PERIYAR UNIVERSITY
SALEM – 636 011

M.Sc., DEGREE
FOOD SCIENCE AND NUTRITION
[Choice Based Credit System (CBCS)]

REGULATIONS AND SYLLABUS
(Effective from the academic year 2008-2009 and thereafter)

M. Sc., FOOD SCIENCE AND NUTRITION
REGULATIONS AND SYLLABUS
(With effect from the academic year 2008 – 09 onwards)

Preamble

The department of Food Science and nutrition aims in developing human resources, to expand and transfer knowledge for continuous improvement of the safety, quality and value of food products. Food is basic to life. Nutrition is the underlying factor which influences the three disciplines as Chemistry, Microbiology and Engineering to form the foundation for Food Science. Hence to inculcate the importance in developing nutritional science among the budding nutritionists and food processing industrialists, the ***M. Sc., Food Science and Nutrition*** programme is aimed with the following objectives.

- Engineered to theoretical and practical aspects of the entire food chain from production of the raw material to the utilization of the product by the consumer
- Gain insight into the national nutritional problems and their management through diet.
- Develop skills in organizing and evaluating nutrition project in the community.
- To promote interactions with other disciplines which relate to the study of Food Science and Nutrition

This programme is offered under Choice Based Credit system (CBCS). The CBCS enables the student to select variety subjects as per his interest and requirement. Students can earn more credits than the stipulated minimum of 90 credits, through self study courses and supportive courses.

Candidate's eligibility for admission

A degree in B.Sc Nutrition and Dietetics, B.Sc Home Science, B.Sc degree with PG Diploma in Nutrition and Dietetics/ Food processing, B. Tech / B.Sc Food Technology, B.E. / B. Tech Food Process Engineering; M.B.B.S; B.Sc Life Science courses with Nutrition and Dietetics/ Food Processing as ancillary approved by the Association of Indian Universities are eligible to seek admission.

Duration of the course- Two-year degree programme.

CBCS- Structure of the Course

S.No	Paper Code	Title of the paper	Hours	L	T	P	C
Core Papers							
1	08FSNC 01	Food Science	90	5	0	0	5
2	08FSNC 02	Nutrition through Life Cycle	90	5	0	0	5
3	08FSNC 03	Biochemistry	90	5	0	0	5
4	08FSNC 04	Therapeutic Nutrition I	90	5	0	0	5
5	08FSNC	Food Science Practical	54	0	0	3	2

	05						
6	08FSNC 06	Therapeutic Nutrition II	90	5	0	0	5
7	08FSNC 07	Advanced Nutrition	90	5	0	0	5
8	08FSNC 08	Community Nutrition	90	5	0	0	5
9	08FSNC 09	Therapeutic Nutrition Practicals	54	0	0	3	2
10	08FSNC 10	Food Analysis practical	108	0	0	6	4
11	08FSNC 11	Food processing and Quality control	90	5	0	0	5
12	08FSNC 12	Research methodology and Statistics	90	5	0	0	5
13	08FSNC 13	Statistics and Computer Applications practical	54	0	0	3	2
14	08FSNC 14	Food Processing and quality control Practical	54	0	0	3	2
15	08FSNC 15	Neutraceuticals and Functional Foods	90	5	0	0	5
16	08FSNC 16	Biochemical Analysis Practicals	108	0	0	6	4
17	08FSNC 17	Project	342	0	0	19	4
Elective Papers							
01	08FSNE 01	Food Microbiology	72	4	0	0	4
02	08FSNE 02	Food Biotechnology	72	4	0	0	4
03	08FSNE 03	Food Packaging	72	4	0	0	4
04	08FSNE 04	Food Toxicology	72	4	0	0	4
05	08FSNE 05	Biophysical Techniques	72	4	0	0	4
06	08FSNE 06	Physiological Aspects of Nutrition	72	4	0	0	4
07	08FSNE 07	Food product development and Marketing strategy	72	4	0	0	4
08	08FSNE 08	Instrumentation in Food Processing	72	4	0	0	4

Supportive courses for other departments							
01	08FSNS 01	Food Preservation	72	3	0	0	4
02	08FSNS 02	Bakery	72	3	0	0	4
03	08FSNS 03	Family Meal Management	72	3	0	0	4
04	08FSNS 04	Nutrition and Physical Fitness	72	3	0	0	4
Self study courses / Internships							
01	FSNSSO1	Food Processing and Quality Control Internship for 10 days	---	--	--	---	2
02	FSNSSO2	Dietetics Internship for 30 days	---	--	--	---	2
03	FSNSSO3	Community Nutrition camp for one week	---	--	--	---	2
04	FSNSSO4	Food Preservation training for one week	---	--	--	---	2

Note:-

1. Human Rights – Compulsory course for all P.G students
2. C – Core course, E- Elective course, S-Supportive course, L- Lecture, T-Tutorial, P- Practical, C- Credit
3. Credits for Core courses - 70
   Credits for Elective courses - 12
   Credits for supportive courses - 08
   Total credits - 90
   Self study courses (Extra) - 8 (Internships)
   Value Education - 2

CBCS – Scheme of Examinations

S.No	Paper Code	Title of the paper	Exam Hours	I	E	T	C
Core Papers							
1	08FSNC 01	Food Science	3	25	75	100	5
2	08FSNC 02	Nutrition through Life Cycle	3	25	75	100	5
3	08FSNC 03	Biochemistry	3	25	75	100	5
4	08FSNC 04	Therapeutic Nutrition I	3	25	75	100	5
5	08FSNC 05	Food Science practical	3	20	30	50	2
6	08FSNC 06	Therapeutic Nutrition II	3	25	75	100	5
7	08FSNC 07	Advanced Nutrition	3	25	75	10	5

						0	
8	08FSNC 08	Community Nutrition	3	25	75	100	5
9	08FSNC 09	Therapeutic Nutrition practicals	3	20	30	50	2
10	08FSNC 10	Food Analysis practicals	3	40	60	100	4
11	08FSNC 11	Food Processing and Quality control	3	25	75	100	5
12	08FSNC 12	Research methodology and Statistics	3	25	75	100	5
13	08FSNC 13	Statistics and Computer Applications practicals	3	20	30	50	2
14	08FSNC 14	Food Processing and Quality control practicals	3	20	30	50	2
16	08FSNC 15	Neutraceuticals and Functional Foods	3	25	75	100	5
17	08FSNC 16	Biochemical Analysis Practicals	3	40	60	100	4
18	08FSNC 17	Project	--	40	60	100	4
Elective Papers							
01	08FSNE 01	Food Microbiology	3	25	75	100	4
02	08FSNE 02	Food Biotechnology	3	25	75	100	4
03	08FSNE 03	Food Packaging	3	25	75	100	4
04	08FSNE 04	Food Toxicology	3	25	75	100	4
05	08FSNE 05	Biophysical Techniques	3	25	75	100	4
06	08FSNE 06	Physiological aspects of Nutrition	3	25	75	100	4
07	08FSNE 07	Food Product Development and Marketing Strategy	3	25	75	100	4
08	08FSNE 08	Instrumentation in Food Processing	3	25	75	100	4
Supportive courses for other departments							
26	08FSNS 01	Food Preservation	3	25	75	100	4
27	08FSNS 02	Bakery	3	25	75	100	4

28	08FSNS 03	Family Meal Management	3	25	75	100	4
29	08FSNS 04	Health and Physical Fitness	3	25	75	100	4
Self study courses / Internships							
01	FSNSSO1	Food Processing and Quality Control Internship for 10 days	10 days	20	30	50	2
02	FSNSSO2	Dietetics Internship for 30 days	30 days	20	30	50	2
03	FSNSSO3	Community Nutrition camp for one week	7 days	20	30	50	2
04	FSNSSO4	Food Preservation training for one week	7 days	20	30	50	2

Teaching methodologies

The classroom teaching would be through conventional lectures and use of OHP and Power point presentations. The lecture would be such that the students should participate actively in the discussion, student's seminar, and multi sensory approach in learning. The scientific discussions would be arranged to improve their communicative skill.

In the laboratory, instructions would be given for the experiments followed by demonstration and finally the students have to do the experiments individually. Periodic tests would be conducted and for the students of slow learners would be given special attention.

Examinations

Examinations are conducted in semester pattern. The examination for the Semester I & III will be held in November/December and that for the Semester II and IV will be in the month of April/May.

Candidates failing in any subject (both theory and practicals) will be permitted to appear for such failed subjects in the same syllabus structure at subsequent examinations for within next 5 years. Failing which the candidate has to complete the course in the present existing syllabus structure.

Scheme for valuation

Evaluation will be done on a continuous basis and will be evaluated four times during the course work. The first evaluation will be in the 7^{th} week, the second in the 11^{th} week, third in the 16^{th} week and the end – semester examination in the 19^{th} week. Evaluation may be by objective type questions, short answers, essays or a combination of these, but the end semester examination is a university theory examination with prescribed question paper pattern.

Grading System

The term grading system indicates a six point scale lf evaluation of the performance of students in terms of marks, grade points, letter grade and class.

Evaluation of performance of students are based on six point scale grading system as given below

Six Point Scale		
Grade	**Grade point**	**Marks**
O	5.50 -6.00	75-100
A+	4.50-5.49	65-74
A	4.00 - 4.49	60-64
B+	3.50- 3.99	55-59
B	3.00 - 3.49	50-54
F	0.00- 2.99	0-49

Scheme for Internal Marks in Theory (Max.marks-25)

Seminar and Assignment – 10 (each 5 marks)
Internal Tests- 10 (Best two out of three tests: Each 5 Marks)
Attendance -5 marks

Scheme of valuation for Dissertation

Internal: 40 Marks (Introduction and objectives – 5 marks, Review of literature - 5
Marks: Methodology – 10 Marks: Results and Discussion – 15 Marks: Bibliography - 5 Marks)

External: 40 Marks **(**Introduction and objectives – 5 marks, Review of literature – 5
Marks: Methodology – 10 Marks: Results and Discussion – 15 Marks: Bibliography - 5 Marks)
Viva-voce - 20 marks

Pattern of Question paper (Theory)

Duration of the examination - 3 hours , Maximum marks - 75

Part A
Answer all questions 10X1 = 10
(Multiple Choice questions)

Part B
Answer any five out of seven 5X3 = 15

Part C
Answer all questions 5X10 =50
(Internal Choice questions)

Total 75 marks

(All parts of question should have equal importance to all five units in the syllabus)

CORE PAPER
PAPER I
FOOD SCIENCE

SUB CODE: 08FSNC01 **HOURS**: L + T+P=C
MARKS : 100 5 + 0+ 0=5

UNIT I
Concept of food and nutrients, physiochemical properties and principles of food, colloidal system in foods – sols, gels, factors influencing gel formation, types of food colloids and physical characters. Emulsions – nature, surface activity, types of surface films, common food emulsion, functions of emulsifying agents. Foams – theory of foam formation, factors affecting foam formation, types of food foams, stability of food foams. Methods of cooking and effect of cooking on nutrients.

UNIT II
Quality attributes – size, shape, consistency, viscosity, texture, taste, flavour. Methods of evaluation of food quality- subjective & objective. Cereals and millets- classification, nutritional composition, structure, principles of cookery – gelatinization, retrogradation, dextrinisation, factors influencing cooking quality. Pulses, nuts and oil seeds- classification, nutritional composition, structure, pulse cookery – methods.

UNIT III
Fats and oils-composition, properties, satiety value, kinds and uses, rancidity of fat and its prevention. Sugars- sources, uses, properties, principles of sugar cookery. Syrup-stages of sugar cookery and crystalline and non-crystalline candies. Vegetables and fruits – structure, composition, classification, pigments, enzymes, tannins, pectin, acids and flavors- principles involved in cooking – effect of cooking on pigments, browning reaction, ripening of fruits.

UNIT IV
Egg- structure, composition, coagulation of egg protein, factors affecting coagulation of egg protein, egg quality. Meat – structure and composition, postmortem changes, cuts of meat, storage of meat. Poultry and fish – classification, composition, structure, selection of poultry and fish.

UNIT V
Milk – types, composition, physical and chemical properties, effect of heat, acids and enzymes. Spices and condiments- types, uses and abuses. Beverages - classification, nutritive value, and types

REFERENCE:

1. Sri Lakshmi, B. Food Science, New Age International [p] Limited, New Delhi, Third Edition, 2003
2. Potter, N.W., Food Science, AVI Publishing Co. Cunneticut, 1960.
3. Shakuntalamanay, N& Shadakcheraswamy, M, Foods, facts and principles, Wiley

Easterd Ltd. 2004.
4. Margus Karel daryl B. Lund, Physical principles of food preservation, 2nd edition
Printed in the United States of America
5. M.N. Ahmed, Food Science and Nutrition, 1st Edition Anmol Publications Pvt. Ltd,
New Delhi (2005)

PAPER II
NUTRITION THROUGH LIFE CYCLE

SUB CODE : 08FSNC02 **HOURS**: L + T+P=C
MARKS : 100 5 + 0+ 0=5

UNIT I

Concept of different food groups, Recommended Dietary Allowances for Indians, basis for requirement, computation of allowances. 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 and complications of pregnancy.

UNIT II

Nutrition in lactation- physiological adjustments during lactation, hormonal controls & 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.

UNIT III

Nutrition in infants – rate of growth, weight as the indicator, feeding premature infants and low birth weight infants, breast Vs bottle feeding, nutritional allowances, supplementary feeding and weaning foods. Nutrition in preschool children – growth and development of preschool children, food habits, nutritional requirements and supplementary foods.

UNIT IV

Nutrition in school age - Early and middle childhood, growth and development, food habits, nutritional needs and feeding – packed lunch. Nutrition during adolescence – physical growth, physiological & psychological problems associated with pubertal changes, nutritional needs, eating disorders- anorexia nervosa and bulimia, adolescent pregnancy and its complications

UNIT V

Nutrition during adulthood – Nutrition and work efficiency and nutritional needs. Nutrition during old age - physiological and psychological changes during old age, nutritional requirements, factors affecting food intake, common nutritional problems in old age.

REFERENCE

1. Swaminathan,M. Advanced text book on Food and Nutrition, , An mol Publication Pvt,Ltd, Second Edition.2004.
2. Venkataiah S.D.,Nutrition Education, Anmol Publication Pvt. Ltd, Revised 2004.
3. Mahtab S.Bamji, Prasad Rao, N.Vinodini Reddy. Textbook of Human Nutrition, Oxford and IBH Publishing Co. Pvt .Ltd, Second Edition, 2003.
4. Srilakshmi, B. Nutrition Science, New Age International [p] ltd, New Delhi, 2002.
5. Gopal,C.Kamalakrishnaswamy, Nutrition in Major Metabolic Disease, Oxford India Paper backs Publisher First Edition 2000.
6. H.P.S. Sachdev, Anna choudhry., Nutrition in children- Developing country concerns N.I. Publications Pvt. Ltd, New Delhi, 2004.
7. Sumati. R. Mudambi, M.V Rajagopal., Fundamentals of Foods & Nutrition, 4th Edition New age International publishers New Delhi, 2006.
8. Judith E. Brown., Nutrition Now, 2nd edition, West / Wadswroth west / Wadsworth, An International Thomson publishing company, 1998.
9. Melvin H. Willams., Nutrition for health fitness & Sport. 5th edition Mcgraw –Hill, publishing Co., 1999.
10. Gordon M. Wardlaw, Anne M. Smith Contemporary Nutrition, Mc Graw – Hill International Edition -2006.
11. Nutrient Requirement and Recommend Dietary Allowances for Indians by Indian council of Medical research, National Institute of nutrition, Hyderabad, 2004.
12. Dietary Guidelines for Indians, National Institute of Nutrition, Hyderabad, 2004.

PAPER III
BIOCHEMISTRY

SUB CODE: 08FSNC03 **HOURS**: L + T+P=C

MARKS : 100 5 + 0+0=5

UNIT – I

Structure and functions of cell. Enzymes – Introduction, enzyme activity and factors affecting enzyme activity, Enzyme inhibition – competitive, non-competitive and uncompetitive inhibition. Coenzymes. Molecular aspects of transport- passive diffusion, facilitated diffusion and active Transport.

UNIT – II

Carbohydrates – Classification, function, digestion, absorption, utilization - Glycolysis, TCA cycle, HMP shunt and energy production, gluconeogenesis. Electron Transport chain and phosphorylation

UNIT – III

Proteins - classification, function and utilization ; Amino acids – classification, function ; general pathways of protein metabolism- Denaturation, transamination, deamination, decarboxylation and urea formation, amino acid balance and imbalance; evaluation of protein quality.

UNIT – IV

Fatty acids – Classification, function, utilization, transport, deposit, biosynthesis and oxidation of saturated and unsaturated fatty acids, cholesterol, phospholipids and bile pigments. Role of carbo hydrate, protein and fat in energy metabolism

UNIT – V

Nucleic acids – Composition, function, classification, Isolation, structure and properties of DNA and RNA. Metabolism of Nucleic acids – biosynthesis and breakdown of purine and pyrimidine nucleotides.

REFERENCE

1. Lehninger, A.L, Biochemistry, worth publishers INC, New York, 2000.
2. Ambiga Shanmugam, Fundamentals of biochemistry for Medical students, Karthik printers, 2002.
3. Nutritional Biochemistry, 2nd edition Tom Bridt, Academic press 2006.
4. Powar and Chatwal, Biochemistry, Himalaya publishing house, 2000.
5. Ranganatha Rao, K, Text book of Biochemistry, Prentice Hall of India, New Delhi, (2000).

PAPER IV
THERAPEUTIC NUTRITION I

SUB CODE : 08FSNC04 **HOURS**: L + T+P=C

MARKS :100 5 + 0+0= 5

UNIT –I

Drugs- Introduction, Classification, biotransformation and excretion of drugs, routes of drug administration, mechanisms of drug action, factors modifying drug effects, drug and nutrient interactions. Therapeutic diets – Principles & objectives of diet therapy. Review of hospital diets- Regular diet, liquid diet, light diet, soft diet, pre and postoperative diet. Diet planning and use of exchange list in nutrient calculation.

UNIT –II

Gastrointestinal disorder – structure and functions of gastrointestinal system. Etiology symptoms and modifications of diet in diarrohea, constipation peptic ulcer, malabsorption syndrome and ulcerative colitis.

UNIT –III

Disorders of liver, gall bladder and pancreas- structure and functions. Etiology, classification and dietary regimen in jaundice, hepatitis, cirrhosis, hepatic coma, cholecystitis, cholelithiasis and pancreatitis.

UNIT – IV

Diseases of kidney – structure and functions. Etiology and dietary management in glomerulo nephritis, nephrosis, renal failure, nephroscelerosis, nephrolithiasis, dialysis and transplantation.

UNIT –V

Diseases of the heart & circulatory system- structure and functions of cardiovascular system, risk factors of cardiac diseases, causes, prevention and dietary management of hypertension, atheroscelerosis, congestive heart failure, hyperlipoproteinemia,

hypercholesterolemia, role of antioxidants in the prevention and treatment; Nutrition and alcoholism

REFERENCE

1. The Management of Nutrition in Major Emergencies, A.I.T.D.S. Publishers and Distributors Delhi, First Edition 2002.
2. LoryA. Smolin and Mary B.Grosvenor, Nutrition Science and Application, Saunders College Publishing New York, Third Edition, 2000.
3. Mahtab S.Bamji, Prasad Rao, N.Vinodini Reddy. Textbook of Human Nutrition, Oxford and IBH Publishing Co. Pvt .Ltd, Second Edition, 2003.
4. Gopal, C. Kamalakrishnaswamy, Nutrition in Major Metabolic Disease, Oxford India Paper backs Publisher, First Edition, 2000.
5. Mahan, L.K., Stump, S.E and Krause, S, Food Nutrition & Diet therapy, 11th edition, W.B. saunders Co, 2004
6. Passmore, D.P and Break, J.P, Human Nutrition& Dietetics, English language Book Society, Livingeston, 1986.
7. Shills, E.M and Olson, S.J and SMC, Modern nutrition in Health and Diseases, Volume II, 8th edition, Lea & Febringes, philadelphia1994.

PAPER V
FOOD SCIENCE PRACTICALS

SUB CODE: 08FSNC05 **HOURS**:
L+T+P = C
MARKS : 50
0+0+3 = 2

Cereals

a. Microscopic structure of food starches (raw and cooked)
b. Gelatinization properties of food starches

Pulses

a. Effect of adding salt, vinegar and oils in cooking quality of whole and split pulses

Fruits and vegetables

a. Browning in fruits and vegetables and prevention of browning

Milk and milk products

a. Determination of relative density of milk at different temperatures

Egg

a. Effect of salt, acid, sugar and fat on the stability of egg white foam

Meat and substitutes

a. Effect of preparation techniques on meat tenderization

Nuts and oilseeds

a. Effect of roasting on nuts and oilseeds

Sugar

a. Inversion, Melting and caramelization of sugar

Fats and oils

a. Determination of smoking point, absorption of oil and changes in physical parameters of fats and oils.

REFERENCE

1. Mohini Sethi and Eram S. Rao (2005) Food Science Experiments and Applications, CBS Publishers & Distributors, New Delhi.
2. Pomeranz, Y.(Ed), (1991), Functional properties of food components, (2nd edition), Academic press, New Delhi
3. Bowers, J. (1992): Food theory and applications, (2nd edition), Macmillan Publishing co., New Delhi

PAPER VI
THERAPEUTIC NUTRITION II

SUB CODE : 08FSNC06 **HOURS** : L + T+P=C
MARKS : 100 5 + 0+0= 5

UNIT – I

Endocrine system- classification and functions of hormones- pitutary, thyroid, pancreas and adrenal gland. Obesity and underweight – etiology, types, dietary modifications in the management of obesity and under weight. Anemia – types, signs & symptoms, clinical manifestation, dietary interventions.

UNIT –II

Diabetes mellitus – Epidemiology , incidence, classification, symptoms, metabolic changes, long term & short term complications, types of insulin, dietary modifications for diabetes mellitus; Glycemic index of foods, nutritive and non nutritive sweeteners.

UNIT –III

Nutrition in cancer: Reproduction of the normal cells, classification of neoplasms, principles of cancer pathogenesis, causes of cancer cell development, metabolic and nutritional alterations in malignancy. Bodies defense system, cancer therapy & nutrition, eating problems in cancer. Feeding and blend preparation for cancer.

UNIT – IV

Etiological factors & Dietary modifications in

a) Fever
b) Injury & burns
b) Diet in Allergy
c) Dental Diseases – dental caries & peritonitis.

UNIT –V

Management of neurological disorders- neuropathies, migraine, stroke. Management of musculoskeletal system disorders- muscular dystrophy, osteoporosis, osteoarthritis and Rheumatoid arthritis. HIV infection and AIDS : Epidemiology, transmission of HIV,

Clinical manifestations, HIV infection and other disease, immunity and AIDS virus, dietary management, prevention and control.

REFERENCE

1. The Management of Nutrition in Major Emergencies, A.I.T.D.S. Publishers and Distributors Delhi, FirstEdition,2002.
2. LoryA.Smolin and Mary B.Grosvenor, Nutrition Science and Application, Saunders College Publishing New York, Third Edition, 2000.
3. Mahtab S.Bamji, Prasad Rao, N.Vinodini Reddy. Textbook of Human Nutrition, Oxford and IBH Publishing Co. Pvt .Ltd, Second Edition, 2003.
4. Gopal, C. Kamalakrishnaswamy, Nutrition in Major Metabolic Disease, Oxford India Paper backs Publisher, First Edition, 2000.
5. Mahan, L.K., Stump, S.E and Krause, S, Food Nutrition & Diet therapy, 11th edition, W.B. saunders Co, 2004
6. Passmore, D.P and Break, J.P, Human Nutrition& Dietetics, English Language Book Society, Livingeston, 1986.
7. Cataldo, C.B., Rolfes, S.R and whitney, E.N, Understanding clinical nutrition, west publishing Co. New york, 1991.
8. Shills, E.M and Olson, S.J and SMC, Modern nutrition in Health and Diseases, Volume II, 8th edition, Lea & Febringes, philadelphia1994

PAPER VII
ADVANCED NUTRITION

SUB CODE : 08FSNC07 **HOURS**: L + T+P=C
MARKS : 100 5 + 0+0=5

UNIT – I

Energy – Energy value of food and its determination, energy expenditure – components – basal metabolism, physical activity and thermogenesis, factors affecting BMR, energy utilization in cells and energy balance. Dietary fiber- Definition, types of fiber in plant foods, sources, composition, role of dietary fiber and resistant starch in nutrition, effect of over consumption of fiber.

UNIT II

Chemistry, digestion, absorption, metabolism, physiological functions, deficiency disorders, RDA, sources, toxicity, method of assessment and interrelationship of Fat soluble vitamins- A,D,E and K.

UNIT III

Chemistry, digestion, absorption, metabolism, physiological functions, deficiency disorders, RDA, sources, toxicity, method of assessment and interrelationship of Water soluble vitamins – Thiamine, riboflavin, niacin, vitamin B_{12}, folic acid, pyridoxine, pantothenic acid, biotin and ascorbic acid.

UNIT IV

Chemistry, digestion, absorption, metabolism, physiological functions, deficiency disorders, RDA, sources, toxicity, method of assessment and interrelationship of Macrominerals- calcium, phosphorous, magnesium, potassium, sodium and chloride.
Water and Acid base balance.

UNIT V

Chemistry, digestion, absorption, metabolism, physiological functions, deficiency disorders, RDA, sources, toxicity, method of assessment and interrelationship of Microminerals- iodine, iron, copper, fluorine, zinc, magnesium, manganese, chromium and selenium.

REFERENCE

1. Gardon, M. Wardlaw., Paul, M. Iunset and Marcia, F.Seyler, Contemporary Nutrition, Mosby Publications, 1994.
2. Okoye, Z.S., Biochemical Aspects of Nutrition, Prentice Hall of India Pvt Ltd, Eastern Economy edition,1992.
3. Shils, E.M., Shike, Ross,A.C., Caballero, B and Cousins, R.J., 10th edition, Lippincott Williams and Wilkins, 2006.
4. Guthrie, H. Andrews, Introductory Nutrition, Saint Hours time, Mosby college,1998.
5. Berdaxier, C.D, Advanced Nutrition- Macro Nutrients, CRC Press USA,1995.
6. Srilakshmi, B., Nutrition Science, New Age International, 2002.
7. Lehninger, A.L, Biochemistry, Worth Publishers Inc, New York,2000.
8. Nutrient Requirements and Recommended Dietary Allowances for Indians, ICMR, A Report of the expert group of ICMR, 1992.
9. Geissler, C. and Powers, H., Human Nutrition, 11th edition, Elsevier Publication, 2007.

Practical / Related Experiences.

1. Demo on determination of energy value of foods using Bomb calorimeter
2. Demo on determination of Protein Efficiency Ratio using Wistar Strain male Albino rats.

PAPER VIII
COMMUNITY NUTRITION

SUB CODE : 08FSNC08 **HOURS**: L + T+P=C

MARKS :100 5 + 0+0=5

UNIT I

Relation of Nutrition to National development in terms of socio- economic, industrial and agricultural development. Food security- Definition, Food security at house hold level, Factors affecting food security system, National and international approaches to improve food security.

UNIT II

Assessment of Nutritional status - Dietary survey, Biochemical methods, Growth monitoring methods, Body composition studies, Tests of intelligence related to nutrition. Epidemiology of communicable diseases - Factors responsible for the spread of communicable diseases, Mode of transmission- Chicken pox, Typhoid fever, Malaria, Leprosy, Filariasis.

UNIT III

Malnutrition - Etiological factors leading to Malnutrition, consequences of malnutrition, Synergism between malnutrition and infection, measures to overcome malnutrition. Infant Mortality Rate(IMR), Neonatal Mortality Rate (NMR), Maternal Mortality Rate(MMR) and prevalence of common nutritional problems – Protein Energy Malnutrition(PEM), Vitamin A Deficiency diseases, Anemia, Iodine deficiency disorders and flurosis,

UNIT IV

Nutrition Intervention Programmes in India .Objectives and operation of Chief Minister Noon Meal Programme(CMNMP) and Integrated Child Development Service(ICDS). Primary Health Center (PHC) – concept, organization, current status in India and delivery of service. National organization– ICMR, NIN, NNMB, CFTRI, DFRL, and ICAR, NIPCCD. International Organization– FAO, WHO, UNICEF. Voluntary services – CART, CWS, CRS and AFPRO

UNIT V

Nutrition Education- Types and Methods of education. Principles of planning, executing and evaluating nutrition education programmes, problems of nutrition education.

REFERENCE

1. Wal Ruchi Mishra,S, Encyclopedia of Health Nutrition and family welfare, published by Sarup and sons, New Delhi 2000.
2. Srilakshmi, B. Nutrition Science, New Age International [p] ltd, New Delhi, 2002.
3. Swaminathan, M.Handbook of Food and Nutrition, the Banglore Printing and Publishing Co.Ltd, Fifth Edition, 2003.
4. Padmini Gupta, Ruchi thakkar, Nutritional Disorders and Community Health, Pointer Ltd Publishers, Jaipur.
5. Venkataiah S.D. Nutrition Education, Anmol Publication Pvt, Ltd Reserved 2004.
6. Mahtab S.Bamji, Prasad Rao, N.Vinodini Reddy. Textbook of Human Nutrition, Oxford and IBH Publishing Co. Pvt .Ltd, Second Edition, 2003.
7. Reddy, R.S. Nutrition Education, Common Wealth Publisher, First Edition, 2004
8. Park & Park, (2000), Park's Textbook of Preventive and social medicine, 18th edition, M/S Banarasids Bhanot, Jabalpur
9. R. C. Mishra , Health and Nutrition Education, A. P.H. Publishing Corporation, New Delhi, 2005.

Practical / Related Experience

1. Planning, conducting and evaluating nutrition education programmes in a selected community.
2. Critical appraisal of existing interventions and programmmes in the voluntary sector and government and suggestions to improve the same vis – a – vis target groups in society and specific needs

PAPER IX
THERAPEUTIC NUTRITION PRACTICALS

SUB CODE : 08FSNC09 **HOURS**: L + T+P=C

MARKS :50 0 + 0+3=2

1. Basic principles in planning diets for individuals, institution – hospital.
2. Preparation of hospital diets
    a. Preparation of tube feeding blends.
    b. Diets for febrile conditions – Typhoid , TB
    c. Diet in gastro intestinal disorders – Peptic ulcer diarrohea & constipation
    d. Diet in liver and gall bladder diseases – Cirrhosis, Hepatitis
    e. Diet planning for diabetes mellitus- NIDDM
    f. Diet in renal disorders- Acute renal failure, Renal Calculi
    g. Diet in cancer, AIDS and allergy.
    h. Diet in obesity and underweight.

REFERENCE

1. Srilakshmi, B. Dietetics, New age International (P) Ltd, New Delhi.(2002)

PAPER X
FOOD ANALYSIS PRACTICALS

SUB CODE: 08FSNC10 **HOURS**: L + T+P=C
MARKS : 100 0 + 0+6 =4

I. Quantitative Analysis

1. Total Carbohydrate
2. Total dietary fiber / Crude fiber
3. Protein
4. Nitrogen
5. Peroxide value of fat
6. Iodine Number of oil
7. Saponification number of oil
8. Acid Number of oil
9. Iron
10. Phosphorus
11. Calcium
12. Vitamin –C
13. Thiamine
14. Riboflavin
15. Sodium
16. Potassium
17. Vitamin A **/** β carotene

Demonstration

1. Energy value
2. Moisture
3. Fat

REFERENCE

1. Raghuramulu, N., Nair, K.M. and Kalyanasundaram, A. (1983), A Manual of laboratory
Techniques, National Institute of Nutrition, Silver prints, Hyderabad.
2. Oser, B.L.(1954), Hawke's physiological chemistry, XIV edition, Tata MC Graw Hill
Publishing company ltd, Mumbai.
3. Jayaram. J.(1996), Laboratory manual in Biochemistry, New Age International Ltd,
publishers, New Delhi, fifth reprint .
4. Sadasivam, S and Manickam, A (1991), Biochemical methods, New Age International Pvt.
Ltd, publishers, New Delhi, 2nd edition .

PAPER XI
FOOD PROCESSING AND QUALITY CONTROL

SUB CODE: 08FSNC11 **HOURS**: L+T+ P=C
MARK : 100 5 + 0+0= 5

UNIT – I

Physical principles in food processing, – thermal processing, refrigeration, freezing, dehydration, ionizing radiation. Chemical principles in food processing – preservation/ processing by sugar, salt, curing, smoking, acid and chemical. Chemical changes in food that affect texture, flavor, colour , nutritive value and safety during handling , storage and processing.

UNIT II

Cereal Technology: Rice- Parboiling, milling, by products of rice milling; Wheat- milling, by products of wheat milling fermentation; Manufacture of breakfast cereals, extruded products, puffed and flaked cereals. Pulse /legume Technology – milling, fermentation and germination. Sugar technology – Manufacturing of sugar from sugarcane, sugar cubes and powdered sugar.

UNIT –III

Oil Seeds – milling, extraction of oil and it's processing, inter – esterification and production of MCT meal concentrates and isolates, specialty fats from non-traditional oilseeds, use of fat replaces in processed food. Milk Technology - Separation, standardization, pasteurization, homogenization, sterilization, evaporation, drying, condensation, membrane fractionation, milk products -butter, ghee, cream, paneer, yoghurt and cheese.

UNIT-IV

Egg Technology – manufacturing of egg powder. Fleshy food Technology – canning, freezing, salting, smoking, dehydration of meat, poultry and fish, fish oil extraction. Fruits and vegetables –dehydration, juices, concentrates. Spices Technology - Extraction of essential oils and colors.

UNIT – V

Food Quality assurance – Quality assurance programme –Quality plan, documentation of records, product and specifications process control and HACCP, corrective action, and total quality process. Quality parameters- physical, chemical, functional, microbial; Rapid diagnostic methods of food quality – instruments and kits, Food standards – GMP, codex alimentations, ISO – 9000 serious, Food laws - PFA, FPO, AGMARK, MPO, BIS, Food safety and standards act,2006.

REFERENCE

1. A.D. Bonnell., Quality Assurance in sea food processing – A practical Guide, 1st Published, Published in Great Britain by Chapman & Hall London, 1994.
3. Rick Parkar, Introduction to Food Science, Library of Congress Cataloging-in-Publication Data, First Edition, 2002.
4. Lillian Hoagland Meyar, Food Chemistry, CBS Publishers & Distributors, New Delhi, Reprint, 2004.
5. Suman Bhatti & Uma Varma, Fruit & Vegetable Processing Organizations and

Institutions, CBS Publishers and Distributors, New Delhi, Reprint 2003.
6. Thoms Richardson and Johan W. Finley, Chemical Changes in Food during Processing, CBS Publishers and Distributors, New Delhi, 2003.
7. Yeshajahu Pomeranz Clifton E.Meloan, Food Analysis theory and Practice, CBS Publishers and Distributors, New Delhi Third Edition, 2004.
8. Miridula Mirajkar, Sreelatamenon, Food Science and Processing Technology, Volume-II Commercial Processing and Packaging, Kanishka Publishers & Distributors, New Delhi, 2005.
9. Early, R. (1995): Guide to Quality Management Systems for the Food Industry, Academic and Professional, London
9. Gould, W.A. and Gould, R.W. (1988): total Quality Assurance for the Food Industries, CTI Publications Inc. Baltimore.
10. Pomeranz, Y. and Meloan, C. E (1996): Food Analysis: Theory and Practice, CBS Publishers and Distributor, New Delhi.
11. Askar, A. and Treptow, H. (1993): Quality Assurance in Tropical Fruit Processing, Springer – Vertag, Bertin.
12. World Health Organisation (1998): Guidelines for Drinking Water Quality, 2nd edition, vols. 1,2, and 3, Geneva.
13. Marth, E.H. (1978): Standard Methods for the Examination of Dairy Products 14th ed or edition. Interdisciplinary Books and Periodicals, Washington, D.C.
14. Ranganna, S. (1986): Handbook of Analysis and Quality Control for Fruit and Vegetable Products, 2nd edition, Tata McGraw Hill Publishing Co. Ltd., New Delhi.
15. Hagstad, H.V. and Hubbert, W.T. (1986): Food Quality Control, Foods of Animal Origin, lowa State University press, AMES.

Practical / Related Experience

1. Visit to food processing Industries- Rice, wheat, pulse, millets, fleshy foods, Egg milk, and milk product and fruit and vegetable processing Industry.

PAPER XII
RESEARCH METHODOLOGY AND STATISTICS

SUB CODE : 08FSNC12 **HOURS**: L + T+P=C

MARKS :100 5 + 0+0= 5

UNIT I

Meaning of Research, Role of Statistics & research in Home Science discipline, objectives of research, Types of Research and their application, selection and formulation of Research problem, 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 Non-sampling errors.

UNIT II

Methods of collecting primary data- Questionnaire, preparation of schedules, Interview method, case- study method, Experimentation method, Data Collection – Primary and secondary data, Sources of secondary data, precautions while using secondary data. Editing and coding the data, Organization of data- Classification – meaning and objectives, types of classification, formation of discrete and continuous frequency distribution, Tabulation – Role, parts 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 essential 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. Scales of measurement and the appropriate statistical techniques.

UNIT V

Probability - Rules of probability and its applications. Distribution - Normal, binomial, their properties, importance of these distributions in statistical studies. 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.

REFERENCE

1. Kothari, C.R , Research Methodology, 2002.
2. Gupta, S.P, Statistical Methods, Sultana Chand and Sons, 31st revised edition, 2002.
3. Devadas, R.P ,A Handbook on Methodology of Research, Sri Ramakrishna Vidhyalaya,
Coimbatore, 1989.
4. Ramakrishnan, P , Biostatistics, Saras publication, 2001.
5. Donald, H.M.C. Burney , Research Methods, fifth edition, Thomson and Wadsworth
Publications, 2002.
6. Shanthi,P., Sophia and Bharathi , Computer oriented statistical methods/ probability and
Statistics, charulatha publications, second edition, 2000.
7. Pillai,R.S.N and Bagavathi,V , Statistics, Chand and company limited, 2001 .

Practical / Related Experiences

1. Identifying the research problems under each type.
2. Formulation of questionnaires and schedules.
3. Consolidating data and forming tables.
4. Drawing graphs and diagrams appropriately.
5. To understand and select a suitable saying methods for a given situation.
6. Working out numerical sums for all statistical analysis and interpret.

PAPER XIII
STATISTICS AND COMPUTER APPLICATIONS PRACTICALS

SUB CODE : 08FSNC13 **HOURS**: L + T+P=C

MARKS : 50 0 + 0+3= 2

1. Working with files and folders
2. Working with control panel options
3. MS Word- Starting word, creating, editing and saving a word document, previewing and printing a document, creating table and working with graphics, Tabulating nutrient content of foods and editing the table.
4. MS Excel - Starting excel, working with spread sheet, working with formula, functions,
graphs and charts. Calculating the measures of central tendency, measures of dispersions and
dietary calculation using excel
5. MS power point - creating slides, slide show presentation, transition and effects, inserting

pictures and slides, import and export using excel and other templates, creating a powerpoint
presentation with animations on nutrition related topics

6. Creating Email ID, sending and receiving Emails.
7. Creating a website, ways to develop website for e-journals, creating nutritional brochures
8. Statistical packages- application of data analysis package and SPSS package in calculation of mean, SD, 't' test, ANOVA, Correlation , Regression etc with suitable nutrition research examples.

REFERENCE

1. Sanjoy Saxena, 2002, MS office 2000, for everyone, Vijay Nicole imprints, Chennai
2. Ajai, S. Gaur and Sanjaya S. Gaur, 2006. Statistical methods for practice and Research,
   Sage Publications, New Delhi
3. SPSS package tutorial

PAPER XIV
FOOD PROCESSING AND QUALITY CONTROL PRACTICALS

SUB CODE : 08FSNC14 **HOURS**: L + T +P=C
MARKS :50 0 + 0+3 = 2

1. Determination of physical dimensions of grains (Length, Breadth, Thickness and Bulk density)
2. Determination of wet and dry gluten content of flours.
3. Testing the pectin strength of different fruits and vegetables.
4. Determination of PH and titrable acidity of a food sample.
5. Determination of Total solids as soluble and insoluble in foods
6. Test for adulterants
7. Food Evaluation using different sensory tests
8. Total microbial count
9. Determination of pasteurization effect in milk by MBRT
10. Preparation of culture media for different organisms

REFERENCE

1. Venderzant, c. and D.F. Splitts Toesser (1992): Compendium of methods of the microbiological examination of Doods, 3rd edition, American public health Association,
   Washington D. C.

2. Lawless, H.T. and Klein, B.P. (1991): Sensory science theory and applications in foods.
Marcel Dekker Inc.
3. Ranganna, S. (2004), Handbook of analysis and quality contrl for fruit and vegetable
products Tata Mc Graw Hill publishing co.Ltd., New Delhi
4. Journal of Food Science and Technology, AFSTI publications.

PAPER XV
NUTRACEUTICALS AND FUNCTIONAL FOODS

SUB CODE : 08FSNC15 **HOURS**: L + T+P=C
MARKS :100 5 + 0+0= 5

UNIT – I

Functional Foods and Nutraceuticals - Introduction - Defining the concept – Cereals and pulses and functional food Teleology of Nutraceuticals – Primary and secondary metabolites in plants. General Teleology – a) Carotenoids b) Conjugated linolenic acid c) Flavonoids d) Sulphur containing Amino Acid Derivatives e) Omega 3 fatty acids f) PUFA g) Terpenoids

UNIT – II

Therapeutic role of nutrceuticals

Classifying Neutraceuticals

a) Food Source – Plant: Soya, olive oil, tea, grape wine, garlic, dietary fibre and other fruits and its Mechanism of Action – on Anticancer, Blood Lipid Profile, Anti oxidation.

UNIT – III

a) Animal source as neutraceuticals: Milk and products, meat, fish. Microbial: probiotics. Mechanism of Action in various disease conditions related to human health.

b) Chemical Nature – Isoprenoid derivatives, phenolic substances, Fatty acids and structural lipids, Carbohydrates and derivatives, Amino acid base substances, Microbes, Minerals.

UNIT -IV

Dietary Supplements – role of nutraceuticals in the management of – Inborn errors of metabolism, obesity, neurological disorder, diabetes mellitus, hypertension, vitamin A Deficiency and PEM.

UNIT –V

Infant foods and formulas, supplement, herbal and functional food, beverages and Role of nutraceuticals in Sports nutrition. Nutragenomics – Relationship between nutritional supplementation and gene expression and disease prevention.

REFERENCE

1. Mary, K. Schmidl and Theodre, P. Labuza , Essentials of Functional Foods, Culinary

and hospitality industry publication services, 2000.
2. Mazza, G , Functional Foods- Biochemical and processing aspects, Culinary and hospitality industry publication services, 1998.
3. Israel Goldberg , Functional foods, Pharma foods, Nutraceuticals, Culinary and hospitality industry publication services, 2001.
4. Robert easy Wildman , Handbook of Nutraceuticals and Functional Foods, Culinary
and hospitality industry publication services, 2001.
5. David, H.Watson , Performance, Functional Foods, Culinary and hospitality industry
publication services, 2003.
6. Chatwick, R et al. , Functional Foods, Springer, 2003.
7. Jeffery Horst, Methods of Analysis for Functional Foods and Nutraceuticals, CRS Press, 2002.
8. Paresh, C. Dutta , Phytosterols as Functional Food Components and Nutraceuticals,
Marcel Dehker Inc, New York, 2004.

Practical / Related Experiences

A visit to siddha Pharmaceutical Company

PAPER XVI
BIOCHEMICAL ANALYSIS PRACTICALS

SUB CODE : 08FSNC16 **HOURS**: L + T+P=C
MARKS :100 0 + 0+6=4

Analysis of Blood / Serum

1. Blood glucose
2. Serum iron
3. Serum cholesterol
4. Serum protein
5. Serum vitamin – A
6. Blood Haemoglobin

Analysis of urine

1. Creatinine
2. Urea
3. Total nitrogen
4. Calcium
5. Phosphorus
6. Vitamin – C

Qualitative Analysis

1. Qualitative analysis of sugars

Reactions of Monosaccharide

- Reactions of Glucose

- Reactions of Fructose
- Reactions of Galactose
- Reactions of mannose
- Reactions of Ribose

Reactions of disaccharides

- Reactions of maltose
- Reactions of lactose

Reactions of polysaccharides

- Reactions of starch
- Reactions of dextrin

General Procedure for unknown sugars

- Analysis of unknown sugar –A

3. Qualitative analysis of amino acids

Reactions of individual amino acids

- Reactions of tyrosine
- Reactions tryptophan
- Reactions of arginine
- Reactions of histidine
- Reactions if cystine
- Reactions of methionine

General procedure for unknown aminoacids

- Analysis of unknown amino acids

REFERENCE

1. Reghuramulu, N., Naire, K.M & Kalyanasundaram, S.A., Manual of Laboratory Techniques, National Institute of Nutrition, ICMR, Silver Prints, Hyderabad, 1983.
2. Varley, H., Gowenlak, A.H and Hell, M.,Practical Clinical Biochemistry, William Itinmaon Medical Books, London, 1980.
3. Jayaraman, J., Laboratory manual in Biochemistry, New Age International Ltd, Publishers, New Delhi, Fifth Reprint, 1996.
4. Sadasivam, S and Manickam , A , Biochemical methods, New Age International P.Ltd. Publishers, New Delhi, Second edition, 1996.

ELECTIVE PAPER
PAPER I
FOOD MICROBIOLOGY

SUB CODE : 08FSNE01 **HOURS**: L + T+P=C
MARKS :100 4 + 0+0=4

UNIT I
Introduction – Development of microbiology, classification of microorganisms, morphology – Bacteria, yeast, mold and algae. Primary sources of micro-organism in food, microbial growth intrinsic and extrinsic parameters of food affecting the microbial growth.

UNIT II
Principles and types of food spoilage, Control of micro organisms – Sterilization, physical agents – lights, desiccation, electricity and heat. Chemical agents, removal of microorganism by filtration.

UNIT III
Water – sources, bacteriology of water supplies, Bacteriological examination, Purification of water, water borne diseases and prevention. Food borne diseases-food infection and intoxication.

UNIT IV
Microbiology of cereal and cereal products- organisms associated with grains. Classification and control of molds in bread. Microbiology of fruits and vegetables – contamination and control of microorganisms in fruits and vegetables.

UNIT V
Microbiology of milk and milk products- kinds of microorganisms in milk, sources of contamination, pathogens in milk, control of microbes in dairy products, fermented milk, butter and cheese. Microbiology of fleshy foods – egg, poultry, fish and meat products-sources and contamination, spoilage and its control.

REFERENCE

1. Pelczar, M.I and Reid, R.D, Microbiology, MC Graw Hill Book Company, New York, 5th edition, 1993.
2. Atlas M.Ronals , Priniciples of microbiology, 1st edition, Mosby – year book Inc, Missouri, U.S.A, 1995.
3. Frazier, W.C, Food Microbiology, MC Graw Hill Inc 4th edition, 1988.
4. Banwart , Basic food Microbiology, 2nd edition CBS Publisher, 1989.
   Bensaon, H.J, Microbiological applications, C. Brown publishers, U.S.A, 1990.

Practical / Related Experiences.

1. A visit to defence food laboratory.
2. A visit to BIS

PAPER II
FOOD BIOTECHNOLOGY

SUB CODE : 08FSNE02 **HOURS**: L + T+P=C

MARKS :100 4 + 0+0=4

UNIT – I

Introduction to Biotechnology, Industrial biotechnology, Introduction to industrial micro organisms, metabolism and regulation of metabolism, production of primary and secondary metabolites, Isolation and screening of micro organisms, stain improvement and biotransformation.

UNIT II

Gene cloning – steps and technique involved in gene cloning. Genetically modified foods- Definition, examples of GM foods and its production, advantages and disadvantages, ethical and legal concerns – safety aspects of foods produced by biotechnology and genetic engineering.

UNIT III

Food Fermentation- Batch and continuous process, Fermentor design, solid substrates fermentation, instrumentation and control, criteria used in media formulation, downstream processing, Alcoholic beverages, cheese making, bread making, fermented soya based foods, meat fermentations and vinegar.

UNIT IV

Enzyme technology in food industry -Industrial enzymes (with respect to food processing industry), immobilization of enzymes, immobilized plant cells for production of food flavors and colours, immobilized enzymes in food processing, development of novel sweeteners, Production of food additives and supplements

UNIT V

Microbial biomass production- baker's yeast, single cell protein and mushroom, Food industrial wastes- Typs, sources and characteristics of industrial wastes, waste disposal – physical, chemical and biological treatment, management of waste by prodicts from sugar, fruits and vegetable, meat, fish, oil and fat, dairy and cereal industry; utilization of food industry wastes; Recovery of useful materials from effluents by different systems.

REFERENCE

1. Owen Pward, Fermentation Biotechnology Principles, processes and products, Prentice H New Jersey, 1989.
2. Frazier and West Hoff , Food Microbiology, Tata McGraw Hill publishing company Ltd, New Delhi, 1995.
3. Dubey, R.C , Text book biotechnology S.Chand and Co Ltd,New Delhi, 2001.
   Gupta, P.K, Elements of biotechnology, Rostogi and Co, Meerut, 1996.
4. 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).

5. Stanbur, P.F and Allan, W. (1984): Principles of fermentation technology, Pergamon Press
oxford
6. Lee, B.H . (1996), Fundamentals of food biotechnology, VCH publishers, Inc. New york.
7. Herzaka, A. and R.G. (1981), Food industry wastes, disposal and recovery, Applied
Science Publishers, London
8. Lawrence K.W. and Wang, MUS (1992), Handbook of Industrial waste treatment, Marcel
Dekker, Inc. New York
9. WHO (1990): Strategies for assessing the safety of foods by biotechnology, Report of
joint FAO/WHO consultation -Geneva

Practical related experience

4. Isolation, purification and maintenance of yeast and bacterial cultures
5. Aerobic and anaerobic fermentation
6. Production of various fermented food products
7. Production of metabolites and enzymes

PAPER III
FOOD PACKAGING

SUB CODE : 08FSNE03 **HOURS**: L + T+P=C

MARKS :100 4 + 0+0=4

UNIT – I

Food Packaging – concepts, significance, Laws and policies behind packaging, safety and legislative aspects of packaging, methods of packaging- aseptic, modified atmospheric packaging, eco friendly packaging, Bag in Box and Vacuum packaging.

UNIT – II

Properties and applications of packaging materials – oven able, microwavable packages, retortable packages, new polymeric packaging films , Glass, Plastic Papers, paperboards, metal plate, tin free Steel sheets (TFS), aluminum plate wood and plywood, plastics.

UNIT- III

Cans – types, specification for the selection of cans, canning of dried and liquid foods, evaluation of canning and finishing, testing of can quality, Designing of thermal process- for low acid foods, spoilage examination of canned foods.

UNIT – IV

Storage, handling and distribution of packages, criteria for selection of packaging materials and methods. Packaging of food products – microwavable foods, fleshy foods, dairy products, cereal and snack foods grains, breakfast cereals, pastas, bakery products, snack foods and confectionery, fruits and vegetables products, Beverages- water, coffee tea, juices, carbonated soft drinks & fermented alcoholic & non alcoholic drinks.

UNIT –V

Testing and evaluation of packaging media- retail packs (including shelf life evaluation) and transport packages, Food marketing and role of packaging, packaging Aesthetic and graphic design, labeling in packages, coding and marking including bar coding.

REFERENCE

1. Gordon L. Robertson Food Packaging principles & practice, New york, Marcell Dekker Inc.
2. Ronald H. Schmidt Gary E. Roderick Handbook of Food packaging, Food safety Technology by NIIR Board of consultants & Engineers
3. Bureau of G and Multon J.K Food Packaging technology, (Vol.1 and 2) – VCH publishers, INC, New York.
4. Kadoya, T. (1994), Food Packaging, Academic Press, New York
5. Paine, F.A. and Paine, H. Y, (1993), Handbook of Food Packaging, Kluwa Academic Publisher, van Nostrand, Rein hold, New York.

PAPER IV
FOOD TOXICOLOGY

SUB CODE : 08FSNE04 **HOURS**: L + T+P=C

MARKS :100 4 + 0+0=4

UNIT- I

Toxicology- Definition, Principles of Toxicology, Routes of toxicant exposure and absorption, biotransformation, storage and exertion of toxicants.

UNIT- II

Measurement of toxicity- biological techniques, physical and chemical methods binding assays. Dose- response relationships, animal toxicity test, risk assessment, standard setting.

UNIT- III

Food additives – introduction, general principles for use, safety assessment, types and functions, food colors, sweeteners, antioxidants, acidulants and sequestrants, flavouring agents, antimicrobial agents.

UNIT- IV

Toxicants resulting from food processing- occurance, metabolism and toxicity of polycyclic aromatic hydrocarbon, heterocyclic aromatic amine, premelanoidins from maillard reaction, lysinoalinine, oxidized sulfur-containing aminoacids, rancid fats and oils, thermal decomposition of fats and lipids, food irradiation, nitrate, nitrite and N-nitroso compound

UNIT- V

Toxicants and anti-nutrients in plant foods- introduction, protease inhibitors, amylase inhibitors, lipase inhibitors, lectins, phytate, tannins, cyanogenic glycosides, glucosinolates, favic agents, lathyrogens, toxic aminoacids, toxic fatty acids, saponins, glycoalkaloids, oxalates, toxic plant phenols and alcohols, vasoactive amines, psychoactive substances, methylxanthins, pyrrolizidine alkaloids, phytoestrogens, allergens, antivitamins, miscellaneous endogenous toxicants, removal of toxicants and antinutrients.

REFERENCE

1. Subramanian, . M.A, Toxicology principles & methods MJP publishers (2004)
2. Tonu Pussa, Principles of food Toxicology, CRC press Taylon & francis Group, London
3. S. S. Deshpande, Handbook of food toxicology, Newyork, 2002.
4. Stanley T.Omaye Food and Nutritional Toxicology, CRC press LLC, 2004.
5. Norman. N. Potter, Joseph H. Hotachkiss, Food Science, Fifth edition, 2006.
6. Finley, J.W., Robinson, S.F. and Armstrong, D.J. (1992): Food Safety Assessment, ACS
   symposium series, American chemical society, Washington.
7. Graham, H.D (1980): The safety of foods AVI publishing company INC., Westport.

PAPER V
BIO-PHYSICAL TECHNIQUES

SUB CODE : 08FSNE05 **HOURS**: L + T+P=C
MARKS :100 4 + 0+0=4

UNIT – I

Principles and applications of chromatography - paper, Ion exchange, adsorption, thin layer, gas chromatography, HPLC gel filtration of biologically important compounds. Principles and applications of electrophoresis- paper, starch gel, agar-gel, polyacrylamide gel, moving boundary electrophoresis, immuno electrophoresis, iso-electric focusing.

UNIT-II

Principles and applications of colorimetry, fluorimetry, spectrometry – UV and Visible molecular absorption spectrometry, AAS, Atomic Emission spectrometry, Flourecence spectrometry, Atomic Mass spectrometry, Infrared spectrometry.

UNIT III

Radioactive and stable isotopes used in biological investigations, Units of radioactivity, Radioisotopes, effects of ionizing radiation and their hazards and prevention, Electron diffraction and Electron microscopy.

UNIT IV

Instrumentation for measurement of viscosity, consistency, texture rheological properties of food, relative humidity and water activity.

UNIT V

Instrumentation for measurement of specific gravity, freezing point, melting point, refractive Index measurement of colour, gel strength, borax measurement, densitometry, refractometry, and polarimetry.

REFERENCE

1. Fund,D.Y.C and Mathews, R, Instrumental methods for quality assurance in foods, Marcel Dekher Inc ,New York,1991.
2. Herschoderfer, S.M(ed), Quality control in the food industry, Vols(1 – 4), Academic Press, London, 1968-1987.
3. Fung, D.Y.C, and Mathews, R. (1991): Instrumental Methods for Quality Assurance in Foods, Marcel Dekker, Inc. New York.
4. DeMan, J.M., Voisey, P. W. Rasper, V.F. and Stanley, D.W. (1976): Rheology and Texture in Food Quality, The AVI Publishing Co. Inc, West Port.
5. Skoog, D.A., Holler, F.H. and Nieman (1998): Principles of Instrumental Analysis Saunders College Publishing, Philadelphia.
6. Gruenwedel, D. W.; Whitaker, J.R. (editors) (1984): Food Analysis Principles and techniques, Volumes 1 to 8, Marcel dekker, Inc., New York.
7. Moskowitz, H.R. (ed) (1987): Food Texture: Instrumental and Sensory measurement: Marcel Dekkker, Inc., New York.
8. Pomeranz. Y. and Meloan, C.E. (1996): Food Analysis: Theory and Practice; 3rd Edition, CBS Publishers and Distributors, New Delhi.

Practical /Related Experiences

Demo on working principle of instruments

PAPER VI
PHYSIOLOGICAL ASPECTS OF NUTRITION

SUB CODE : 08FSNE06 **HOURS**: L + T+P=C

MARKS :100 4 + 0+0=4

UNIT I

Blood- composition, cellular elements of blood- structure, hemopoiesis, metabolism and function, Hemoglobin- structure, synthesis and function, plasma proteins- functions, changes in various disorders, Enzymes in medical diagnosis.

UNIT II

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, Neuroendocrine control of stress and immunity, Immune mechanisms in infections, Autoimmunity and Hypersensitivity.

UNIT III

Hunger, Appetite and Satiety, obesity and starvation, circadian rhythm of salivary, gastric, pancreatic and glucocorticoid secretions. Hormones- principles of hormone action and endocrine control, synthesis, secretion and biological effect of pituitary, thyroid, parathyroid, adrenal, pancreas, male and female reproductive hormones.

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 base 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.

REFERENCE

1. Chatterjee, C.C, Human Physiology, Vol I & II, Medical Allied Agency.
2. Sukkar, M.Y.,EI- Munshid, H.A and Ardawi, M.S.M ,Concise human physiology , Blackwell scientific publications, 1993.
3. Daniel, P., Stites., Abba, I. Terr., Tristram, G. Parslow., Basic and clinical Immunology
   Prentice – Hall International InC, 8th edition, 1994.
4. Dulsy Fatima., Arumugam, Immunology, Saras publication.
5. Chakrabarti., Ghosh and Sahana., Human physiology, the New Book stall, second Edition, 1984.
6. Maurice, E. Shils and Vemon, R. Young , Modern Nutrition in Health and Disease, Indian Edition, seventh Edition.
7. Guyton, J.E, Textbook of Medical physiology, Saunders Publication, seventh edition, 1997.
8. Murugesh, N, A concise textbook of pharmacology, fifth edition, Prabhu offset printers, 2000.
9. Anne Waugh, Allison grant, Anatomy and physiology in Health and illness, 9th edition Elsevier church livingstone Edinburgh,London 2001.
10. Gary A. Thibodeau , Kevin T.Patton, Anatomy & Physilogy, Reed Elseviee India pvt Ltd, New Delhi 17th edition 2003.

Practical / Related Experience

Visit to modern biomedical laboratory

PAPER VII
FOOD PRODUCT DEVELOPMENT AND MARKETING STRATEGY

SUB CODE : 08FSNE07 **HOURS**: L + T+P=C
MARKS : 100 4 + 0+0=4

UNIT - I

New food products – definition, classification, factors shaping new product development – social concerns, health concerns, impact of market place influence and technology, reason for new food product development- corporate, market place, technological and governmental influences.

UNIT – II

Steps in product development, standardization methods involved in product development. Portion size and portion control; calculation of nutritive value and cost of production, shelf life and storage stability evaluation procedure of developed food products.

UNIT-III

Formulation of new food products for infants, pre-school children, adolescents, pregnant and nursing mothers, old age, sports persons, armed sources personnel and therapeutic uses. Selection and training of judges, development of score card and analysis of data, role of advertisement and technologies in promotion of new products.

UNIT – IV

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. Market promotion and positioning of food products.

UNIT - V

Conditions for sale, license and identification and quality processing, conditions for distribution, storage and sanitation, Studying the global and market status, Export potential for selected Indian food products, Role of export promoting agencies, economic feasibility of new products.

REFERENCE

1. Sivarama Prasad. A, Agricultural Marketing in India – Mittal Publications, New Delhi, 1985.
2. Acharya. S.S. And N.L. Agarwal, Agricultural Marketing In India – Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, 1992.
3. Aaron, L. Brody, John B. Lord, Developing New Food Products for A Changing Market Place, 2nd Edition, 2005,
4. Gordon. W. Fuller., New Food Product Development, 2004.
5. Mary Earle, Richard Earle and Allan Anderson, Food Product Development, Woodhead Publishing limited, 2001.
6. Edited by Catherine Side, Food Product Development based on experience, Iowa State

Press, A Blackwell Publishing Company.

Practical related experience

1. Market survey, consumer survey to identify new products in terms of
   - line extension
   - repositioning existing products
   - New form/reformulation
   - Innovative products
   - New packaging of existing products
   - Creative products
2. Tapping traditional foods and unconventional sources of foods.

PAPER VIII
INSTRUMENTATION IN FOOD PROCESSING

SUB CODE : 08FSNE08 **HOURS**: L + T+P=C
MARKS :100 4 + 0+0=4

UNIT – I

Unit operations in food processing - classifications; Design and selection of Food Processing equipments; Mechanical transport equipment- pumps, process piping and valves, conveyors; Food storage equipment – solid and liquid food storage equipments.

UNIT –II

Mechanical processing equipment- size reduction- slicers/ dicers, mincers, cutters, crushers and grinders; Size enlargement- Agglomerators , homogenizers and mixers; Mechanical separation equipment – Sorters, separators – solid /solid separators, solid / liquid separators.

UNIT – III

Heat transfer equipments – heat exchangers; Heat generation equipments- microwave oven, omhic heating system, infrared emitters; Food evaporation equipments- Evaporators ; Thermal processing equipments – Blanchers, sterilizers and pasteurizers.

UNIT –IV

Mass transfer equipments – distillers , extraction and leaching equipments, gas and liquid absorption equipments , adsorption and ion exchange equipments, crystallizers.
Food Dehydration equipment- dryers; Refrigeration and freezing equipment – refrigerators, freezers, thawers, freeze driers or lyophilizers

UNIT – V

Equipments for novel food processes – Membrane separation equipment, irradiation system, extruders, fementors, pulse electric field processing equipment , High pressure processing equipment, pulsed light processing equipment; Food packaging equipment- fillers, closures, sealers, wrappers, aseptic packaging equipment and palletizers.

REFERENCE:

1. Fellows, P.J. (2000), Food Processing technology: Principles and Practice, Second edition,
CRC woodhead publishing ltd, Cambridge

2. Peter Zeuthen and Leif Bogh – Sorensen, (2003), Food Preservation techniques, Woodhead publishing ltd
3. George D. Saravacos and Athanasios E. Kostaropoulos (2002) Handbook of Food
Processing Equipment Kluwer Academic /Plenum publishers

SUPPORTIVE COURSES

PAPER I

FOOD PRESERVATION

SUB CODE : 08FSNS01 **HOURS**: L + T+P=C
MARKS :100 3 + 0+0=4

UNIT I

Basic principles of food preservation, prevention of food spoilage, principles of sanitation to be observed in food preservation, Methods of food preservation.

UNIT II

Addition of salt – pickling and curing of meat and fish, canning – steps, containers and equipment for canning. Sugar concentrates, Jams, Jellies and squashes.

UNIT III

Refrigeration and freezing – methods, advantages and disadvantages. Drying and dehydration – methods , factors influencing, advantages and disadvantages.

UNIT IV

Fermentation of foods - advantages and disadvantages, types, factors controlling fermentation, commonly fermented foods- sauerkraut, wine, vinegar, beer, temph, Soya sauce.

UNIT V

Chemical additives – classification, criteria for selection of chemical additives- mode of action, types of preservative, irradiation and microwave heating of foods, principal effects of irradiation,
advantages, disadvantages, method of packing- list of common packaging materials and their usage with examples.

REFERENCE

1. Potter, H. N, Food Science, AVI Pub, Co., Westport, 1978.
2. Srilakshmi, B, Food Science, 3rd Edition, New Age International Pub, New Delhi, 2003.
3. Shakuntala Manay and Shadaksharaswamy, Foods, Facts and Principles, Wiley Eastern
Co., New Delhi, 1995.
4. Charley,H, Food Science ,(2nd edition), John Wiley & sons, New York, 1982.
5. Lall, G., Siddhappa, G.V and Tandon, J. L, preservation of fruits and vegetables, Indian
council of agricultural research, New Delhi, 1967.

Practical /Related Experiences

1. A visit to Food Processing and Preservation industry (one week)and report preparation

PAPER II
BAKERY

SUB CODE : 08FSNS02 **HOURS:** L + T+P=C
MARKS : 100 3 + 0+0=4

UNIT - I

Baking Principles, role of ingredients in baking, Major ingredients – wheat flour – Types of wheat, Principles of flour milling, flour and dough qualities, gluten and test for gluten.

UNIT – II

Other ingredients and their function in baking. Sugar – sources, types, functions of sugar and role in baking. Shortening agents – Nature of fat, types, functions and characteristics, shortening value and plasticity, Leavening agents – Definition, physical, chemical and biological leavening agents, role of leavening agents in baking. Eggs – egg foams and their role in bakery.

UNIT – III

Baking process – basic concepts, batch/continuous dough mixing, dividing, moulding, panning, proofing, baking, Qualitative changes during different unit operations.

UNIT – IV

Major and minor equipments used in bakery, plan for a bakery unit – Maintenance of sanitation and hygiene in bakery Unit.

UNIT – V

Methods of preparing variety of baked products – bread and bread rolls, biscuit, cake, cookies, pastries, variety of icings, souffle and meringue.

REFERENCES

1. Matz, S.A, Technology for the materials of baking, Elsevier Science publishers, England, 1989.
2. Helen Charley, Food Science, New York, John wiley & Sons, 1982.
3. Debey's bakery, wheat associates of India, 1979
4. Varghese, Theory of cookery, new age international, New Delhi, 2001.

Practical /Related Experiences

1. Visit to well established bakery unit. (One week) and report preparation

PAPER III
FAMILY MEAL MANAGEMENT

SUB CODE: 08FSNS03 **HOURS**: L + T+P=C
MARKS : 100 3 + 0+0=4

UNIT – I

Concept of Food and Nutrients, Food groups, Classification of foods, Meal planning – basic principles, factors influencing meal Planning for different age groups, Basic meal pattern, it's modification to suit different income levels, age, and physiological stress, Balanced diet, Recommended Dietary Allowance.

UNIT – II

Nutrition in Pregnancy & lactation – Physiological changes during pregnancy & lactation, complications during pregnancy, nutritional requirements during pregnancy and lactation, special foods during lactation.

UNIT – III

Nutrition in infancy – Physical growth and development, infant feeding – breast & bottle feeding, home prepared weaning foods and commercial weaning foods, Modification of cow milk for infant feeding, Introduction of solids and feeding problems in normal and premature infants. Nutrition in preschool children - physical growth and development. Nutrient and food requirements of preschool children, menu planning, factors to be considered while planning a diet for preschool children.

UNIT – IV

Nutrition in school children – Physical growth and development, Nutrient requirements & menu planning, factors to be considered while planning a menu and packed lunch.
Nutrition in Adolescence- Physical growth, nutrient requirement and menu planning.

UNIT – V

Nutrition in adults - Reference man and women, nutrient requirements and menu planning, Nutrient requirement in relation to physical activity. Nutrition in old age – physiological and psychological changes in aging, factors affecting food intake during old age, special needs & nutrient requirements during old age and menu planning.

REFERENCE

1. Vinodhini Reddy, Prahlad Rao, Govinth Sastry and Kashinath , Nutrition Trends in India, NIN, Hyderabad, 1993.
2. Shills E.M.,Olson, A.J.,Shike, Lea and Febiger , Modern Nutrition in health and disease, 1983
3. Srilakshmi, Dietetics, New age International Pvt. Ltd, 2003.
4. Srilakshmi, Nutrition science, New Age international Pvt. Ltd, 2003.

Practical /Related Experiences

Planning a meal for different age groups.

PAPER IV
NUTRITION AND PHYSICAL FITNESS

SUB CODE: 08FSNS04 **HOURS**: L + T+P=C
MARKS :100 3 + 0+ 0=4

UNIT –I

Introduction to physical activity and exercise – types, Body system involved in exercise Cardio respiratory, muscular and energy system. Definition of fitness. Substrate utilization during work.

UNIT – II

Physical fitness assessment- cardio respiratory fitness, assessment of body composition, muscular fitness assessment, flexibility assessment.

UNIT –III

Diet in exercise - Carbohydrates for exercise, carbohydrate loading, ergogenic aspects, carbohydrate based dietary supplements.

UNIT – IV

Role of protein and at in exercise, body third and electrolytes changes in exercise, water electrolytes & temperature regulation. Fluid & Electrolyte losses, fluid and electrolyte replacement. Role of vitamins and minerals during exercise, vitamin and mineral supplements for exercise

UNIT – V

Yoga and Fitness, effect of yoga on immune system, endomine system, nerrous system, digestve
system and muscular system, Health benefits of yoga.

REFERENCE

1. Roberta larson Duyff. John wiley & sons, Inc American Dietetic Association, complete food
and Nutrition guide, 2nd edition 2002,
2. Nutrition for health fitness & sport Melvin H. Willams. 5th edition – 1999.
3. Udaiveer, Nutrition & Food, Anmol Publication Pvt. Ltd, New Delhi, 2005.
4. Guyton & Hall, Text book of Medical Physiology, 11th edition , 2006.
5. Gordon M. Wardlaw, Anne M. Smith contemporary Nutrition, Mc Graw – Hill International
Edition, 2006.
6. Wc13 Mcgraw – Hill. Vishwannath M. Sardesai (), Introduction to clinical Nutrition, Marcel
Dekker, Inc New York, 2003.