qualities, manufacture of bread and cakes.

**RICE**

Structure, nutritive value and composition.

Cereal cookery.

**UNIT II**

**PULSES**

Composition, nutritive value, methods of processing, vegetable protein mixes protein, natural toxicants and pulse cookery.

**NUTS AND OILSEEDS**

Composition, nutritive value, nutritious food mixes from oil seeds.

**FATS AND OIL**

Sources, nutritional composition, functions, physical and chemical properties, rancidity — types and prevention, role of fat / oil in food preparations.

**SUGARS AND RELATED PRODUCTS**

Sources, uses, reactions of sugar and sugar related products. Crystalline and non-crystalline candies.

**UNIT III**

**VEGETABLES AND FRUITS**

Classification, selection, storage, composition, structure, texture, pigments, browning reaction, pectic substances, ripening of fruits, changes on cooking and processing.

## **BEVERAGES – types and classification.**

### **UNIT- IV**

**Meat** - Structure, composition, postmortem changes, Rigor mortis, Aging and Tenderization of meat, colour of meat, changes of meat in cookery and methods of cooking.

**Poultry** - Classification, composition, market forms, selection factors and methods of cooking.

**Fish** - Classification, composition, kinds of fish, characteristics of fresh fish, fish products and methods of cooking.

**Egg** - Structure, composition, grading and selection, effects of heat on egg protein, egg foam and role in cookery.

**Milk and milk products** - Composition, physical and chemical properties — effects of heat, acid and enzymes, processing of milk, types of milk.

Milk products –butter, cheese, milk powder, khoa, ice cream

### **UNIT V**

**Spices and condiments** – types, uses and abuses, role in cookery ,medicinal uses.

**Quality of foods**- Subjective and objective evaluation of foods.

**Food additives** - Food colours and flavours, thickeners, emulsifiers and food improvers.GRAS additives

#### **Food Preservation**

Methods of food preservation- dehydration, freezing, refrigeration, preservation with chemicals, mold inhibitors and antioxidants, irradiation, microwave heating.

### **REFERENCE**

1. Paul, P.c. and Palmer, H.H., Food Theory and applications, John Wiley and Sons., New York, 1992.
2. Srilakshmi, B., “Food Science”, New Age International Private Ltd., New Delhi, 2003.
3. Charley, H and Weanee, C.M. — Foods — A scientific Approach, IIIrd Edition, Practice Hall, 1995.
4. Swaminathan,M –Food science chemistry and experimental foods –Bappco Publishers
- 5.Manay,S.M and Shadaksharaswamy –Food,facts and Principles,Wiley Eastern Ltd,1987
- 6.Norman.N.Potter –Food Science,CBS Publishers

## **SEMESTER-I**

### **PAPER II**

## **NUTRITION THROUGH LIFE CYCLE**

**Hours of Instruction / week: 5**

### **Objectives**

Enable the students

1. Understand the role of adequate nutrition in stages of life cycle.
2. Gain knowledge on methods of assessment of the nutritional status of population groups.

### **UNIT I**

Concept of different food groups recommended dietary allowances for Indians, basis for requirement, computation of allowance. Comparison of Indian recommended allowances with that of UK, USA, FAO/WHO standards.

**Nutrition in pregnancy** - Stages of gestation, maternal physiological adjustments, weight gain during pregnancy and nature of weight gain, nutritional requirements, storage of nutrients, physiological cost of pregnancy, complications of pregnancy.

## UNIT II

**Nutrition in Lactation** - Physiological adjustments during lactation, hormonal controls and reflex action, lactation in relation to growth and health of infants, physiology of milk production, problems of breast feeding, nutritional components of colostrum and mature milk, special foods during lactation, nutritional requirements during lactation.

**Nutrition in infants** - Rate of growth, weight as the indicator, premature infant, feeding premature infants, low birth weight, breast vs. bottle feeding, nutritional allowances, supplementary feeding, weaning foods.

## UNIT III

**Nutrition in Preschool Children** - Growth and development of preschool children, prevalence of malnutrition (Vitamin A, infection, anaemia, IDD) in preschool age, food habits, nutritional requirements, supplementary foods.

**Nutrition in School Age** - Early and middle childhood, physiological development, food habits, nutritional needs and feeding, RDA, Foods habits.

## UNIT IV

**Nutrition During Adolescence** - Physical growth, physiological and psychological problems associated with pubertal changes, nutritional needs, eating disorders — anorexia nervosa, bulimia nervosa, nutrition and medical problems in adolescent pregnancy and its requirements and complications.

**Nutrition During Adulthood** — Nutrition and work efficiency, basis for requirements, RDA.

**Nutrition for Old Age** - Socio economic and psychological factors — nutritional requirements, factors affecting food intake, clinical needs and malnutrition, institutionalized changes in old age. Advances in geriatric nutrition.

## UNIT V

**Nutrition for physical activity and exercise** - Body systems involved in physical activity (Cardio-respiratory and musculo-skeletal system), benefits of an active lifestyle (cardiorespiratory, musculo-skeletal improvements and other health benefits of physical activity), physical fitness assessment — cardio respiratory fitness, assessment of body composition, muscular fitness assessment, flexibility assessment. Exercise and thermogenesis, role of carbohydrate, fat and protein as a fuel for exercise, fluid and electrolyte balance during prolonged exercise, nutritional requirements in sports, dietary intake before, during and after exercise.

## REFERENCES

1. Vinodhni Reddy, Prahiad Rao, Govmth Sastry and Kashinath, "Nutrition Trends in India", NIN, Hyderabad, 1993.
2. Shills, E.M. Olson, A.J. and Shike, Lea and Febiger, "Modern Nutrition in Health and Diseases".
3. Frances, J. Zeman, Nutrition and Dietetics, 1983.
4. B. Srilakshmi, "Dietetics", New Age International Pvt. Ltd, 2003.
5. B. Srilakshmi, "Nutrition Science", New Age International Pvt. Ltd., 2003.
6. Krause's Food, nutrition and diet therapy, Eleventh edition

## SEMESTER-I PAPER—III NUTRITIONAL BIOCHEMISTRY Hours of instruction / week: 6

### Objective

To enable the students to understand the application of biochemistry in the field of Foods and Nutrition.

### UNIT I

**Metabolism of Carbohydrates** - Glycolysis, TCA cycle, HMP shunt and energy production, Glycogenesis, Gluconeogenesis, Biosynthesis of ascorbic acid. Renal threshold for glucose.

### UNIT II

**Metabolism of Fatty Acids** - Biosynthesis and oxidation of saturated .and unsaturated fatty acids, cholesterol and phospholipids, Bile salts and fatty liver.

### UNIT III

**Protein-synthesis,metabolism.**

**Metabolism of individual amino acids** - Glycine, phenylalanine, tyrosine, tryptophan, histidine, methionine and creatinine. Denaturation, transamination, deamination, decarboxylation, urea formation. Synthesis and breakdown of haemoglobin and bile pigments.

### UNIT IV

**Nucleic acids** - Composition, function and classification. Isolation, structure and properties of DNA and RNA. Biosynthesis and breakdown of purine and pyrimidine nucleotides.  
**Assay Techniques:** Bioassay techniques, microbiological assay of vitamins.

### UNIT V

**Techniques in nutritional biochemistry** - Separation of sugars and amino acids by chromatography. Electrophoretic separation of proteins. Colorimetry and spectrophotometry — principle, procedure and difference, pH meter – working and application. Radioisotopes in clinical diagnosis. Elemental analysis by atomic absorption spectroscopy and flame photometry.

## REFERENCES

1. Lehninger, A.L., Biochemistry, Worth Publishers Inc., New York, 2000.
2. Keith Wilson and John Walker, Practical Biochemistry, Cambridge University Press, 2000. –
3. Ambiga Shanmugam, Fundamental of Biochemistry for Medical Students, Karthik Printers, 1992.
4. Powar and Chatwal, Biochemistry, Himalaya Publishing House, 2000.
5. Rariganatha Rao, K., Text Book of Biochemistry, Prentice Hall of India, New Delhi, 1980.
6. Harold Varley, Practical Clinical Biochemistry, IV Ed., CBS Publishers and Distributors.
7. Geoffrey, L. Zubay, William W. Parson, Dennis E. Vance, Principles of Biochemistry, WM.C. Brown Publishers, 1995.

## SEMESTER – I PAPER IV                      NUTRITION IN DISEASE –I Hours of instruction / week: 5

### Objectives

To enable the students

1. Understand the etiology of various diseases
2. To gain knowledge in the dietary modifications in various disease conditions

### UNIT I

**Therapeutic Diets** – Principles, objectives and diet therapy, Review of hospital diets, type of dietitians, role of dietitian in the hospital and community, Nutrition Care Process (NCP), diet planning and use of exchange list in nutrient calculation, diet counseling and patient education. Enteral and Parenteral nutrition –types, applications, types & nutrient composition of feeds, complications, merits and demerits. Functions of Indian Dietetic Association

### UNIT II

#### Gastro Intestinal Diseases

##### 1. Diseases of Oesophagus

Esophagitis and Hiatus hernia.

##### 2. Disease of Stomach

Indigestion, hypochlorhydria, acute and chronic gastritis and peptic ulcer

##### 3. Disease of Intestine

Flatulence, constipation - atonic, spastic and obstructive, diarrhoea - acute and chronic and steatorrhea.

**4. Inflammatory Diseases** -Diverticulosis, diverticulitis, regional enteritis, ulcerative colitis, malabsorption syndrome - sprue.

### UNIT III

**Diabetes Mellitus** - Epidemiology / Incidence - Classification - symptoms. Metabolic changes : Long term & short term complications, clinical findings - diagnostic tests - glycemic index of foods, types of insulin, dietary complications, dietary modifications in energy, carbohydrate, fat, protein, fibre and micronutrients. Herbal plant remedies for diabetes mellitus.

#### **Inborn errors of Metabolism.**

Etiology, symptoms and dietary treatment for

**1. Disorders of Amino Acid Metabolism**

Phenylketonuria, tyrosemia, histidinemia and maple syrup urine diseases.

**2. Disorders of Carbohydrate Metabolism**

Galactosemia, fructose and lactose intolerance.

**3. Diseases of Adrenal Cortex and Thyroid Gland**

Etiology, symptoms and dietary management of Addison disease, hypothyroidism, hyperthyroidism, tetany, hypocalcaemia and gout.

**UNIT IV**

**Diseases of the Heart and Circulatory System** - Acute and chronic cardiac disorders, risk factors of cardiac diseases, dietary management in hypertension, atherosclerosis, congestive heart failure, hyperlipoproteinemia, hypercholesterolemia, role of antioxidants in the prevention and treatment.

**UNIT V**

**Nutrition in cancer** - Epidemiological studies, reproduction of the normal cells, classification of neoplasms, principles of cancer, pathogenesis. Causes of cancer cell development, metabolic and nutritional alterations in malignancy, cancer therapy and nutrition, nutritional therapy and cancer, eating problems in cancer.

**REFERENCES**

1. Antia, F.P., Clinical Dietetics and Nutrition, Oxford University, Mumbai, 1989.
2. Cornine H. Robinson, Marilyn R. Lawles, Wanda L., Chenweth, Ann Garwin, Normal and Therapeutic Nutrition, XVII Editor.
3. Krause, M.V. Hunseher, M.A., Food Nutrition and Diet Therapy, W.S. Saunder's Company, Philadelphia, London, Toronto, 1980.
4. Maurice, E. Shills, James, A. Olsen, Moshe Shihe, Modern Nutrition on Health and Disease, Vol. 1 & 2, VIII Edition, Lea and Pediger, Philadaiphia, 1994.
5. B. Srilakshmi, Dietetics, New Age International Private Ltd.
6. Davidson, S.S. Passmore, P., Branch, J.F. Humaii Nutrition and Dietetics, 9th Edition, F & S, Lingstons Ltd., Edinburgh and London, 1993.
7. Sue Rod Williams, Nutrition and Diet Therapy, Times Mirror Mashy College Publishing St. Laws, Toronto, Boston, 1989.
8. Gopalan, C., Ramshastri and Balasubramaniam, S.C. Nutritive value of Indian Foods, NIN, Hyderabad, 1994.

**CORE PRACTICAL I**  
**FOOD ANALYSIS PRACTICAL**

**I ANALYSIS OF FOOD FOR**

- A. Calories
- B. Moisture
- C. Fibre
- D. Ash
- E. Calcium
- F. Iron
- G. Phosphorus

- H. Protein By Micro-Kjeldahl Method
- I. Water Soluble Protein-By Lowry's Method
- J. Fat-By Soxhlet Extraction
- K. Carotene
- L. Thiamine
- M. Riboflavin
- N. VITAMIN-C  
(foods have to be analysed before and after processing)
- II. Glycogen extraction and estimation
- III. Analysis of fat-sap no, iodine no, acid no and RMvalue
- IV. Estimation of lipid in egg yolk
- V. Sorensen's formal titration for estimation of amino acid.

**SEMESTER -II**  
**PAPER - V**  
**FOOD PROCESSING**  
**Hours of instruction / week :5**

**Objectives**

To enable students to learn different food processing and preservation techniques.

**UNIT I**

Magnitude, Division and Interdependent activities of the food industry, unit operations of the food industry. Food processing sector –vision and mission, opportunities, strategies and constraints in the Indian food processing sector. Post harvest priority requirements, Strengths, weakness, opportunities and threats (SWOT) of food sector.

**UNIT II**

**Rice Technology** - Production, processing, milling of rice, parboiling, processes, by products of rice milling and their utilization. Nutrient loss during processing.

**Wheat Technology** - Production, processing, manufacture of breakfast cereals

**Millets** - Production, processing.

**UNIT III**

**Pulses** - Production, types of processing of different pulse products - Soyabean Processing.

**Technology of oil seeds** - Processing ,meal concentrates and isolates.

Fats from non-traditional oil seeds, rice bran oil, sal fat, mango kernel fat, kokum fat, mahua ,butrycea fat, membrane processing of vegetable oils, vanaspathi with low trans fatty acids, bakery fats with low trans fatty acids, low-fat spreads, hydrogenation of fats.

**UNIT IV**

**Mushroom** - Production, processing, utilization.

**Meat** - Production, processing, smoking and curing of meat, grading.

**Poultry** - Production, preparing poultry for consumption, packaging.

**Fish** - Production, effect of handling practices, storage of eggs, manufacturing and packaging of egg products.

## UNIT V

**Vegetables** - Drying and dehydration techniques –drum drying, vacuum puffing, foam mat drying, freeze drying, accelerated freeze drying.

Processing of potato grits, potato granules, Potato flour, dehydrated garlic and dehydrated green peas.

**Fruits**- Sun drying of banana and grapes; Mechanical dehydration – use of kiln drier and tunnel drier.

Canning -steps, spoilage of canned foods,advantages,disadvantages.

Bottling –steps ,advantages,disadvantages.

## REFERENCES

1. Saiauel, A. Matz., The Chemistry and Technology of cereals of Foods and Feed”, CBS Publishers and Distributors, 1996.
2. G.C. Banerjee, Poultiy, Oxford and IBH Publishing CODUB Ltd., New Delhi.
3. Giridhari Lal,G.S.Sidhappa and G.L.Tandon-Preservation of fruits and vegetables,ICAR,New Delhi,1998
4. Raghurent Chinatamini, Advances in Agro Industry and Food Processing, Dominant Publishers and Distributors, 1999.
5. Shakuntala Manay, N., Shadak Cheraswamy, M., Food Facts and Principles, Wiley Eastern Ltd., 1987.
6. R & D at the CFTRI, Three decades M.R. Raghavendra Rao, K.R. Bhatt achaiya and J.V. Shankar CFTRI, Mysore.
7. Research and Development at CFTRI, 1950 — 2000, CFTRI, Mysore.
8. Potter, N.W. Food Science, AVI Publishing Co., Connecticut, 1960.
- 9.Processed food Industry
- 10.Journal of Indian food industry
- 11.D.K.Salunkhe,S.S.kadam-Handbook of vegetable science and technology,Marcel Dekker Inc,New York,2005.



## REFERENCES

1. Kothari, C.R. Research Methodology
2. Gupta, S.F., Statistical Methods, Sultana Chand and Sons, 31 Revises Edition, 2002.
3. Devadas, R.P., A Handbook on Methodology of Research, Sri Ramakrishna Vidhyalaya, Coimbatore, 1989.
4. Ramakrishnan, P., Biostatistics, Sara Publication, 2001.
5. Donald, H. Mc. Burney, Research Methods, Fifth Edition, Thomson and Wadsworth Publications, 2002.
6. P. Shanthi Sophia Bharathi, Computer Oriented Statistical Methods / Probability and Statistics, Chanilatha Publications, Second Edition, 2000.
7. R.S.N. Pillai, V. Bagavathi, Statistics, S. Chand and Company Limited, 2001.

## SEMESTER II PAPER VII MACRONUTRIENTS HOURS OF INSTRUCTION / WEEK: 5

### Objectives

To enable students

1. Gain recent knowledge about macro nutrients
2. Gain recent findings in the study

### UNIT I

**Energy** - Historical background, energy content of food, energy measurements - direct and indirect calorimetry, energy utilization in cells, basal metabolism, physical activity. Regulatory thermogenesis, energy requirements, variables which influence the energy requirements with reference to adults, infants, adolescents, ICMR, FAO and WHO requirements, energy balance and control of body weight, the share of three main energy nutrients — carbohydrates, proteins and fats.

### UNIT II

**Carbohydrates** - Classification, digestion, absorption and utilization of carbohydrates, nutritional importance of carbohydrates.

**Dietary fibre** - Definition, types of fibre in plant foods, sources, composition, digestion, clinical aspects. Role of dietary fibre in therapeutic nutrition. Effect of fibre in the absorption of different nutrients.

### UNIT III

**Fats and lipids** - Classification of fats and fatty acids, review of digestion and absorption of fats, transport of lipid in blood, lipid transformation in the liver, lipotropic factors, role of essential fatty acids; deposition of fats in the body. Effect of deficiency and toxicity, role of fats in the etiology of arteriosclerosis.

### UNIT IV

**Protein** - Classification of proteins and amino acids, protein synthesis, function, digestion, absorption and utilization. Factors affecting protein utilization. Factors affecting protein

utilization. Amino acid requirements and amino acid pattern, essential amino acids, amino acid balance, imbalance and toxicity, computation of protein requirements through factorial method and balance study, ICMR and FAO / WHO requirements, evaluation of quality of protein, conduct of animal studies, rat as an experimental animal, food sources, protein deficiency- prevalence, causes and treatment, role of animal proteins and vegetable protein mixture in combating malnutrition, estimation of amino acids and protein needs.

#### **UNITY**

**Hormone and Nutrient Interactions** - Interaction over carbohydrate, protein and fat metabolism.

Nutrition in alcoholism — effect of alcohol in digestion and absorption of nutrients, Alterations of nutrient metabolism and organ damage.

#### **REFERENCE**

1. Gardon M. Wardlaw, Paul. M. lunset and Marcia F. Seyler, Contemporary Nutrition, Mosby, Sixth edition.
2. Z.S.C. Okoye, “Biochemical Aspects of Nutrition”, Prentice Hall of India Pvt. Ltd., Eastern Economy Edition, 1992.
3. Shils E.M., Olson and Febiger, “Modem Nutrition in health and disease”, Philadelphia, 1999,ninth edition.
4. Guthire.I-I. Andrew S. “Introductory Nutrition” Saint Hours time, Mosby College, 1988.
5. Berdanier, C.D. Advanced Nutrition: Macro. Nutrients CRC Press VSA, 1995.
6. Sorimshaw, N.S and Schwrch, B. Protein Energy Interactions Proceedings of DECG Workshop, 1992.
7. Swaminathan, M. Advanced Text Book foods Nutrition, Bappco Publication. Vol.1,2000

### **SEMESTER - II**

#### **PAPER - VIII**

#### **NUTRITION IN DISEASE -II**

**Hours of instruction / week: 5**

#### **Objectives**

To enable the students to

1. Understand the etiology of various diseases
2. To gain knowledge in the dietary modifications in various disease conditions.

#### **UNIT I**

Etiological factors and Dietary modifications in

- (a) Fevers and infection
- (b) Burns, surgery
- (c) Nutritional deficiency diseases -PCM, anaemia, vitamin A def.
- (d) Diet in allergy
- (e) Dental diseases -Dental caries and Peridontitis

#### **UNIT II**

**Nutritional Imbalances** - Obesity and under weight, types of obesity, etiological factors, assessment of obesity, grades of obesity, theories — set point fat cell, thermogenesis in

obesity. Dietary modifications role of maintenance diets, anorexia, bulimia nervosa.

### **Respiratory and Musculo-skeletal Systems**

Arthritis, rheumatoid and osteo arthritis, asthma, chronic pulmonary diseases, epilepsy and multiple sclerosis.

### **UNIT III**

#### **Diseases of Liver, Gall Bladder and Pancreas**

Etiology, dietary management in liver, gall bladder and pancreas, jaundice, viral hepatitis, cirrhosis, hepatic coma and fatty liver, cholecystitis, cholelithiasis, acute and chronic pancreatitis.

### **UNIT IV**

#### **Diseases of Kidney**

Etiology, dietary Management in kidney, urinary tract disorders, acute and chronic glomerulo nephritis, nephrosis, acute renal failure, chronic renal failure, end stage renal disease, uremia, nephrosclerosis, nephrolithiasis, kidney transplants, maintenance of an artificial kidney (dialysis)

### **UNIT V**

#### **HIV Infection and AIDS**

Epidemiology, transmission of HIV, pathophysiology, clinical manifestations, HIV infection and other diseases, Immunity and AIDS virus, dietary management, Prevention and Control.

### **Basic aspects of neurotransmitters and its modulators**

### **REFERENCES**

1. Antia, F.P., Clinical Dietetics and Nutrition, Oxford University, Mumbai, 1989.
2. Corinne H. Robinson, Marilyn R. Lawler, Wanda L., Chenweth, Ann Garwin, Normal and Therapeutic Nutrition, XVII Editor.
3. Krause, M.V. Hunseher, M.A., Food Nutrition and Diet Therapy, W.S. Saunder's Company, Philadelphia, London, Toronto, Eleventh edition.
4. Maurice, E. Shills, James, A. Olsen, Moshe Shihe, Modern Nutrition on Health and Disease, Ninth Edition, Lea and Pediger, Philadelphia, 1994.
5. B. Srilakshmi, Dietetics, New Age International Private Ltd.
6. Davidson, S.S. Passmore, P., Branch, J.F. Human Nutrition and Dietetics, 9th Edition, F & S, Lingstons Ltd., Edinburgh and London, 1993.
7. Sue Rod Williams, Nutrition and Diet Therapy, Times Mirror Masby College Publishing St. Laws, Toronto, Boston, 1989.
8. Gopalan, C., Ramshastri and Balasubramaniam, S.C. Nutritive value of Indian Foods, NIN, Hyderabad, 1994.

**SEMESTER - II**  
**PAPER - IX**  
**NEUTRACEUTICALS AND FUNCTIONAL FOODS**

**Hours of instruction / week: 4**

***Unit -I***

***Introduction to Nutraceuticals as Science:***

Nutraceutical- Definition, Classification - Dietary supplements, Functional foods, Historical perspective, scope & future prospects. Applied aspects of the Nutraceutical Science. Sources of Nutraceuticals. Relation of Nutraceutical Science with other Sciences: Medicine, Human physiology, genetics, food technology, chemistry and nutrition.

***Unit -II***

***Properties, structure and functions of various Nutraceuticals:***

Alkaloids, Terpenoids, Glycosides, Natural phenols, Isoprenoid derivatives, Glucosamine, Octacosanol, flavonoids, carotenoids, polyunsaturated fatty acids, lecithin, choline and spingolipids, Lycopene, Carnitine, Melatonin and Ornithine alpha ketoglutarate as nutraceuticals. Use of proanthocyanidins, grape products, flaxseed oil as Nutraceuticals.

***Unit -III***

***Nutraceuticals of plant and animal origin:***

Plant secondary metabolites, classification and sub-classification - Alkaloids, phenols, Terpenoids. Extraction and purification, applications with specific examples with reference to skin, hair, eye, bone, muscle, heart, brain, liver, kidney, general health and stimulants. Concept of cosmoceuticals and aquaceuticals.

Animal metabolites - Sources and extraction of nutraceuticals of animal origin. Examples: chitin, chitosan, glucosamine, chondroitin sulphate and other polysaccharides of animal origin, uses and applications in preventive medicine and treatment.

***Unit -IV***

***Functional Foods :***

Definition, Relation of functional foods & Nutraceutical (FFN) to foods & drugs. Applications of herbs to functional foods. Concept of free radicals and antioxidants; Nutritive and Non-nutritive food components with potential health effects. Soy proteins and soy isoflavones in human health; Role of nuts in cardiovascular disease prevention. Functional foods from wheat and rice and their health effects. Role of Dietary fibers in disease prevention. Vegetables, Cereals, milk and dairy products as Functional foods. Health effects of common beans, Capsicum annum, mustards, Ginseng, garlic, grape, citrus fruits, fish oils, and sea foods.

***Unit -V***

***Food as remedies:***

Nutraceuticals bridging the gap between food and drug, Nutraceuticals in treatment for cognitive decline, Nutraceutical remedies for common disorders like Arthritis, Bronchitis, circulatory problems, hypoglycemia, Nephrological disorders, Liver disorders, Osteoporosis, Psoriasis and Ulcers etc. Brief idea about some Nutraceutical rich supplements e.g. Bee pollen, Caffeine, Green tea, Lecithin, Mushroom extract, Chlorophyll, Kelp and Spirulina etc.

### References:

1. Murray Robert, Harper's Biochemistry, 24th Ed, Prentice Hall International UK Ltd, 1990.
2. Greenberg David M., Metabolic Pathways, Vol 3, 3rd Ed, Academic Press Pvt Ltd, New York.
3. Todd and others, Clinical Diagnosis and Management, 17 th Ed, W.B.Saunders, Philadelphia.
4. Swaminathan M., Essentials of Food and Nutrition, 2 nd Ed, 1985, Ganesh and Co.
5. Gopalan C., et al, Dietary Allowances for Indians, NIH, Hyderabad.
6. Anita F.P., Clinical Dietetics and Nutrition, 4 th Ed, 1997, Oxford Univ Press.
7. Lehninger Albert, 2001, Principles of Biochemistry, Kalyani Publishers, New Delhi.
8. Devlin, T.M., 1997, 4th Ed, Text Book of Biochemistry with Clinical Correlation, Wiley Liss Inc.
9. Krause's Food, Nutrition and Diet Therapy, 10th Edition by Mahan, L.K. & Ecott-Stump, S. (2000), W.B. Saunders Ltd.
10. Nutrition - Concepts & Controversies, 8<sup>th</sup> Edition, bySizer, F. & Whitney, E. (2000): Wadsworth Thomson Learning.
11. Understanding Nutrition, 8<sup>th</sup> Edition, by Whitney, E.N. & Rolfes, S.R.. (1999): WesV Wadsworth, An International Thomson Publishing Co.
12. Nutrition in Exercise and Sports, 3<sup>rd</sup> Edition by Ira Wolinsky (Ed) (1998): CRC Press.
13. Modern Nutrition in Health & Disease, 9th Edition by Shils, M.E., Olson, J.A., Shike, N. and Ross, A.C. (Ed) (1999):, Williams & Wilkins.
14. Human Nutrition and dietetics by Davidson, S. Passmore, R. Brock. J.F. and TurswellA.S.
15. Modern Nutrition in health and disease by Goodhearth R., S. Shills. Nelson and Cox, 2000, Lehninger's Principles of Biochemistry, Worth Publishers.
16. Nutrition in Health and Disease 17th Edition; Anderson, Dibble, Turkki, Mitchell, Rynbergen J.B.Lippincott Company, 1982
17. Nutrition Principles and Application in Health Promotion Second Edition; C.J.W, Sutor, M.F. Crowley J.B. Lippincott Co., Philadelphia, 1984
18. Nutritional Evaluation of Food Processing Third Edition; E. Karmas and R.S. Harris AVI Boon, New York, 1988
19. Nutrition and Aging; M.L. Hutchinson, H.N. Munro Academic Press, Inc., 1986
20. Nutritional Quality Index of Foods; R.G.Hansen, B.W. Wyse, A.W. Sorenson AVI Publishing Co., Inc., 1979.
21. Handbook of Nutraceuticals and Functional Foods Edited by Robert E.C. Wildman, Routledge Publishers.
22. Nutraceuticals by L. Rapport and B. Lockwood, Pharmaceutical Press.
23. Methods of Analysis for Functional Foods and Nutraceuticals Edited by W. Jeffrey, Hursts, Routledge Publishers.
24. Food is Medicine by P.J Cousion; Duncan Baird Publishers, London.
25. Dietary Supplements of Plant Origin, M. Maffei (Ed.), Taylor & Francis, 2003.
26. Nutraceutical beverages Chemistry, Nutrition and health Effects, Shahidi and Weerasinghe (Ed.), AmericanChemical Society, 2004.
27. Dietary Fiber: Handbook of Dietary Fiber, Susan Sungsoo Cho, Mark L. Dreher.
28. Bioprocesses and Biotechnology for Functional Foods and Nutraceuticals, Jean - Richard Neeser & J. Bruce German, Marcel Dekker, Inc., 2004.

29. Herbal Products -Timotht S.Tracy, Richard L. Kingston.
30. Ayurveda Aahar (Food / Diet)-Prof. P.H.Kulkarni.
31. Dietary Supplements and Alternative Medicines -W. Marvin Davis.
32. Flavour in Food-Andree' Voilley, Patrick Etievant.
33. Dietary Supplements and Functional Foods -Geoffrey P. Webb.
34. A Guide to Understanding Dietary Supplements-Shawn M. Talbott.
35. Introduction to the Chemical Analysis of Foods-S. Suzanne Nielsen.
36. An Evidence - Based Approach to Dietary Phytochemicals -Jane Higdon.
37. Herbal beauty products with formulation & processes-H. Panda.
38. Herbal Drugs & its plant Sources-H. Panda.
39. Herbal Drugs: Potential Antimalarial Herbal Drugs from South Asia-CCRUM.
40. Herbal Medicine & Botanical Medical Fads-Frank Hoffmann, Martin Manning.
41. Herbal Medicines-H. Panda.
42. Medicinal HERBS with uses-H. Panda.
43. Medicinal Plants (Cultivation & their uses)-H. Panda.
44. Medicinal Plants (Traditional Knowledge)-P C Trivedi.
45. Medicinal Plants of the World-Ben-Erik, Van Wyk, Michael Wink
46. Medicinal Plants Of the World Vol-3 -Ivan A Ross
47. Medicinal Plants: Chemistry of Medicinal Plants Part - I-CCRUM
48. Dietary Supplements labeling-compliance review (third edition), James L. Summers
49. (Ed.), Blackwell Publishing
50. Functional foods, designer foods, pharma foods, Nutraceuticals, Israel Goldberg
51. (Ed.), Aspen publishers Inc., Gaithersburg, Maryland, USA, 1999. Chapter 22 page 512

## **CORE PRACTICAL II NUTRITION IN DISEASE PRACTICAL**

### Contents:

1. Weights and measures of foods.
2. Menu planning, food plan, meal distribution, Ideal body weight prescription and preparation of
  - a. Normal diet, regular diet, light diet, soft diet, full liquid diet, clear liquid diet & bland diet
  - b. Pre operative diet and post operative diet
  - c. Diet for obesity, under weight
  - d. Diet for anemia, PEM, iron deficiency
  - e. Diet for diseases of the GI tract – peptic ulcer, diarrhea, and constipation.
  - f. Diet for Cardio-vascular diseases- atherosclerosis, hypertension.
  - g. Diet for diseases of the kidney –kidney stones, renal failure, nephritic and nephrotic syndrome. Diet before & after dialysis.
  - h. Diet for diabetes – Type I & II, Diabetes with CVD disease.
  - i. Diet in febrile conditions- Short duration – typhoid; long duration – tuberculosis
  - j. Diet in liver diseases – Viral hepatitis, cirrhosis and coma
  - k. Diet in burn condition

## **SEMESTER - III PAPER X MICRO-NUTRIENTS HOURS OF INSTRUCTION / WEEK: 6**

### **Objectives**

To enable the students

1. Acquire knowledge in the role of micronutrients in health and disease.
2. Understand the recent advance in the study of micro-nutrients.

### **UNIT I**

**Calcium** - Calcium in skeleton and other tissues, measurements, bone mass, effect of diet and immobilization. Calcium absorption and utilization, calcium balance, requirements, sources, deficiency and excess.

**Phosphorus** - Concentration in the body, calcium - phosphorus ratio, phosphorus adsorption and utilization, deficiency and toxicity.

**Sodium** - Potassium, Magnesium and Sulphur - Distribution, absorption, utilization, role in human nutrition, deficiency and toxicity.

### **UNIT II**

**Trace Elements** - Concept, mode of action, trace element interaction.

Iron-intake, utilization, storage, output and iron balance, deficiency and toxicity, role in prevention of anaemia. Methods of assessing nutritional status and availability of iron.

**Iodine** - History, functions,metabolism,deficiency.

Fluorine- functions,sources, uses of fluoride in the prevention of dental caries, toxic effects of fluoride.

**Historical background** – Functions, sources, deficiency and toxicity of zinc, copper, molybdenum, cobalt, nickel, manganese, selenium, chromium and cadmium.

### **UNIT III**

**Vitamins** - Fat soluble vitamins — A, D, E and K; History, Chemistry, Physiological action, transport, utilization and storage, methods of assay, dietary sources and losses in preparation and handling. Conversion of carotene into vitamin A in human beings, recommended intake, human deficiency and diagnosis, hypervitaminosis.

### **UNIT IV**

**Water Soluble Vitamins** - Thiamine, riboflavin, niacin, vitamin B12, folic acid, pyridoxine, pantothenic acid, biotin and ascorbic acid: History, Chemistry, Physiological action, biochemical utilization, storage, transport, biosynthesis -of vitamins dietary sources, losses in preparation and handling, recommended intake, human deficiency and diagnosis, toxicity, bio availability and inter relationships.

### **UNIT V**

**Vitamin Like Molecules** - Choline, carnitine, inositol, taurine-chemistry, metabolism, deficiency, excess and dietary consideration. Pseudo vitamins — flavanoid, pangamate, laetrile. Interdependence between nutrients and hormones in general.

### **REFERENCE**

1. Sue Rodwell Williams, "Essentials of Nutrition and Diet therapy", V Ed, Times Mirror / Mosby College Publishing, 1990.
2. James L. Groff and Sareen, S. Gropper, "Advanced Nutrition and Human Metabolism", 1999. Thomson Wardsworth.
3. Whitney P.N., and Roes S.R. "Unyerstanding Nutrition", West Publication Co, 1996.
4. Smolin and Grosevenor "Nutrition-Science and Applications, Sauders Company, 1997.
5. Carolyn D. Berdanier, "Advanced Nutrition-Micronutrients, CRC Publications, 1994.
6. C.EBodweli, "Nutrient interactions" Marcel delker Inc., 1988.
7. Robert S.Goodhart and Manice EShills, "Modem Nutrition in Health and diseases, Lea and Feliger, 1980.
8. Suzanne K. GRaty, Adrienne bendich. Vishwa N.Singh, Lawrence F. Machin, Vitamin intaker and health, Mared dekker mc, 1991.
9. Maurice E. Shills and Vernon R. Young, "Modem Nutrition in Health and Disease", Ninth Edition ,1988.
10. Swaminathan, M. Advanced Text Book foods Nutrition, Bappco Publication. Vol.1,2000.

**SEMESTER - III**  
**PAPER - XI**  
**COMMUNITY NUTRITION**  
**Hours of instruction / week: 4**

**Objectives**

To enable students

1. Gain insight into nutritional problems of the community
2. Understand the various nutrition intervention programmes of vulnerable groups in the community
3. Appreciate national and international agencies towards nutrition in programmes.

**UNIT I**

**Emergency situations**

Famine, drought, flood, earthquake, cyclone, Tsunamis, coastal hazards, war, civil and political emergencies and factors giving rise to emergency situation in these disasters. Illustration using case studies from Indian subcontinent.

**UNIT II**

**Protein energy malnutrition (PEM)** - Etiology, types, prevalence, metabolic changes and prevention.

**Nutritional Anaemia** - Definition, causes, types, prevalence, anemia control programme in India.

**Iodine Deficiency** : Causes, prevalence, clinical features and control programme in India.

**Fluorosis** : Causes, prevalence, Clinical features, Fluorosis control programme in India.

**Vitamin A deficiency** : Causes, signs and symptoms, prevention & prophylaxis

**B complex deficiency** : Causes, signs and symptoms, prevention.

**Assessment of Nutritional Status**

Dietary survey, biochemical methods, growth monitoring methods, food consumption survey, body composition studies. Test of intelligence related to nutrition.

**UNIT III**

**Nutrition Intervention Programmes**

Objectives, Special nutrition programme (SNP), Modified Applied Nutrition Programmes (ANP), Integrated Child Development Services (ICDS), Tamil Nadu Integrated Nutrition programme (TFNP) and Noon Meal Scheme.

**Role of International Organizations** - Food and Agriculture Organization (FAO), World Health Organisation (WHO), United Nations International Children's Emergency Fund (UNICEF), Co-operative American Relief Everywhere (CARE) and World Bank.

**National Organizations**

National Institute of Nutrition (NIN), National Nutrition Monitoring Bureau (NNMB), Indian Council of Agriculture Research (ICAR), Indian Council of Medical Research (ICMR), Central Food Technological Research Institute (CFTRI). General nutritional, support International agencies, non-government organizations, and government programs involved with food aid and relief during emergencies (Famine, drought, flood, earthquake, cyclone, Tsunamis, coastal hazards, war, civil)

#### **UNIT IV**

**Nutrition Education** - Objectives, definitions, importance of nutrition education to the community.

**Methods of nutrition education, nutrition education programmes** - Planning, implementation and evaluation, training workers in nutrition education programmes, integration of nutrition education with education and extension of works, nutrition and health education for adolescent girls, lactating and pregnant women. Nutrition education in schools and community.

#### **UNIT V**

Concepts of community Health, Primary Health Center (PHC)- Concept, organization, current status in India and delivery of service, Taluk level hospitals, Employees State Insurance (ESI)

#### **Epidemiology of Communicable Diseases**

Factors responsible for the spread of communicable diseases, mode of transmission — chicken pox, typhoid fever, tuberculosis, malaria, leprosy, filariasis and AIDS. Prophylaxis and Immunization schedule. Waste disposal system in India.

#### **REFERENCES**

1. Proceedings of the Nutrition Society of India, Vol. 35, 42, 43, 44, 46 and 47, 1999, N1N, Hyderabad.
2. S. Wal Ruchi Mishra, Encyclopedia of Health Nutrition and Family Welfare, Published by Sarup and Sons, New Delhi, 2000.
3. Hojn C., Water low, Andrew M. Tomkins, Sally M. Grantham. MC, Anegor, "Protein Energy Malnutrition", Published by Edward Arnold, 1992.
4. Vinodini Reddy, Praihad Rao, Gowrinath Sastry, J. and Kashinath, K.C., Nutrition Trends in India, N1N, Hyderabad, 1993.
5. Park and Park, Text book of preventive and social medicine, Banarsidas Published by Jahalpu, 1995.
6. Jelliff, D.D. Pathes, Assessment of Nutritional Status of community, WHO Geneva, 1989.
7. Sarala Gopalan (1996), Towards better nutrition for women and children, Problem and Programmes, Department of Women and Child Development, Government of India.
8. Susheela, A.K. (1997), Drinking water quality surveillance and Prevention of diseases : Participation of Health Department Personnel in the safe drinking water mission activities and benefits thereof. In the proceedings of the National Workshop on water quality monitoring and surveillance in rural areas Rajiv. Gandhi National Drinking Water Mission, August 1997.
9. Susheela, A.K. and Jethnandani, P. (1996), Circulating Testosterone levels in skeletal fluorosis patients, Clinical Toxicology.
10. Bagchi, K. Evaluation of nutrition education in nutrition monitoring and assessment, Editors — Gopaldas T. and Seshadris, Oxford University Press, Delhi, 1987.
11. Long-term follow up of school health education programme, World Health Forum, 1996,

**SEMESTER III**  
**PAPER XII**  
**PHYSIOLOGICAL ASPECTS OF NUTRITION**  
**Hrs of instruction / week: 6**

**Objectives**

To enable the students

1. Gain knowledge on blood components and immunological aspects
2. Understand the physiological aspects of hormones, drugs, etc.

**UNIT I**

**Blood** - Composition, cellular elements of blood — RBC, WBC AND Platelets. Haemoglobin — structure and function. plasma proteins — functions. Blood coagulation and disorders of blood coagulation

**UNIT II**

**Immunity** - Types of immunity, cells of the immune system, immune response - humoral immunity, cell mediated immunity, immune changes in malnutrition, vitamin deficiency, iron deficiency and zinc modulation, neuro-endocrine control of stress and immunity, immune mechanisms in infections, auto-immunity and hypersensitivity.

**UNIT III**

**Hormones** - Principles of hormone action and endocrine control, synthesis, secretion and biological effect of pituitary, thyroid, parathyroid, adrenal, pancreas, male and female reproductive hormones.

**Enzymes**- definition, classification, action, factors influencing rate of enzyme action, Michaelis-Menten equation, derivation, enzymes in medical diagnosis.

**UNIT-IV**

**Water and Electrolyte Balance** - Total body water, intake versus output of water, body fluid compartments, composition of body fluid, measurement of body fluid volumes, forces controlling the water and electrolyte balance between cells and extra cellular fluid, metabolism of water and electrolytes, regulation of acid balance, effect of diet on water, electrolyte and acid base balance.

**Function tests** - Gastric function test, liver function test, renal function test and endocrine function test.

**UNIT V**

**Drugs** - Introduction, absorption, biotransformation and excretion of drugs, drug metabolism, routes of drug administration, mechanisms of drug action factors modifying drug effects, receptor theories, drug and nutrient interactions. Hunger, appetite and satiety, physiological and psychological factors affecting food intake.

**REFERENCES**

1. Concise Human Physiology by M.Y. Sukkar, H.A. El-Murshid and M.S.M. Ardawi — Blackwell Scientific Publications, 1993.
2. Basic and Clinical Immunology — Daniel P. Stites, Abba I. Terr, Tristram G. Parslow —

Prentice Hall International Inc., 1994, 8th Edition.

3. Human Physiology — Chakrabarti, Ghosh and Sahara — The New Book Stall, Second Edition, 1984.
4. Modern Nutrition in Health and Disease — Robert S. Goodhart, Maurice E. Shils — Indian Edition, Fifth Edition, 1973.
5. Modern Nutrition in Health and Disease — Maurice E. Shils, Verrnon, R. Young — Indian Edition, Seventh Edition, 1980.
6. Textbook of Medical Physiology — Guyton, I,E, Saunders, Seventh Edition.
7. Essentials of physiology — M. Muthayya, Emerald Publishers, Second Edition, 1986.
8. Textbook of clinical (Medical) Biochemistiy and immunology by S. Rainakrishnan & Raji Swami, T.R. Publications Private Ltd., 1995.
9. N. Muruges, A concise textbook of Pharmacology, Fifth Edition, Prabhu Offset Printers, 2000.
10. P. Parimoo, A textbook of Medicinal Chemistry, CBS Publishers and Distributors, 1995.
11. G. Tripathi, Enzyme Biotechnology, Techno Science Publications, 1999.

**CORE PRACTICAL-III**  
**BIOCHEMICAL ANALYSIS PRACTICAL**  
**HOURS OF INSTRUCTION/WEEK: 6**

**I.QUALITATIVE ESTIMATION of**

- A. Sugars-Mono, Di And Polysaccharides
- B. Proteins And Amino Acids

**I. ANALYSIS OF BLOOD FOR**

- A. Glucose
- B. Haemoglobin And Iron
- C. Cholesterol
- D. Pyruvic Acid
- E. Serum AG Ratio
- F. Serum Phospholipid
- G. Serum Protein
- H. Serum Alkaline Phosphate

**III. ANALYSIS OF URINE FOR**

- A. Creatinine
- B. Urea
- C. Total Nitrogen
- D. Calcium
- E. Phosphorus
- F. Vitamin-C

**SEMESTER- III**  
**PAPER XIII**  
**Software Programming in Nutrition**  
**HOURS OF INSTRUCTION / WEEK: 2(theory)+3(practical)**

**Objectives**

To enable students

- a. Gain knowledge on Ms-Access Version 2002.
- b. Acquire knowledge to create software in Nutrition using VB.

**UNIT I**

**Introduction to Windows 2000** - Working within a window, using start menu, using explorer, using toolbars, menus and dialog boxes, customizing the Desktop via control panel opening control panel, using Accessibility options, adding and removing programs, setting date and time, customizing screen display, Adjusting the mouse, controlling drives, folders and files, recycle bin.

**Introduction to Ms-Access 2002-Database** - Creating a database, opening a database, closing a database, printing database, introduction to database objects.

**Table** - Creating table in design view and table wizard, setting primary key, creating Relationship between tables, enforcing referential integrity, customizing fields and tables, importing and linking a table.

**UNIT II**

**Queries** - Creating a query in design view, working with design, creating different types of queries in wizard, using queries to calculate values and summarising the data.

**Forms** - Creating a form in design view and wizard, modifying on existing form, creating a subform.

**Reports** - Creating a report in design view and in wizard, creating a summary report, modifying an existing report, calculating values in a report, grouping report records, creating a subreport, creating mailing labels.

Adding and deleting controls to forms and reports, beautifying forms and Reports - formatting text, adding lines, shapes, borders, pictures / images and clip art, setting image, alignment.

**UNIT III**

**Introduction to Visual Basic** - Introduction to development environment, forms - setting form properties, form events and methods, common intrinsic controls - setting properties for controls, events and methods for controls, adding controls to forms, dialog boxes - Input Box, MsgBox, Common dialog boxes. Advanced Active X controls - Tree view and List view control Rich Text Box control, Ms Flex Grid control.

**UNIT IV**

**Programming Basics** - Visual Basic data types, variables - naming and declaring variables, types, constants, operators - Arithmetic, Relational and logical operators, Handling keyboard and Mouse Input in programs.

**Arrays** - Declaring arrays, static array, Dynamic array, multi-dimensional array and control array.

**Modules** - Form module, standard module, class module working with subprocedures and function procedures, Built-in functions.

## **UNIT V**

**Program Flow Control** - Working with conditional statements - If .... Then, If Then Else if, Nested If, select case, working with looping concept - For.. .Next, Do... .While, Do.... Until, While.. ..Wend, Nested loops.

**Drawing with Visual Basic** - Co-ordinate systems, Graphics controls, Graphics controls, Graphics methods, specifying colors, Processing Images.

**Database Basics** - Creating a database in Visual Basic, creating a user interface using ADO Data control, Data report.

## **REFERENCE**

1. T.Karthikeyan, P.C.software for Office Automation (Ms-Office), for private circulation, Gobi Arts and Science College, Gobichettipalayam, Erode, July 2002.
2. Curtis Frye, "Microsoft Access Version 2002, Plain and Simple", Printie — Hall of India, Private Limited, New Delhi — 110 001, 2001.
3. Craig Eddy and Timothy Buchanan, "Microsoft Access 2000 in 24 hours"; Techrmedia publications, 1999.
4. Alan Simpson, Celeste Robinson, "Mastering Access 2000", BPB publications, 1999.
5. Susan Sales, harkins, Ken Hansen, MCSD, Tom Gerhart, "Using Microsoft Access 2000", Prentice Hall of India, Private Limited, 1999.
6. Garry cornell — "Visual basic 6 from the Ground up", TMH, 1999.
7. Steve Brown, Visual Basic 6-In Record Time", BPB publications, 1998.
8. Brain siler and Jeff spotts, "Using Visual Basic 6", Special Edition, Prentice -- Hall of India, Private Limited, New Delhi — 110 001, 200L
9. Evangelos Petroustos, "Mastering Visual Basic 6", BPB publications, 1998.

### Practical Knowledge I Activity

1. Creating a nutrition related database in Access and in Visual Basic
2. Applying different types of queries
3. Creating a form for patient details for any one disease
4. Creating a simple software in nutrition.

**SEMESTER IV**  
**PAPER - XIV**  
**FOOD BIOTECHNOLOGY**  
**Hours of instruction / week: 6**

**Objectives**

To enable students to understand the concepts of biotechnology and its application in food production

**Unit I**

Development and progress of biotechnology related to food production and processing, scope and importance.

Genetic engineering – tools, enzymes – exonucleases, endonucleases, restriction endonucleases, ligases, reverse transcriptases. Cloning vectors – plasmids, bacteriophage, cosmids, phasmids.

**Unit II**

Regulatory aspects of biotechnological methods – Upstream & Downstream processing, biosensors, biochips, limiting factors and regulation. Impact of biotechnology on the nutritional quality of foods.

Single cell protein and mycoprotein: Production of microbial protein, SCP, substrate, nutritional value, harvesting spirulina, mushroom culture and yeast biomass production.

**Unit III**

Enzyme technology: Soluble enzymes, immobilized enzymes : amylases, invertase, glucose isomerase, protease, lipase, lactase and pectinase – synthesis and application in food industry.

Organic acids and pigments; Vitamins – vitamin A, ergosterol, riboflavin, vitamin B12, fatty acids; Amino acids – lysine, methionine, glutamate.

**Unit IV**

Fermentation systems & process – Batch and continuous process, fermentor design, bioprocess control.

Technology of production of fermented foods - Alcoholic beverages, cheese making, fermented cereal products, soy based foods, meat fermentation, probiotic, prebiotic and synbiotic foods, vinegar and baker's yeast production.

**Unit V**

Role of biotechnology in the production of – food additives synthesis – citric acid, gluconic acid, High fructose corn syrup (HFCS), thickeners and gelling agents, xanthan gums.

Genetically modified foods – need, challenges, potential benefits, nutritional improvement, issues of concern (Safety aspects of genetically modified foods). Microencapsulation- basic aspects only

**References:**

1. Gary Walsh and Denis R. Headen, Protein Biotechnology John Willey & Sons England.  
Dubey, R.C and Maheswari, D.K, A Text book of Microbiology, S.Chand and Co, Ltd, New Delhi (2003).
2. Food preservation technology series, Food science and food biotechnology, 2003, Gustavo F.Gutierrez – Lopez, Gustavo V. Barbosa – canovas, CRC press.
3. Food science and processing technology; Biochemistry of food and nutrition, Mridula Mirajkar, Sreelata Menon, Kanishka publishers, Vol 1
4. Advances in biochemical engineering/ Biotechnology, Stahl, Ulf et al., 2008.
5. Fundamentals of food biotechnology; Byong H.Lee, John wiley & sons.
6. Food biotechnology, Anthony pometto et al., CRC press; second edition, 2005.
7. Handbook of organic food processing and production, Simon Coright and Diane Mc Crea,, Second Edition
8. Microbiology – A Human Perspective, Nester, Anderson, Roberts, Pearsall, 4<sup>th</sup> edition, Mc Grew Hill Publication.
9. Biotechnologies food fermentation, V.K.Joshi, Ashok pandy, Vol II, Applied educational publishers and Distributors.
10. Food science and biotechnology, Bong S.Noh., ISSN: 1226 – 7708
11. Microbial biotechnology; Fundamentals of applied microbiology, Alexander N.Glazer, Hiroshi Nikaido, W.H. Freeman & Company.

**SEMESTER I**  
**ELECTIVE GROUP A**  
**PAPER I**  
**CONVENIENCE FOODS**  
**Hours of instruction /week :3**

**OBJECTIVES:**

To enable students

- 1.To gain knowledge on convenience foods
- 2.To acquire knowledge on food processing techniques.

**SUBJECT DESCRIPTION:**

This paper presents the need for new product development, processing and types of convenience foods and their marketing strategy.

**GOAL:**

To enable students to learn and gain awareness on convenience foods and their processing techniques.

**UNIT I**

**Food product development** –Development of new product, need for developing new products, Developing marketing strategy for new product, Strategies in product development, success and failure factors for new products.

**UNIT II**

**Snack foods**

**Popped snacks** – Popcorn –popping procedures,loss during popping,measurement of expansion,factors affecting quality of popcorn,storage.

**Puffed snacks** – Puffable materials,extrusion methods ,drying,Addition of flavours and colours,Simulated popcorn.

**Baked snacks** –Proportion and role of ingredients;**Sweet based** –plain cookies,wire cut cookies;**Salt based** –soda crackers and cheese crackers.

**UNIT III**

**Convenience foods for defense services** –IMF and Hurdle Technology-Principles.

Processing of dehydrated vegetables, vegetable powder, IMF fruit slices, IMF fruit bars, fruit milk, soup powder.

Foods designed by DRDO for defense services – list and principle of processing applied.

**UNIT IV**

**Ready to eat foods**– principle of retort processing, technique, production, advantages and disadvantages. Ready to eat foods available in India. Marketing and future prospects.

**UNIT V**

**Extruded foods** – Principle of extruders, Production of pasta- noodle and macaroni products, Common extruders used in food industry,Merits and demerits of extruder technology, Uses of extruded foods, Factors affecting extrusion performance.

**REFERENCE:**

- 1.The complete technology book on snack foods-H.Panda, NIIR, New Delhi
- 2.Food processing and preservation –G.Subbulakshmi & Shoba.A.Udipi,NewAge Publishers,2001.
- 3.Food Processing Industries –Small industry research Institute ,Delhi.
- 4.Indian Food industry
- 5.Food Processed Industry
- 6.Food and nutrition World

**SEMESTER II  
ELECTIVE GROUP A  
PAPER II  
FOOD PACKAGING  
Hours of instruction/week:3**

**OBJECTIVES:**

To enable students to understand the need for food packaging and the recent packaging materials and labeling.

**SUBJECT DESCRIPTION:**

This paper presents the functions of packaging material for different foods, types of packaging, their characteristics and applications in food.

**GOAL:**

To enable students to learn and gain knowledge on food packaging and applications during transportation.

**UNIT I**

Definition, functions of packaging materials for different foods, characteristics of packaging material, food packages -bags, pouches, wrappers,tetra packs.

**UNIT II**

Types of packaging materials – characteristics, applications in food industry, merits and demerits, textiles and wood, metal, glass, flexible films, rigid and semirigid plastic containers, paper and boards.

**UNIT III**

Microwave ovenable containers – characteristics, applications and advantages. Retortable packages – Retort pouches, retortable aluminium containers, composite flexible retortable packages – application and advantages. Shrink packaging, active packaging, smart pack, Intelligent packaging.

**UNIT IV**

Ecofriendly alternatives to plastics – Edible packaging – advantages, material used – lipid coating, proteins, composite films, current applications, biodegradable packaging material – biopolymer based edible film. Packaging of finished goods – weighing, filling, scaling, wrapping, cartooning, labeling, marking and trapping.

## **UNIT V**

**Labelling-** Standards for labelling, Purpose of labels, description of label for food packaging, critical elements of food label, types of labels, common terms for labels, materials used, surface treatment, labels for freight containers, labelling regulations, bar code, nutrition labelling, health claims, mandatory labelling provisions.

### **REFERENCES:**

1. Principles of food packaging by Stanley Sacharous. Roger C Griffirin. 2nd Ed. Avi pub Co. Westport.
2. A hand book of food packaging by Paine. F.A & Paine.H.Y. Leonard hill. Blackie Sons Ltd London.
3. Handbook of packaging materials. By Sacharow.S. Avi Pub Co. Westport.
4. Food packaging materials by Croshy N.T. Applied Science Pub Ltd. London.
5. The packaging media by Paine F.A. Blackie & Sons Ltd. London.
6. Food Packaging technology Hand book-NIIR,Delhi
7. Food processing technology- Fellows, Second edition, Woodhead Publ,England,2000.
8. Indian Food industry
9. Food Processed Industry
10. Food and nutrition World

**SEMESTER III**  
**ELECTIVE GROUP A**  
**PAPER III**  
**FOOD QUALITY CONTROL**  
**Hours of instruction/week: 3**

### **Subject Description:**

This paper presents the principles of quality control, food laws, food standards, critical points for hazard analysis, food patents.

### **GOALS:**

To enable students to learn and gain awareness on food laws, standards and aspects of food safety.

### **OBJECTIVES:**

To enable students

1. To gain knowledge on food safety & food laws
2. To study about quality control & common food standards.

## **UNIT I**

**Quality control** – Objectives, Importance, functions of quality control, Stages of quality control in food industry.

**Food quality assurance** – Design of company quality assurance program, Microbiological concerns.

Managing quality in supply chain and marketing of food products.

## **UNIT II**

**Government regulations in quality control** – FAO/WHO codex Alimentarius commission, PFA, AGMARK, BIS, FPO, fair average quality (FAQ) specification for food grains, ISO 9000 series.

**HACCP** – background, current status, structured approach, principles, benefits and limitation.

Consumer Protection Act (CPA)

### **UNIT III**

**Role of Central and State Government in imparting quality control** – WHO assisted activities – Role of control food laboratory and state food laboratories. Qualification and duties of public analyst and food inspector.

### **UNIT IV**

**Food standards** – cereals & products – bread, biscuits, cakes, pasta products.

**Fruit products** – jam, juices, squashes, ketchup, sauce,

**Oils & fats** – coconut oil, groundnut oil, palm oil, sunflower oil, vanaspati.

**Milk & products** – Skimmed milk powder, partly skimmed milk powder, condensed sweetened milk. Other products-coffee, tea, sugar, honey, toffees.

**Patent** – definition, requirements, patent laws in India, administrator, need for patent system, advantages, precautions to be taken by applicants, patent procedures, non-patenable.

### **UNIT V**

**Food safety** – meaning of food safety.

**Importance of food** quality and safety for developing countries.

**Food hazards** – Physical, Chemical, Biological hazards associated with foods – types. Effect of processing and storage on microbial safety.

**Types of food toxicants** – Endogenous, natural, synthetic toxicants.

### **REFERENCES:**

1. A first course in food analysis – A. Y. Sathe, New Age Publications, 1999.
2. Food Science – Norman. N. Potter & Joseph. H. Hotchkiss, CBS Publishers, 1996.
3. Food Science, Chemistry & Experimental foods – M. Swaminathan, Bappco Publishers.
4. BIS standards.
5. Technology of food preservation – Desrosier And Desrosier, CBS Publishers, Fourth edition, 1999.
6. Indian food Industry.
7. Processed food Industry.

**SEMESTER IV**  
**ELECTIVE GROUP A**  
**PAPER IV**  
**QUALITY CONTROL PRACTICALS**  
**Hours of instruction/week :3**

1. Estimation of titrable acidity.
2. Estimation of total solids
3. Estimation of specific gravity in foods.
4. Estimation of fat content in milk by volumetric Gerber method.
5. Analysis of pectin in foods.
6. Estimation of lactose in milk.
7. Estimation of tannins in tea.
8. Test for rancidity in oils – Kries test
9. Food adulteration – Test to detect adulteration
10. Preparation and inoculation of growth media – Inoculation and incubation – counting of microbes.
11. Product formulation – Cereal based, Pulse based, Milk based, Vegetable, Fruit based or Combinations.
12. Standardisation of formulated food
13. Evaluation of sensory characteristics – development of score cards
14. Consumer acceptability and popularization of formulated product

**SEMESTER I  
ELECTIVE GROUP B  
PAPER I**

**Institutional Food Management**

**Objectives:**

To enable the students

1. By emphasizing the various facets of functioning of food service institutions,
2. With the necessary knowledge to become an efficient manager.

**UNIT - I**

**Food service system**

Introduction to food service system, evaluation of the food service industry, characteristics of the various types of food service units-commercial, institutional, hospital, military, any other. Scope and development of food service institution in India  
Principles and functions of food service management.

**UNIT – II**

**Food service organization**

Definition and types of organization in food, tools of organization and administrative leadership.  
Financial management –definitions, application of management accounting to catering operations, budgeting, determining the financial needs sources and book-keeping and accounting.

**UNIT – III**

**Quantity food purchase**

Procedures and records involved in purchasing, receiving, storing, and issuing of food materials. Factors involved in selection of raw materials. Quantity food service - types, objectives, Indian and western styles of service.

**UNIT – IV**

**Quantity food preparation**

Menu planning – definition, types of menus. Standardization of recipe – definition, standard recipe format and uses. Standard portion sizes - definition, portioning equipment and portion control. Use of left over foods.

**UNIT – V**

**Organization of space and equipment**

Kitchen- type, designing, storage space and service areas.

Equipment - planning, selection and purchasing.

Sanitation and safety of food service Industry-Sanitation of plant – measures taken to maintain sanitation – types of cleaning. Personnel hygiene – facilities and benefits provided to workers.

Safety at work – measures adopted.

## REFERENCES

1. Sethi, m. and Matha, S. Catering Management – An Integrated approach, wiley Eastern Ltd., New Delhi, II Edition 1993.
2. Palacio, J.P. Harger, V., Shugart, G. and Theis, M. West's Introduction to food service, MacMillan Publication Co., New York, XVII Edition, 1994.
3. Kotschevar, L.H. and Teerell, M.E., Food service planning, Layout and Equipment, MacMillan Publication co., New York, III Edition, 1985.
4. Delfakis, H. Scanion, W.C. and Van Burch, J.B. Food service Management, South Western Publication Co., cincinnati, ohio, 1992.
5. Cracknell, H.C. and Nobis, G. Mastering Restaurant Service, Macmillan Master Service, Macmillan Education Ltd, (pub) London, 1989.

## SEMESTER II ELECTIVE GROUP B PAPER II Food Product Development and Marketing

### Objectives:

To enable the students

1. To understand and know various aspects of food product develop food science and technology, packaging, nutrition values and marketing.
2. To recognize the potential for entrepreneurship through marketing.

### UNIT-I      **New product development**

Definition and classification, characterization and factors shaping new product development. Health concerns impact of technology and market place influence.

### UNIT-II      **Formulation of new product development**

Formulation of new product development for infants, preschool, sports person, elderly- Selection of raw materials, portion size, standardization methods, calculation of nutritive values, cost production, shelf life.

### UNIT-III      **Sensory evaluation**

Establishing sensory panels – Designing testing facilities – Analytical Test – Conduct a sensory Evaluation Test – Designing score card, objective evaluation, Instruments used for texture evaluation.

### UNIT-IV      **Packaging**

Packaging – Introduction, Types of packing materials. New product development – patent, patent laws, international code for Intellectual property rights (IPR).

## **UNIT-V      Marketing**

Concept of market and marketing – Approaches to study marketing and marketing functions, market structure, market efficiency and market integration. Role of government in promoting agricultural marketing.

### **REFERENCES**

1. Baker,R.C., Fundamentals of New Food Product Development,1988.
2. Fuller G.W, New Food Product Development from Concept to Market place.
3. Sivarama Prasad A. Agricultural marketing in India, Mittal Publication, New Delhi, 1985.
4. Aaron, L. Brody, Joha .B. Lord.Developing New Food Product for a changing Market place, 2<sup>nd</sup> Edition, 2005,
5. Acharya S. S. and N.L. Agarwal Agricultural Marketing in India – Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, 1992.

## **SEMESTER III ELECTIVE GROUP B PAPER III Culinary Techniques**

### **OBJECTIVES:**

To enable the student

- To develop skills needed for a career in the food service industry.
- To learn a variety of cooking techniques

### **UNIT - I**

#### **Workstation set-up**

The essentials for setting up workstations in basic commercial and institutional settings. Set up of the grill, hot and cold food stations, salad, dessert, and baking stations.

#### **Culinary tools**

Hand Tools, Light Kitchen Equipment, Heavy Kitchen Equipment – types and uses

### **UNIT - II**

#### **Dessert baking and cake decoration**

Cake-mixing methods, cake preparation fundamentals, assembling and icing, and decorating techniques. Preparations of different types of cakes, pies, cookies, petite four, and pastries that use various dough bases. Preparations of butter cream and glazed icings. Cake decoration. Sweetening substitutions for sugar-restricted diets.

#### **Desserts**

Different types of puddings, (cream, baked, chilled, soufflé, mousses), gelatins, fruit dishes, parfaits, sorbets, éclairs, and crepes. Ingredient substitution for diet-restricted desserts.

### **UNIT - III**

#### **Salads**

Components and preparation of salads and salad dressings. Salad preparation includes fruit, vegetable, leafy green, meat, seafood, gelatin, and pasta salads dressings made from the three basic types of salad dressings – oil and vinegar, mayonnaise, and boiled or cooked.

#### **Sandwich production**

Preparation of hot, cold, and grilled sandwiches.

### **UNIT - IV**

#### **Vegetable cooking**

Vegetarian entrees and side dishes. Vegetables cuts and different methods of preparing common vegetables including boiling, steaming, and sautéing. Vegetables used for flavoring and garnishing. Vegetable carving

#### **Soups, stocks, sauces, and gravies**

Common procedures used to prepare stocks, ingredients used in making stocks, and the function of a stock in making sauces and soups. Classifications of soups, preparations methods of thickening, holding, and serving. Classic and contemporary sauces and the uses featuring the five major sauces in the culinary field.

### **UNIT - V**

#### **Beverages**

Hot and cold beverages and proper serving methods. Beverage products prepared with and without caffeine. Breakfast drinks such as hot cocoa and party beverages such as fruit-based punches.

#### **Dairy products**

The use of dairy products as thickening, binding, adhesive, emulsifying, clarifying, and lightening. Types of milk products such as cheese, cream, sour cream, and whipping cream. Desserts using eggs

#### **Spices and seasonings**

Use various spices and seasonings in food in order to enhance flavors in cereal and pulse preparations, meats, poultry, fish, and vegetables.

Enhancement of special diets that are fat and salt restrictive through various herbs and spices. Basic procedures of infusion with fresh herbs and spices.

#### **Reference Books**

1. The new food lovers companion, Comprehensive Definitions of Nearly 6000 Food, Drink, and Culinary Terms (Barron's Cooking Guide) by *Sharon Tyler Herbst*
2. Recipes, Restaurants, & Pitmasters from America's Great Barbecue Regions by *Michael Karl Witzel*

3. [\(The\) Chef's Companion](#): A Concise Dictionary of Culinary Terms, 2nd Edition by *Elizabeth Riely*
4. [Chef's Garden: Fresh Produce from Small Spaces](#) by *Terence Conran*
5. [Cook's Encyclopaedia: Ingredients And Processes](#) by *Tom Stobart*
6. [The Cook's Essential Kitchen Dictionary](#) By *Jacques L. Rolland*
7. [Culinary Artistry](#) By *Andrew Dornenburg & Karen Page*
8. [Knives Cooks Love: Selection. Care. Techniques. Recipes.](#) by *Sur La Table and Sarah Jay*
9. [Larousse Gastronomique](#) (2001 revised) *Prosper Montagne (Editor)*
10. [Knives Cooks Love: Selection. Care. Techniques. Recipes.](#) by *Sur La Table and Sarah Jay*
11. [Larousse Gastronomique](#) (2001 revised) *Prosper Montagne (Editor)*
12. [\(The\) Professional Chef](#), 7th Edition by *Culinary Institute of America*
13. [\(The\) Professional Pastry Chef](#): Fundamentals of Baking and Pastry, 4th Edition by *Bo Friberg*
14. [\(The\) Science of Good Food](#): The Ultimate Reference on How Cooking Works by *David Joachim, Andrew Schloss*
15. Professional Chef: The Art of fine Cooking, , by [Saraswat, A](#); Publisher: UBS Publishers Distributors Ltd (Published: 2004)
16. The Kitchen Hand: A Miscellany of Kitchen Wisdom, by [Telford, Anthony](#); Publisher: Sue Hines Book (Published: 10/2004)

**SEMESTER IV**  
**ELECTIVE GROUP B**  
**PAPER IV- Practical**  
**Food Service Management Practical**

**Objectives:-**

- To gain an understanding of commercial food service.
- To have hands-on preparation of items popular in food operations.
- To gain experience in menu planning, recipe preparation, food portions and food preparation, presentation and cost and nutritive value calculation.
- To apply the interpersonal skills crucial to working with coworkers and others effectively.
- Perform cleaning and sanitation duties in accordance with sanitation and health codes
- Prevent food contamination

**List of exercises**

Recipe preparation, food portions, presentation, cost and nutritive value calculation for the following..

1. Prepare four salads and salad dressings
2. Prepare two each hot and cold sandwiches
3. Prepare eggs, for breakfast foods
4. Use dairy and cheese products in two recipes
5. Prepare two fruits and fruit dishes
6. Prepare two vegetables and vegetable dishes
7. Prepare pasta, grains, rice and legumes (two dishes each)
8. Prepare any two meat and meat dishes including beef, pork, poultry, fish or shellfish
9. Prepare four stocks, basic sauces and gravies
10. Prepare two vegetarian and two non- vegetarian soups
11. Prepare two basic baked goods - Fruit Tart and Lemon & Chocolate Cake
12. Two field trips after the mid-point of the program to hotels / restaurant to observe work station set up, tools used, preparation and portioning, pricing and presentations.