MASTER OF SCIENCE (FOOD AND NUTRITION)

REGULATIONS

ELIGIBILITY

A pass in any one of the following Degree Courses of B.Sc Nutrition and Dietetics, Nutrition, Food Service Management and Dietetics, Food Science and Quality Control, Food Science and Nutrition, Botany, Zoology , Biochemistry, Biotechnology, Chemistry, Microbiology, Home science or Family and Community Science or an Examination accepted as equivalent thereto by the Academic Council, subject to such conditions as may be prescribed thereto are permitted to appear and qualify for the **M.Sc., Food and Nutrition Examination** of this College after a course study of two academic years.

OBJECTIVE OF THE COURSE

The Curriculum is designed to attain the following learning goals which students shall accomplish by the time of their graduation:

1. To provide advanced knowledge on food science and nutrition to enhance the quality of life through the improvement of human health and nutritional status
2. To enable the students to implement the basic food science in operation
3. To develop skills and techniques in food preparation with conservation of nutrients and palatability using cooking methods generally employed
4. To help the students to contribute proper utilization of foods and prevent wastes
5. To understand the prevalence of malnutrition in our Country and gain knowledge on effective methods to combat malnutrition.

SCHEME OF EXAMINATION

Subject Code	Subject	Ins. Hrs/ Week	Exam Duration	Max Marks			Credit Points
				CA	CE	Total	
First Semester							
15PFN13A	Advanced Food Science	7	3	25	75	100	4
15PFN13B	Nutrition Through Life Cycle	6	3	25	75	100	4
15PFN13C	Nutritional Biochemistry	5	3	25	75	100	4
15PFN13D	Advanced Food Chemistry	6	3	25	75	100	4
15PFN13P	Lab-I: Food science and food chemistry	3	3	40	60	100	4
	ELECTIVE I	3	3	25	75	100	4
		30				**600**	**24**
Second Semester							
15PFN23A	Food Processing	5	3	25	75	100	4
15PFN23B	Physiological Aspects of Nutrition	5	3	25	75	100	4
15PFN23C	Macronutrients	6	3	25	75	100	4
15PFN23D	Nutrition in Diseases – I	5	3	25	75	100	4
15PFN23P	Lab-II: Food Analysis	6	3	40	60	100	4
	ELECTIVE II	3	3	25	75	100	4
		30				**600**	**24**
Third Semester							
15PFN33A	Micronutrients	5	3	25	75	100	4
15PFN33B	Nutrition in Diseases – II	5	3	25	75	100	4

15PFN33C	Research Methodology and Statistics	5	3	25	75	100	4
15PFN33D	Computer Applications in Nutrition	3	3	10	40	50	2
15PFN33P	Lab-III: Clinical Nutrition Techniques	6	3	40	60	100	4
15PFN33Q	Lab-IV: Nutrition in Diseases	3	3	20	30	50	2
15PFN33T	Industry Internship	-	3	-	50	50	2
	ELECTIVE III	3	3	25	75	100	4
		30				**650**	**26**
Fourth Semester							
15PFN43A	Community Nutrition	5	3	25	75	100	4
15PFN43V	Project Work and Viva Voce	22	3	120	80	200	8
	ELECTIVE IV	3	3	25	75	100	4
		30				**400**	**16**
	TOTAL					**2250**	**90**

Note: One Month Internship in Food Industry and submit a Training Report for Comprehensive Examination in the third semester.

ELECTIVE – I

(Student shall select any one of the following subject as Elective in first semester)

S. No	Subject Code	Name of the Subject
1.	15PFN1EA	Functional Foods and Neutraceuticals
2.	15PFN1EB	Institutional Food Management
3.	15PFN1EC	Food Product development

ELECTIVE – II

(Student shall select any one of the following subject as Elective in second semester)

S. No	Subject Code	Name of the Subject
1.	15PFN2EA	Human Physiology
2.	15PFN2EB	Food Packaging
3.	15PFN2EC	Clinical Nutrition

ELECTIVE – III

(Student shall select any one of the following subject as Elective in third semester)

S. No	Subject Code	Name of the Subject
1.	15PFN3EA	Food Safety and Quality Control
2.	15PFN3EB	Culinary Techniques
3.	15PFN3EC	Convenience Foods

ELECTIVE – IV

(Student shall select any one of the following subject as Elective in fourth semester)

S. No	Subject Code	Name of the Subject
1.	15PFN4EP	Food Quality Control Lab
2.	15PFN4EQ	Food Service Management Lab
3.	15PFN4EC	Food Biotechnology

Total Credit Distribution

Subjects	Credits	Total		Credits	Cumulative Total
Core	4	12 x 100 =	1200	48	
Core	2	01 x 50 =	50	02	
Core Lab	4	3 x 100 =	300	12	
Core Lab	2	1x 50 =	50	02	**74**
Industry Internship	2	1 x 50 =	50	02	
Project	8	1 x 200 =	200	08	
Elective	4	4 x 100 =	400	16	**16**
		Total	**2250**	**90**	**90**

FOR COURSE COMPLETION

Students have to Complete the following Subjects:

- Core papers in I, II, III and IV Semesters.
- Elective papers in the I, II , III and IV Semesters.
- Core practical's in I,II, and III Semesters.
- Industry Internship Report & Viva- Voce in III Semester
- Project and Viva - Voce in IV Semester
- One month training in multi-specialty Hospital to qualify for the Degree

15PFN13A	ADVANCED FOOD SCIENCE	SEMESTER- I

Total Credits: 4

Hours Per Week: 7

OBJECTIVES:

To enable students to

1. Gain knowledge on composition and nutritive value of foods
2. Develop the understanding about the science of foods

CONTENTS

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

chemicals, mold inhibitors and antioxidants, irradiation, microwave heating.

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

TEXT BOOKS:

1. *Srilakshmi, B.,* **"Food Science"., 6th Edition** ., New Age International Private Ltd., New Delhi, India.
2. *Swaminathan, M* **.,"Food Science Chemistry and Experimental Foods**", Bappco Publishers, Bangalore, India.

REFERENCE BOOKS:

1. *Manay,S.N and Shadaksharaswamy.M.,* 2008 .,"**Food, facts and Principles**"., 3rd Edition., New Age International(P) Ltd. Publishers., New Delhi.,India.
2. *Potter.N.N and Hotchkiss.J.H.*,1996., "**Food Science**" CBS Publishers.,

15PFN13B	NUTRITION THROUGH LIFE CYCLE	SEMESTER-I

Total Credits: 4
Hours Per Week: 6

OBJECTIVES:

Enable the students to

1. Understand the role of adequate nutrition in stages of life cycle
2. Gain advanced knowledge about nutrition for the betterment of health

CONTENTS

UNIT- I

Concept of different food groups, recommended dietary allowances for Indians – Nutrients and Food, basis for requirement, computation of allowance - Macronutrients.
Nutrition in pregnancy - Stages of gestation, maternal physiological adjustments, weight gain during pregnancy and nature of weight gain, nutritional requirements, eating disorders and complications of pregnancy

UNIT- II

Nutrition in Lactation - Physiological adjustments during lactation, Physiology of milk Production - hormonal controls and reflex action, lactation in relation to growth and health of infants, 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 for maintenance of health, RDA

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

UNIT- V

Nutrition for Special Condition

Sports and Exercise Fitness - 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. Concept of aerobic exercises

Nutrition during higher altitudes

Nutrition during Space voyage

Nutrition for Rehabilitation and mentally challenged

TEXT BOOKS:

1. *Mahan.K and Escott.S.,* 2000., "**Food Nutrition and Diet Therapy**", 11th Edition.,W.S. Saunder's Company, Philadelphia, USA.
2. *Srilakshmi .B.,* "**Dietetics**"., 2010, 6th Edition., New Age International Pvt. Ltd., New Delhi, India.

REFERENCE BOOKS:

1. *Brown .J.E.,* "**Nutrition Through The Lifecycle**"., 2002., Wadsworth Thomson Learning**,** USA.
2. *Shills E.M., Olson, Shike.M and Ross. A.C.* 1999, "**Modem Nutrition in Health and Disease**". 9th Edition. Lippincott Williams and Wilkins Publications., Philadelphia.

15PFN13C	NUTRITIONAL BIOCHEMISTRY	SEMESTER-I

Total Credits: 4

Hours Per Week: 5

OBJECTIVES:

To enable the students to

1. Understand the application of biochemistry in the field of Food and Nutrition.
2. Gain knowledge on assay techniques and instrumentation

CONTENTS

UNIT- I

Metabolism of Carbohydrates - Glycolysis, TCA cycle, HMP shunt and energy production, glycogenesis, gluconeogenesis, biosynthesis of ascorbic acid. Renal threshold for glucose. Inborn errors of carbohydrate metabolism.

UNIT- II

Metabolism of Fatty Acids - Biosynthesis and oxidation of saturated .and unsaturated fatty acids, cholesterol and phospholipids, Bile salts and fatty liver. Inborn errors of fat metabolism.

UNIT- III

Protein- Bio-synthesis and 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. Inborn errors of protein metabolism.

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. ELISA.

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. Principle and procedure of operation of GC, HPLC.Elemental analysis by atomic absorption spectroscopy and flame photometry.

TEXT BOOKS:

1. *Lehininger, A.L.*, 2000., "**Biochemistry**"., Worth Publishers Inc., New York,.
2. *Deb A.C.*, 2004., "**Fundamentals of Biochemistry**", 8th Edition., New Central Book Agency Pvt Ltd., Kolkata, India.

REFERENCE BOOKS:

1. *Shanmugam.A.,* 2004.,"**Fundamentals of Biochemistry for Medical Students**"., Karthik Printers, 7th Edition., India.
2. *Sathyanarayana .U and Chakrapani U.*, 2004., "**Biochemistry**", 3rd Edition, Books and Allied Pub., Kolkata, India.

15PFN13D	ADVANCED FOOD CHEMISTRY	SEMESTER-I

Total Credits: 4

Hours Per Week: 6

OBJECTIVES

To enable the students

1. To gain insight into the chemistry of foods.
2. To understand the various properties exhibited by foods

CONTENTS

UNIT - I

Physico-chemical properties of foods: Moisture in Foods, Hydrogen Bonding, Bound Water, Water Activity in Foods, Determination of Moisture Content in Foods, True Solutions, Dispersions, Sols, Gels, Foams, Colloids and Emulsions.

UNIT - II

Chemistry of Starch and Sugars :Components of Starch, Swelling of Starch Granules, Gel Formation, Retrogradation, Syneresis, Effect of Sugar, Acid, Alkali, Fat and Surface Active Agents on Starch, Stages of Sugar Cookery, Crystal Formation and factors affecting it. Types of Candies, Action of Acid, Alkali and Enzymes. Chemistry of Milk Sugar, Non Enzymatic Browning.

UNIT - III

Chemistry of Proteins: Components of Wheat Proteins, Structure, Gluten Formation Effect of Soaking, Fermentation and Germination on pulse proteins, Properties of egg protein, Chemistry of milk protein, Changes in milk, Egg and meat proteins during heating, Action of heat, acid, alkalis on vegetable proteins and animal proteins.

UNIT - IV

Chemistry of Fats and Oils: Physical and chemical Properties of fats and oils, Rancidity, Hydrogenation, Winterization, Decomposition of triglycerides, Shortening power of fats, Changes in fats and oils during heating, Factors affecting fat absorption in foods.

UNIT - V

Chemistry of Pectic Substances, Plant Pigments, Spices and condiments
Pectins, Phenolic Components, Enzymatic browning in fruits and vegetables, Volatile compounds from cooked vegetables, Different types of plant pigments – Water and Fat Soluble pigments, Properties and active principles of spices and condiments.

TEXT BOOKS:

1. *Shakuntala Manay, Shadaksharaswamy. M* **(2000) Foods, Facts and Principles,** New Age International Pvt Ltd Publishers, 2nd Edition.
2. *Chandrasekhar,* **U. Food Science and applications in Indian Cookery (2002)** Phoenix Publishing House, New Delhi
3. *Swaminathan, M.* **Food Science, (2005) Chemistry and Experimental Foods,** Bappco Publishers, Bangalore.

REFERENCE BOOKS:

1. *Meyer, L.H*, **Food Chemistry,** (2004) CBS Publishers and Distributors, 4th edition
2. *Paul, P.C. and Palmer*, **H.H. Food Theory and Applications** (2000) JohnWiley and Sons, New York, (Revised Edition)
3. *Chopra H.K, Panesar, P.S*, **Food Chemistry** (2010) Narosa Publishing House, New Delhi

15PFN13P	LAB - I : FOOD SCIENCE AND FOOD CHEMISTRY	SEMESTER-I

Total Credits: 4

Hours Per Week: 3

OBJECTIVES

To enable the students

1. To understand the scientific principles involved in food preparation and physio-chemical changes that occurs during cooking.

CONTENTS

1. Gelatinization of Starch, Retrogradation and Syneresis.
2. Microscopic examination of uncooked and gelatinized.
3. Gluten Formation.
4. Stages of Sugar Cookery, Preparation of Fondant, Fudge, Caramel and Toffee.
5. Scum formation, Boiling over and scorching of milk.Effect of Soaking, germination and fermentation of Pulses.
6. Coagulation of egg white and egg yolk, Boiled Egg, Poached Egg, Omlettes, Custards, Cake and Mayonnaise.
7. Coagulation and precipitation of milk proteins.
8. Changes observed in cooking meat, fish and poultry, Testing the tenderness of meat.
9. Smoking Temperature of different fats, Factors affecting absorption of fats
10. Effect of acids, alkali and heat on water soluble and fat soluble pigments
11. Enzymatic Browning and Methods of prevention

15PFN23A	FOOD PROCESSING	SEMESTER- II

Total Credits: 4

Hours Per Week: 5

OBJECTIVES

1. To enable students to learn different food processing techniques
2. To know the government strategies in food processing sector

CONTENTS

UNIT- I

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 operations of the food industry.

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 and processing of products.

UNIT- III

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

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

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

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

Poultry - Production, preparing poultry for consumption, packaging.

Fish - Production, effect of handling practices.

Egg- Production and manufacturing of egg products.

UNIT- V

Vegetables - Drying and dehydration techniques –drum drying, vacuum puffing, foam mat

drying, freeze drying, accelerated freeze drying.

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.

Mushroom - Production, processing.

TEXT BOOKS

1. *Subbulakshmi and Udipi.S.*, 2001., "**Food processing and Preservation Technology**"., New Age Publications., New Delhi, India.
2. *Khader.V*, 2001., "**A Textbook of Food Processing Technology**", ICAR, New Delhi, India

REFERENCE BOOKS

1. *Sivashankar. B.,* 2002 .,"**Food Processing and Preservation**", PHI, New Delhi, India.
2. **Modern Technology of Food Processing and Agro Based Industry**, 2nd Edition, NIIR Board, Asia Pacific Business Press, 2002.

15PFN23B	PHYSIOLOGICAL ASPECTS OF NUTRITION	SEMESTER- II

Total Credits: 4
Hours Per Week: 5

OBJECTIVES

To enable the students

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

CONTENTS

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, Michaels Menton 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.

TEXT BOOKS:

1. *Sembulingam.K and Sembulingam.P.*, 2013., "**Essentials of Medical Physiology**"., 6th Edition, JAYPEE Brothers, Medical Publishers., New Delhi, India.
2. *Stites.D.P., Terr.A.I. and Parsiow.T.G.*, 1994., "**Basic and Clinical Immunology**"., 8th Edition.,Prentice Hall International Inc.,

REFERENCE BOOKS:

1. *Guyton, A.G. and Hall, J.B*. (1996): **Text Book of Medical Physiology**, 9th Edition, W.B. Sanders Company, Prism Books (Pvt.) Ltd., Bangalore.
2. *Subrahmanyam.S.*,2007., "**Text Book of Human Physiology**"., S.Chand Publications.,New Delhi, India.

15PFN23C	MACRONUTRIENTS	SEMESTER- II

TotalCredits: 4
Hours Per Week: 6

OBJECTIVES:

To enable students

1. Gain knowledge on the macro nutrients and its functions
2. To update the requirements of nutrients

CONTENTS

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, utilization and nutritional importance.

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

UNIT- III

Fats and lipids - Classification of fats and fatty acids, digestion and absorption of fats, transport of lipid in blood, lipid transformation in the liver, 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, function, digestion, absorption and utilization. Factors affecting protein utilization. Amino acid requirements, 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, food sources, role of animal proteins and vegetable protein mixture in combating malnutrition, estimation of amino acids and protein needs.

UNIT- V

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 rnetabolism and organ damage.

TEXT BOOKS:

1. *Groff J.L.and Gropper.S.*S., 2000. "**Advanced Nutrition and Human Metabolism**", 3rd Edition, Thomson Wardsworth, USA.
2. *Swaminathan M.*, 2002., "**Advanced Textbook on Food and Nutrition**" Vol I, Bangalore Printing press and Publishing Co.Ltd. India.

REFERENCE BOOKS:

1. *Mahan.K and Escott.S.*, 2000., "**Food Nutrition and Diet Therapy**", 11th Edition.,W.S. Saunder's Company, Philadelphia, USA.
2. *Shils E.M., Olson, Shike.M and Ross*. A.C. 1999, "**Modem Nutrition in health and disease**", Philadelphia,ninth edition.Lippincott Williams and Wilkins Publications, Philadelphia.

15PFN23D	NUTRITION IN DISEASES - I	SEMESTER-II

Total Credits: 4
Hours Per Week: 5

OBJECTIVES

To enable the students

1. To understand the etiology, symptoms and complications of various diseases
2. To gain knowledge about dietary modifications in various disease conditions

CONTENTS

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.
Enteral and Parenteral nutrition –types, applications, types and nutrient composition of feeds, complications, merits and demerits. Functions of Indian Dietetic Association.

UNIT- II

Gastro Intestinal Diseases
Diseases of Oesophagus: Esophagitis and Hiatus hernia.
Disease of Stomach: Indigestion, hypochlorhydria, acute and chronic gastritis and peptic ulcer.
Disease of Intestine: Flatulence, constipation - atonic, spastic and obstructive, diarrhoea - acute and chronic and steatorrhea.
Inflammatory Diseases -Diverticulosis, diverticulitis, regional enteritis,ulcerative colitis, malabsorption syndrome - sprue.

UNIT- III

Diabetes Mellitus - Epidemiology / Incidence - Classification - symptoms. Metabolic changes : Long term and 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, maple syrup urine diseases and gout.

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.

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 of CVD.

UNIT- V

Nutrition in Cancer - Epidemiological studies, classification of neoplasms, principles of cancer, pathogenesis. Causes of cancer cell development, metabolic and nutritional alterations in malignancy, nutritional therapy for cancer, nutritional problems for cancer.

TEXT BOOKS:

1. *Mahan.K and Escott.S*., 2000., "**Food Nutrition and Diet Therapy**", 11th Edition.,W.S. Saunder's Company, Philadelphia, USA.
2. *Davidson, S.S. Passmore, P., Branch, J.F.*, 1993.,"**Human Nutrition and Dietetics**"., 9th Edition., F andS, Lingstons Ltd., Edinburgh and London.

REFERENCE BOOKS:

1. *Antia, F.P.,* 1989., "**Clinical Dietetics and Nutrition**"., Oxford University., Mumbai.
2. *Shills E.M., Olson, Shike.M and Ross*. A.C. 1999, "**Modem Nutrition in health and disease**"., 9th Edition., Lippincott Williams and Wilkins Publications., Philadelphia.

15PFN23P	LAB-II: FOOD ANALYSIS	SEMESTER- II

Total Credits: 4
Hours Per Week: 6

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. Thiamine
L. Riboflavin
M. Vitamin-C

(foods have to be analyzed before and after processing)

II. Glycogen extraction and estimation
III. Analysis of fat-sap no, iodine no, acid no and RM value
IV. Estimation of lipid in egg yolk
V. Sorensen's formal titration for estimation of amino acid.

15PFN33A	MICRONUTRIENTS	SEMESTER -III

Total Credits: 4

Hours Per Week: 5

OBJECTIVES

To enable the students

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

CONTENTS

UNIT- I

Calcium – distribution of calcium in the body, functions. Calcium absorption and utilization, regulation of calcium, requirements, sources, Deficiency, toxicity and RDA.

osphorus - Concentration in the body, calcium - phosphorus ratio, phosphorus adsorption and utilization, deficiency, toxicity, sources and RDA.

Sodium - Potassium, Magnesium and Sulphur - Distribution, absorption, utilization, functions, sources, deficiency, toxicity and RDA.

UNIT- II

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

Iron- Fuctions, intake, utilization, bio availability of iron, storage, output and iron balance, deficiency, toxicity and sources. Role in prevention of anaemia..

Iodine - History, functions,metabolism,deficiency.

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

Historical background – Functions, sources, RDA, 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. Conversion of carotene into vitamin A in human beings, recommended intake, human deficiency and diagnosis, toxicity.

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, recommended intake, deficiency and diagnosis, toxicity, bioavailability and inter relationships.

UNIT- V

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

TEXT BOOKS:

1. *Williams.S.R.,* 1989., "**Nutrition and Diet Therapy**", Times Mirror Masby College Publishing St. Laws, Toronto, Boston.
2. *Mahan.K and Escott.S*., 2000., "**Food Nutrition and Diet Therapy**", 11th Edition.,W.S. Saunder's Company, Philadelphia, USA.

REFERENCE BOOKS:

1. *Whitney P.N.,* and Roes S.R., 1996., "**Understanding Nutrition**"., West Publication Co,
2. *Swaminathan, M.,* 2000., "**Advanced Text Book foods Nutrition**", Vol.1.,Bappco Publication., Bangalore., India

15PFN33B	NUTRITION IN DISEASE- II	SEMESTER-III

Total Credits: 4
Hours Per Week: 5

OBJECTIVES:

To enable the students

1. To Understand the etiology, symptoms and complications of various diseases
2. To gain knowledge about dietary modifications in various disease conditions.

CONTENTS

UNIT- I

Etiological factors and Dietary modifications in

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

UNIT- II

Nutritional Imbalances - Obesity and under weight, types of obesity, etiological factors, assessment of obesity, grades of obesity, theories - set point and fat cell theory, thermogenesis in obesity. Dietary modifications for obesity, anorexia, bulimia nervosa.

Respiratory and Musculo-skeletal Systems

Arthritis, rheumatoid and osteoarthritis, asthma, chronic obstructive pulmonary diseases, epilepsy and multiple sclerosis.

UNIT- III

Diseases of Liver, Gall Bladder and Pancreas

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

UNIT- IV

Diseases of Kidney

Etiology, dietary Management for kidney diseases- acute and chronic glomerulonephritis, nephrosis, acute renal failure, chronic renal failure, end stage renal disease, uremia, nephrosclerosis, nephrolithiasis, kidney transplantation, 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.

TEXT BOOKS

1. *Mahan.K and Escott.S*., 2000., "**Food Nutrition and Diet Therapy**", 11th Edition.,W.S. Saunder's Company, Philadelphia, USA.
2. *Williams.S.R.,* 1989., "**Nutrition and Diet Therapy**", Times Mirror Masby College Publishing St. Laws, Toronto, Boston.

REFERENCE BOOKS

1. *Antia, F.P.,* 1989., "**Clinical Dietetics and Nutrition**"., Oxford University., Mumbai,India.
2. *Shils E.M., Olson, Shike.M and Ross*. A.C. 1999, "**Modem Nutrition in Health and Disease**", 9th Edition., Lippincott Williams and Wilkins Publications, Philadelphia.

15PFN33C	RESEARCH METHODOLOGY AND STATISTICS	SEMESTER -III

Total Credits: 4
Hours Per Week: 5

OBJECTIVES

To enable the students to

1. Understand the principles and methods of research
2. Apply statistical procedure to analyze numerical data and draw inferences.

CONTENTS

UNIT- I

Meaning of research, objectives of research, types of research and their application, selection and formulation of research problems, hypothesis, designing a research — different types, census and sample method, theoretical basis of sampling, sampling methods — random sampling methods and non-random sampling methods, size of sample, sampling and nonsampling errors.

UNIT- II

Methods of Collecting Primary Data - Questionnaire, preparation of schedules, interview method, case study method, experimentation method, sources of secondary data, precautions while using secondary data.

Editing and Coding the Data

Organization of Data - Classification - meaning and objectives, types of classification, fonnation of discrete and continuous frequency distribution, tabulation - role, part of a table, general rules of tabulation, types of tables.

UNIT- III

Representation of Data - Diagrammatic and graphical representation - significance of diagrams and graphs - general rules for constructing diagrams - types of diagrams, graphs of time series, graphs of frequency distribution.

Interpretation and Report Writing - Meaning of interpretation, technique, precautions, format of research report, types, steps and stages, mechanism and style, precautions and essentials for good report, footnotes and bibliographical citations.

UNIT- IV

Measures of Central Tendency - Mean, median, mode, their relative advantages and disadvantages.Measures of dispersion – mean deviation, standard deviation, quartile deviation. Co-efficient of variation, percentile and percentile ranks. Association of attributes, contingency tables, correlation, coefficient of correlation and its interpretation, rank correlation, regression equations and predictions.

UNIT- V

Tests of significance – large and small samples, 't' and 'F' test, tests for independence using chi-square test. Analysis of variance - one-way and two-way classification.
Probability - Rules of probability and its applications. Distribution - normal, binomial, their properties, importance of these distributions in statistical studies.
Post Hoc tests – LSD, Duncan tests

TEXT BOOKS:

1. *Pillai .R.S.N., Bagavathi .V.,* 2001., "**Statistics**", Sultana Chand and Sons, New Delhi, India.
2. *Gupta, S.P.,* 2002., "**Statistical Methods**", Sultana Chand and Sons, New Delhi, India

REFERENCE BOOKS:

1. *Devadas .R.P.,* 1989.,"A **Handbook on Methodology of Research**"., Sri Ramakrishna Vidhyalaya, Coimbatore
2. *Ramakrishnan, P.,* 2001., "**Biostatistics**", Sara Publication., India.

15PFN33D	COMPUTER APPLICATIONS IN FOOD SCIENCE AND NUTRITION	SEMESTER -III

Total Credits: 2
Hours per Week: 3

OBJECTIVES:

Enable the students to

1. Understand the basics of computer and its applications
2. Gain knowledge to use computers
3. Develop skills to apply computer based technology in Food science and Nutrition

CONTENTS

UNIT- I

Introduction to Computers
History of Development of Computers, Main Frame, Minis, Micros and Super Computer Systems, Binary numbers, Bits, Bytes, CPU, Input and Output Devices, Main and Auxiliary Stage Devices, Software and Hardware

UNIT- II

Operating Systems and MS Office
Introduction to Operating Systems, Windows Applications MS Word, MS Excel. MS Access and MS PowerPoint

UNIT- III

Computer Networks
LAN, WAN, Intranet, Extranet, Service Providers, Modem, Fibre Optics Basic of HTML, WWW, URL, TCP/IP

UNIT- IV

Multimedia
Basic Elements, Hardware, Application of Multimedia, Introduction Multimedia, Authorizin .

UNIT- V

Application of Computers in Food Science and Nutrition

Power point presentation, nutrient and diet calculations, nutrition education and

1. MS Word, Excel, Access and PowerPoint
2. Introduction to Computer Networks
3. Introduction to Macro Flash Player, Adobe Photoshop, Corel Draw
4. Developing Mini Projects in Food Science and Nutrition using MS Word, MS Excel and MS PowerPoint

TEXTBOOKS:

1. *Balagurusamy. E (2008)* **Computing Fundamentals and C Programming,** ***Tata*** McGraw Hill Education Private Limited, New Delhi.
2. *Bansal.S.K (2004*) **Text Book of Information Technology** , APH, Publishing Corporation.

REFERENCE BOOKS:

1. *Andrew S. Tanenbaum (2009) IV Edition*, **Computer Networks,**Pearson Education and Dorling Kindersley Publishers, Delhi.
2. *James F. Kurose and Keith W Ross (2008) III Edition*, **Computer Networking.** A Top-Down Approach Featuring the Internet, Pearson Education and Dorling Kindersley Publishers, Delhi.
3. *Ralf Steinmetz and Klara Nahrstedt (2011)* **Multimedia-Computing, Communications and Applications,** Pearson Education and Dorling Kindersley Publishers, Delhi.

15PFN33P	LAB III : CLINICAL NUTRITION TECHNIQUES	SEMESTER -III

Total Credits: 4

Hours Per Week: 6

I.QUALITATIVE ESTIMATION OF

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

II. 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

15PFN33Q	LAB-IV: NUTRITION IN DISEASES	SEMESTER- III

Total Credits: 2
HoursPerWeek: 3

OBJECTIVES:

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 and 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 and after dialysis.
   h. Diet for diabetes – Type I and 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

15PFN43A	COMMUNITY NUTRITION	SEMESTER -IV

Total Credits: 4

HoursPerWeek: 5

OBJECTIVES:

To enable students to

1. Gain insight into nutritional problems of the community
2. Understand the various nutrition intervention programmes for vulnerable groups in the community

CONTENTS

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, Etiology, types, prevalence, anemia control programme in India.

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

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

Vitamin A deficiency: Causes, clinical signs and symptoms, prevention and prophylaxis

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

Assessment of Nutritional Status:

Anthropometric assessment, Biochemical tests, Dietary/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 for the community.

Methods of nutrition education, nutrition education programmes - Planning, implementation and evaluation, training workers in nutrition education programmes, integration of nutrition 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.

TEXT BOOKS:

1. *Reddy.V., Rao.P, Sastry .G. J and Kashinath K.C.*, 1993., "**Nutrition Trends in India**", N1N, Hyderabad, India.
2. *Park and Park*, 1995., "**Text Book of Preventive and Social Medicine**", Banarsidas Published by Jahalpu.

REFERENCE BOOKS:

1. *Gibney.M.J*, 2004., "**Public Health Nutrition**" , 1st Edition, Black Well Scientific Publications, Oxford.
2. *Wadhwa.A*, 2003, "**Nutrition in the Community**", 1st Edition, Elite Publications, New Delhi.

15PFN1EA	ELECTIVE –I: FUNCTIONAL FOODS AND NEUTRACEUTICALS	SEMESTER -I

Total Credits: 4
HoursPerWeek:3

OBJECTIVES

To enable students to

1. Gain insight on the importance of Nutraceutical
2. Understand on various functional foods and their beneficiaries in health

CONTENTS

UNIT –I

Introduction to Nutraceuticals as Science:
Nutraceutical- Definition, Classification - Dietary supplements, Functional foods, Historical perspective, scope and future prospects, applied aspects of the Nutraceutical Science, Sources of Nutraceuticals

UNIT –II

Properties, structure and functions of various Nutraceuticals:
Alkaloids, Terpenoids, Glycosides, Natural phenols, Isoprenoid derivaties, Glucosamine, Octacosanol, flavonoids, carotenoids, polyunsaturated fatty acids, lecithin, choline and spingolipids, Lycopene, Carnitine, Melatonin and Ornithine alpha ketoglutarate, Phytoestrogens, curcumin, organosulphur compounds as neutraceuticals. 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, 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 and Nutraceutical (FFN) to foods and 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 of 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 prebiotics, probiotic and symbiotic foods and effects

UNIT –V

Food as remedies:
Nutraceuticals in treatment for cognitive decline, Arthritis, Bronchitis, circulatory problems, hypoglycemia, Nephrological disorders, Liver disorders, Osteoporosis, Psoriasis and Ulcers etc, Nutraceutical rich supplements e.g. Bee pollen, Caffeine, Green tea, Lecithin, Mushroom extract, Chlorophyll, Kelp and Spirulina etc.

TEXT BOOKS

1. *Wildman, R.E.C.* ed. (2000) **Handbook of Nutraceuticals and Functional Foods**, CRC Press, Boca Raton
2. *Jeffery H. W.* **Methods of Analysis for Functional Foods and Neutraceuticals**, 2002, Edition I, CRC Press, New York

REFERENCE BOOKS

1. *Mahan.K and Escott.S.*, 2000., "**Food Nutrition and Diet Therapy**", 11th Edition.,W.S. Saunder's Company, Philadelphia, USA.
2. *Murray Robert*, 1990, Harper`s **Biochemistry**, 24th Ed, Prentice Hall International UK Ltd.

15PFN1EB	ELECTIVE –I: INSTITUTIONAL FOOD MANAGEMENT	SEMESTER- I

TotalCredits: 4
HoursPerWeek: 3

OBJECTIVES:

To enable the students

1. To emphasize the various facets of functioning of food service institutions
2. Gain the necessary knowledge to become an efficient manager

CONTENTS

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.

TEXT BOOKS:

1. *Sushma Gupta*, **Textbook of Family Resource Management**, 2013, Edition 9, Kalyani – New Delhi
2. *Sethi and Mahan S*.-**Catering Management and integrated approach**, John Wiley and Sons, New York.

REFERENCE BOOKS:

1. *Joan C. Branson,* Hotel**, Hostel and Hospital House Keeping**, 2004, Edition 5, Book Power – London
2. *Sudhir Andrews,* **Textbook of Hotel, House Keeping Management and Operations**, 2008, Edition I, TMH, New Delhi

15PFN1EC	ELECTIVE –I: FOOD PRODUCT DEVELOPMENT	SEMESTER- I

Total Credits: 4
HoursPerWeek: 3

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.

CONTENTS

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.

TEXT BOOKS:

1. *Baker,R.C.*, **Fundamentals of New Food Product Development**,1988.
2. *Fuller G.W*, **New Food Product Development from Concept to Market place**.

REFERENCE BOOKS:

1. *Sivarama Prasad A*. **Agricultural marketing in India**, Mittal Publication, New Delhi, 1985.
2. *Aaron, L. Brody, Joha .B. Lord*.Developing **New Food Product for a changing Market place**, 2nd Edition, 2005,

15PFN2EA	ELECTIVE –II: HUMAN PHYSIOLOGY	SEMESTER- II

Total Credits: 4
HoursPerWeek: 3

OBJECTIVES:

To enable students

1. Understand the structure and functions of various organs of the body.
2. Obtain a better understanding of the principles of nutrition through the study of physiology.

CONTENTS

UNIT-I

Cell - Structure and functions
Digestive system - Anatomical consideration – structure and functions of stomach, liver,gall bladder, pancreas, small intestine and large intestine.

UNIT-II

Blood, RBC, WBC, Platelets and Lymph, Blood coagulation, blood grouping and Rh factor, Circulatory system - Heart structure and functions - cardiac cycle, cardiac output, ECG, cardiac murmurs, arrhythemia, circulatory shock and heart failure.

UNIT-III

Respiratory system - Basic anatomy of the respiratory system, process of respiration, transport and exchange of oxygen and carbon dioxide in the body, pulmonary function test, pulmonary circulation, regulation of respiration and ventilation.
Endocrine glands - Structure and function of pituitary, thyroid, islets of langerhans and adrenal gland.

UNIT-IV

Reproductive system - Anatomy of the male and female reproductive organs, menstrual cycle, ovulation, menopause. Sense organs - Structure and function of eye, visual pathway, ear , auditory pathway, skin, regulation of body temperature, sensation of taste, smell.

UNIT-V

Excretory system - Excretory organs - structure of kidney, nephron and functions, renal circulation, formation of urine, composition of urine, renal function tests, micturition. Muscles – structure and classification of muscles, physiology of muscular action Central nervous system - Physiology of the neuron, parts of the central nervous system and function, reflex activity, receptors, neurotransmitters.

TEXT BOOKS:

1. *Chatterjee C.C.* (1987): **Human Physiology**, Vol. I and II, Medical Allied Agency,Calcutta.
2. *Wilson, K.J.W and Waugh, A*. (1996): **Ross and Wilson, Anatomy and Physiology in Health and Illness**, 8th Edition, Churchill Livingstone.

REFERENCE BOOKS:

1. *Guyton, A.G. and Hall, J.B.* (1996): **Text Book of Medical Physiology**, (9th Edition, W.B. Sanders Company, Prism Books (Pvt.) Ltd., Bangalore.
2. *Sembulingam.K and Sembulingam.P*, 2013, **Essentials of Medical Physiology**, 6th Edition, JAYPEE Brothers, Medical Publishers.

15PFN2EB	ELECTIVE –II : FOOD PACKAGING	SEMESTER -II

Total Credits: 4
HoursPerWeek: 3

OBJECTIVES:

1. Enable students to understand the need for food packaging.
2. To acquire knowledge on recent packaging, labeling and their advantage.

CONTENTS

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/smart/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.

TEXT BOOKS:

1. **Food Packaging technology** Hand book-NIIR, Delhi, 2004
2. **Handbook on Modern Packaging Industry**, NIIR, Delhi, 2008.

REFERENCE BOOKS:

1. *Griffrin .R.C,* "**Principles of Food Packaging**", Stainley Sacharous, 2nd Ed. Avipub Co.Westport.
2. **Food Packaging technology**, NIIR, Delhi, 2005.

15PFN2EC	ELECTIVE –II: CLINICAL NUTRITION	SEMESTER- II

Total Credits: 4
HoursPerWeek: 3

OBJECTIVES

To enable the students

1. Gain knowledge and develop skills in assessing the patients.
2. Acquire skills in menu planning, nutrient calculation and feeding techniques.

CONTENTS

UNIT- I

Patient Assessment **–**Pre – and Post treatment- Anthropometric assessment, Biochemical assessment, immunity assessment, Clinical observations, Medication history, Dietary assessment methods-24 hour recall method, day to day weight changes. Day to day recording of patient's diet and fluid intake and it's implications.

UNIT -II

Therapeutic Menu Planning **-** Definition of diet therapy, factors to be considered while planning therapeutic diet, Principles of menu planning, Uses of food groups, food guide pyramid.
Diet Modifications **-** Principles of diet modification, modification of the normal diet, impact of psychological factors in improving patients health, nutritional counseling.

UNIT- III

Diet calculation - Definition and objectives of exchange list, recommended dietary allowance, use of food consumption assessment, calculation of nutrients intake using nutritive value book.

UNIT- IV

Normal and abnormal physiological and biochemical parameters and their interpretation.

a. Blood pressure, pulse rate
b. Urine and stools- routine, albumin, sugar and urine culture
c. Blood- sugar (fasting, post-prandial, random), urea, creatinine, lipid profile, protein, A:G ratio, bilirubin, SGPT, SGOT, uric acid,

calcium phosphate, alkaline phosphatase, Hb, CBC, PCV, ESR, Peripheral smear, serum iron and ferritin, TIBC. Imaging and endoscopy tests –X ray, ultrasound scan, CT scan, endoscopy, colonoscopy, biopsy.

UNIT- V

Intensive care nutrition, Nutrition in trauma and burns.
Parenteral Nutrition - Definition and administration techniques, TPN formulas, advantages and complication of TPN.
Enteral Nutrition - Definition, types of tube feeding, formulas for enteral feeding, problems encountered during enteral feeding and advantage of tube feeding.

TEXT BOOKS:

1. *Joshi .Y .K* , 2003, "**Basic Clinical Nutrition**", JAYPEE Brothers, New Delhi.
2. *Rao.M*, 2007, "**Medical Biochemistry**", New Age International, New Delhi.

REFERENCE BOOKS:

1. *Mahan.K and Escott.S.,* 2000., "Food **Nutrition and Diet Therapy**", 11th Edition.,W.S. Saunder's Company, Philadelphia, USA.
2. *Arumugam .M,* 2004, "**Biomedical Instrumentation**", Anuradha agency,.

15PFN3EA	ELECTIVE – III: FOOD SAFETY AND QUALITY CONTROL	SEMESTER- III

Total Credits: 4
HoursPerWeek: 3

OBJECTIVES:

To enable students

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

CONTENTS

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 Alimentarious 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 – Role of central food laboratory and state food laboratories. FSSAI.

UNIT- IV

Food standards – cereals and products – bread, biscuits, cakes, pasta products.
Fruit products – jam, juices, squashes, ketchup, sauce,
Oils and fats – coconut oil, groundnut oil, palm oil, sunflower oil, vanaspati.

Milk and 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 associatedwith foods – types.Effect of processing and storage on microbial safety.
Types of food toxicants – Endogenous, natural, synthetic toxicants.

TEXT BOOKS:

1. *A. Y. Sathe*, 1999, "**A First Course in Food Analysis**" ,New Age Publications,.
2. *Potter.N.N and Hotchkiss.J.H.*,1996., "**Food Science**" CBS Publishers.,

REFERENCE BOOKS:

1. *Swaminathan.M* , "**Food Science, Chemistry and Experimental Foods**" , Bappco Publishers.
2. *Desrosier and Desrosier*., 1999, "**Technology of Food Preservation**" ,4th Edition, CBS Publishers.

15PFN3EB	EECTIVE – III: CULINARY TECHNIQUES	SEMESTER -III

Total Credits: 4
Hours Per week: 3

OBJECTIVES:

To enable the student

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

CONTENTS

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.

TEXT BOOKS:

1. *Arora .K, 2005*, "**Theory of Cookery**" , Frank Bros andCo, New Delhi.
2. *Andrews. S,* 2008, "**Textbook of Food and Beverage Management**", TMH.

REFERENCE BOOKS:

1. *Devis.B,* 2005, "**Food and Beverage Management**", Elseiver India Pvt Ltd,.
2. *Negi.J*, 2006, "**Food and Beverage Management and Cost Control**", Kanishka Publishers, New Delhi.

15PFN3EC	ELECTIVE – III: CONVENIENCE FOODS	SEMESTER -III

Total Credits: 4
HoursPerweek: 3

OBJECTIVES:

To enable students

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

CONTENTS

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 foodsPopped snacks–Popcorn –popping procedures,loss during popping,measurement of expansion,factors affecting quality of popcorn,storage.Puffed snacks –Puffable aterials,extrusion methods ,drying,Addition of flavours and colours,Simulated popcorn.Baked snacks –Proportion and role of ingredients;Sweet based –plain cookies, wirecut 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, fruitmilk, 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 foods.

TEXT BOOKS:

1. *Subbulakshmi and Udipi.S*., 2001., "**Food processing and Preservation Technology**"., New Age Publications., New Delhi, India.
2. *Khader.V,* 2001., "**A Textbook of Food Processing Technology**", ICAR, New Delhi, India

REFERENCE BOOKS:

1. *Sivashankar. B*., 2002 .,"**Food Processing and Preservation**", PHI, New Delhi, India.
2. **Modern Technology of Food Processing and Agro Based Industry**, 2nd Edition, NIIR Board, Asia Pacific Business Press, 2002.

15PFN4EP	ELECTIVE – IV: FOOD QUALITY CONTROL LAB	SEMESTER -IV

Total Credits: 4
HoursPerweek: 3

OBJECTIVES:

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,
12. Fruit based or Combinations.
13. Standardization of formulated food
14. Evaluation of sensory characteristics – development of score cards
15. Consumer acceptability and popularization of formulated product

15PFN4EQ	ELECTIVE – IV: FOOD SERVICE MANAGEMENT LAB	SEMESTER-IV

Total Credits: 4
HoursPerweek: 3

OBJECTIVES:-

1. To gain an understanding of commercial food service.
2. To have hands-on preparation of items popular in food operations.

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 tow non- vegetarian soups
11. Prepare two basic baked goods - Fruit Tart and Lemon and 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.

15PFN4EC	ELECTIVE – IV: FOOD BIOTECHNOLOGY	SEMESTER- IV

Total Credits: 4
HoursPerWeek: 3

OBJECTIVES:

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

CONTENTS

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 and 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 and 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), thickners 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 concepts only.

TEXT BOOKS

1. *Johnson.P,* 2002 ,"**Introduction to Food Biotechnology**" , 1st Edition,CRC- Florida.
2. *Srivastaya M .C,* 2008 ,"**Fermentation Technology**" , NAROSA, New Delhi.

REFERENCE BOOKS

1. *Standbury P.F*, 1997, "**Principles of Fermentation Technolgy**", Adithya Book Pvt Ltd, New Delhi.
2. *Bhaskar.A* , 2009, "**Enzyme Technology**", M.J.P New Delhi.