PERIYAR UNIVERSITY
Periyar Palkalai Nagar, Salem-636011

DEPARTMENT OF FOOD SCIENCE AND NUTRITION

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

REGULATIONS AND SYLLABUS
(Effective from the academic year 2014-2015 and thereafter)

M. Sc., FOOD SCIENCE AND NUTRITION

REGULATIONS AND SYLLABUS

(With effect from the academic year 2014 – 15 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 Chemistry / Bio-chemistry approved by the Association of Indian Universities are eligible to seek admission.

Duration of the course - Two years.

CBCS- Structure of the Course

S.No.	Paper Code	Title of the paper	Hours	L	T	P	C
PART -A Core Papers Semester I							
1	14FSNC 01	Food Science and Chemistry	90	5	0	0	5
2	14FSNC 02	Nutrition through Life Cycle	90	5	0	0	5
3	14FSNC 03	Nutritional Biochemistry I	90	5	0	0	5
4	14FSNC 04	Therapeutic Nutrition I	90	5	0	0	5
5	14FSNC 05	Food Science and Chemistry Practical	54	0	0	3	2
Semester II							
6	14FSNC 06	Therapeutic Nutrition II	90	5	0	0	5
7	14FSNC 07	Nutritional Biochemistry II	90	5	0	0	5
8	14FSNC 08	Community Nutrition	90	5	0	0	5

9	14FSNC 09	Therapeutic Nutrition Practical	54	0	0	3	2
10	14FSNC 10	Food Composition Analysis Practical	108	0	0	6	4
Semester III							
11	14FSNC 11	Food Processing and Quality Control	90	5	0	0	5
12	14FSNC 12	Research Methodology and Statistics	90	5	0	0	5
13	14FSNC 13	Statistics and Computer Applications Practical	54	0	0	3	2
14	14FSNC 14	Food Processing and Quality Control Practical	54	0	0	3	2
Semester IV							
15	14FSNC 15	Nutraceuticals and Functional Foods	90	5	0	0	5
16	14FSNC 16	Biochemical Analysis Practical	108	0	0	6	4
17	14FSNC 17	Project	342	0	0	19	4
Elective Papers							
1	14FSNC 01	Food Microbiology	72	4	0	0	4
2	14FSNC 02	Food Biotechnology	72	4	0	0	4
3	14FSNC 03	Food Packaging	72	4	0	0	4
4	14FSNC 04	Food Toxicology	72	4	0	0	4
5	14FSNC 05	Food Analytical Techniques	72	4	0	0	4
6	14FSNC 06	Physiological Aspects of Nutrition	72	4	0	0	4
7	14FSNC 07	Food product development and Marketing strategy	72	4	0	0	4
8	14FSNC 08	Instrumentation in Food Processing	72	4	0	0	4
Supportive courses for other departments							
01	14FSNS 01	Food Preservation	72	3	0	0	4
02	14FSNS 02	Food Safety and Regulations	72	3	0	0	4
03	14FSNS 03	Family Meal Management	72	3	0	0	4
04	12FSNS 04	Nutrition and Physical Fitness	72	3	0	0	4
PART-B **Self study courses / Internships**							
01	14FSNSSO1	Food Processing and Quality Control Internship	10 days	--	--	---	2
02	14FSNSSO2	Dietetics Internship	30 days	--	--	---	2
03	14FSNSSO3	Community Nutrition Camp	7 days	--	--	---	2
04	14FSNSSO4	Entrepreneurship Training	5 days	--	--	---	2
05	14FSNSS05	Value Education Programmes	30 hrs	--	--	---	2

Note:-

L- Lecture, T-Tutorial, P- Practical, C- Credit

Part A

Credits for Core courses - 70

Credits for Elective courses - 12

Credits for Supportive courses - 08
Total credits - 90
Human Rights - 02

Part –B

Self study courses (Extra) - 08 (Internships)
Value Education - 02
Total credits - 10

CBCS – Scheme of Examinations

S.No.	Paper Code	Title of the paper	Exam Hours	I	E	T	C
PART A **Core Papers** **Semester I**							
1	14FSNC 01	Food Science and Chemistry	3	25	75	100	5
2	14FSNC 02	Nutrition through Life Cycle	3	25	75	100	5
3	14FSNC 03	Nutritional Biochemistry I	3	25	75	100	5
4	14FSNC 04	Therapeutic Nutrition I	3	25	75	100	5
5	14FSNC 05	Food Science and Chemistry Practical	3	40	60	100	2
Semester II							
6	14FSNC 06	Therapeutic Nutrition II	3	25	75	100	5
7	14FSNC 07	Nutritional Biochemistry II	3	25	75	100	5
8	14FSNC 08	Community Nutrition	3	25	75	100	5
9	14FSNC 09	Therapeutic Nutrition Practical	3	40	60	100	2
10	14FSNC 10	Food Composition Analysis practical	6	40	60	100	4
Semester III							
11	14FSNC 11	Food Processing and Quality Control	3	25	75	100	5
12	14FSNC 12	Research Methodology and Statistics	3	25	75	100	5
13	14FSNC 13	Statistics and Computer Applications Practical	3	40	60	100	2
14	14FSNC 14	Food Processing and Quality Control Practical	3	40	60	100	2
Semester IV							
16	14FSNC 15	Nutraceuticals and Functional Foods	3	25	75	100	5
17	14FSNC 16	Biochemical Analysis Practical	6	40	60	100	4
18	14FSNC 17	Project	--	40	60	100	4
Elective Papers							
01	14FSNE 01	Food Microbiology	3	25	75	100	4
02	14FSNE 02	Food Biotechnology	3	25	75	100	4
03	14FSNE 03	Food Packaging	3	25	75	100	4
04	14FSNE 04	Food Toxicology	3	25	75	100	4
05	14FSNE 05	Biophysical Techniques	3	25	75	100	4

06	14FSNE 06	Physiological Aspects of Nutrition	3	25	75	100	4
07	14FSNE 07	Food Product Development and Marketing Strategy	3	25	75	100	4
08	14FSNE 08	Instrumentation in Food Processing	3	25	75	100	4
Supportive courses for other departments							
26	14FSNS 01	Food Preservation	3	25	75	100	4
27	14FSNS 02	Food Safety and Regulations	3	25	75	100	4
28	14FSNS 03	Family Meal Management	3	25	75	100	4
29	14FSNS 04	Health and Physical Fitness	3	25	75	100	4
Self study courses / Internships							
01	14FSNSS01	Food Processing and Quality Control Internship	10 days	40	60	100	2
02	14FSNSS02	Dietetics Internship	30 days	40	60	100	2
03	14FSNSS03	Community Nutrition Camp	7 days	40	60	100	2
04	14FSNSS04	Entrepreneurship Training	5 days	40	60	100	2
05	14FSNSS05	Value Education Programmes	30 hrs	40	60	100	2

Teaching methodologies

The classroom teaching would be through conventional lectures, vedio presentations 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 practical) 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

Evaluation of performance of students is based on ten point scale grading system as given below.

Ten Point Scale			
Grade of Marks	**Grade points**	**Letter Grade**	**Description**

90-100	9.0-10.0	O	Outstanding
80-89	8.0-8.9	D+	Excellent
75-79	7.5-7.9	D	Distinction
70-74	7.0-7.4	A+	Very Good
60-69	6.0-6.9	A	Good
50-59	5.0-5.9	B	Average
00-49	0.0	U	Re-appear
ABSENT	0.0	AAA	ABSENT

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 for Internal Marks in Practical (Max.marks-40)

Internal Tests – 25 (Best two out of three tests: Each 12.5 Marks)
Attendance -5 marks
Record - 10 marks (Average of marks obtained for each experiment in observation note book)

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
(Internal choice questions) 5X5 = 25

Part B

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 AND CHEMISTRY

SUB. CODE: 14FSNC01 **HOURS**: L + T+P=C
MARKS :100 5 + 0+ 0=5

Objectives

1. To learn about colloidal systems, properties and chemistry of food in raw form and on cooking.

UNIT I

Concept of food and nutrients. Physiochemical properties of food. Colloidal system in foods – types and properties of colloids. Sols – types, properties. Gels- theory of gel formation and factors influencing gel formation. Emulsions – types and nature, types of surface films and activity, common food emulsifies, functions of emulsifying agents, emulsification capacity, factors affecting emulsion stability. Foams – theory of foam formation, factors affecting foam formation, foaming capacity and stability, factors affecting foaming stability.

UNIT II

Cereals and Millets- classification, nutritional composition, structure, types of starch in cereals, principles of starch cookery – gelatinization, gelation, retrogradation, syneresis and dextrinisation, starch uses in food systems. Pulses, nuts and oil seeds- classification, nutritional composition, structure, toxic constituents in pulses, factors influencing cooking quality of pulses, complementary proteins.

UNIT III

Sugars- sources, properties, stages of sugar cookery, sugar substitutes, crystalline and non-crystalline candies. Vegetables and fruits –composition, classification, pigments, enzymes, tannins, pectin, acids and flavors, changes during 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, tenderness of meat, changes during cooking. Poultry and fish – classification, composition, structure, selection of poultry and fish. Milk – types, composition, physical and chemical properties, effect of heat, acids and enzymes, milk substitutes.

UNIT V

Fats and oils - sources, properties, kinds, fat substitutes and replacers, effect of heating on fat, rancidity of fat and its prevention. Spices and condiments- types, uses and abuses. Hot Beverages – coffee and tea – types and points to be considered while making hot beverages. Hydrocolloids.

Practical Experience

1. Handling of advanced equipments – RVA and DSC
2. Observing cooking methods and changes during cooking of foods

References

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. Vaclavik, V & Christian, E.W. Essentials of Food Science, XXIV edition,

WWW.Springer.com/978-1-4614-9137-8. 2014.
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: 14FSNC02 **HOURS**: L + T+P=C
MARKS : 100 5 + 0+ 0=5

Objectives

1. To highlight the growth, development and nutritional requirements in different stages of life cycle.

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, physiology of milk production, 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, breast Vs bottle feeding, nutritional allowances, feeding premature and low birth weight infants, supplementary feeding and weaning foods.

UNIT III

Nutrition in preschool children – growth and development, food habits, nutritional requirements, supplementary foods. Nutrition in school age - Early and middle childhood, growth and development, food habits, nutritional needs and feeding – packed lunch. Nutrition during adolescence – physical growth, pubertal changes, nutritional needs, eating disorders- anorexia nervosa and bulimia, adolescent pregnancy and its complications.

UNIT IV

Nutrition during adulthood – Type of work, adult consumption unit, meal planning 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.

UNIT V

Nutrition and Behaviour. Nutrition in yoga and exercise- Role of carbohydrate, protein, fat, vitamins, minerals, water and electrolyte in exercise and its changes before, during and after exercise. Nutrition in Sports. Nutrition in space, defence, high altitudes, extreme hot and cold climates and submarines.

Practical Experience

1. Meal planning for different age groups.
2. Meal planning for special needs – yoga, exercise, sports, sea, space and defence system.

References

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. Bahasahe and B. Dosa, Hand book of nutrition and diet.
8. Sumati. R. Mudambi, M.V Rajagopal., Fundamentals of Foods & Nutrition, 4th Edition New age International publishers New Delhi, 2006.
9. Judith E. Brown., Nutrition Now, 2nd edition, West / Wadswroth west / Wadsworth, An International Thomson publishing company, 1998.
10. Melvin H. Willams., Nutrition for health fitness & Sport. 5th edition Mcgraw –Hill, publishing Co., 1999.
11. Gordon M. Wardlaw, Anne M. Smith Contemporary Nutrition, Mc Graw – Hill International Edition -2006.
12. Nutrient Requirement and Recommend Dietary Allowances for Indians by Indian council of Medical research, National Institute of nutrition, Hyderabad, 2004.
13. Dietary Guidelines for Indians, National Institute of Nutrition, Hyderabad, 2004.

PAPER III
NUTRITIONAL BIOCHEMISTRY I

SUB CODE: 14FSNC03 **HOURS**: L + T+P=C
MARKS : 100 5 + 0+0=5

Objectives

1. To study the biochemistry of digestion, absorption and utilization of macronutrients and nucleic acids.

UNIT – I

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

UNIT – II

Carbohydrates – Chemistry, Classification, function, digestion, absorption, utilization - Glycolysis, TCA cycle, HMP shunt and energy production, gluconeogenesis. Electron Transport chain and phosphorylation, pentose phosphate pathway, Glycogenolysis , Glycogenesis.

UNIT – III

Proteins - chemistry, structure classification, function and utilization ; Protein structure Amino acids – classification, function; general pathways of protein metabolism- Denaturation, transamination, deamination, decarboxylation and urea formation, evaluation of protein quality.

UNIT – IV

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

Practical Experience

1. *In vivo* evaluation of protein quality using animal model.

References

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 : 14FSNC04 **HOURS**: L + T+P=C

MARKS :100 5 + 0+0= 5

Objectives

1. To educate the students on causes, symptoms, dietary management and drug treatment interaction with nutrients in various disorders.

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 and gall bladder - structure and functions. Etiology, classification and dietary regimen in jaundice, hepatitis, cirrhosis, hepatic coma, cholecystitis and cholelithiasis. Nutrition and alcoholism.

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.

Practical Experience

1. Diet counseling techniques for studied disorders.

References

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 AND CHEMISTRY PRACTICALS

SUB CODE: 14FSNC05 **HOURS**: L+T+P = C

MARKS : 100 0+0+3 = 2

Objectives

1. To gain practical experience on chemistry and science of food and nutrients.

Quantitative

Colloidal properties

1. Determination of least gelation concentration of flour.
2. Determination of emulsification capacity of a natural emulsifier.
3. Determination of foaming capacity and foaming stability of egg white foam.

Carbohydrates

4. Determination of pasting properties of flour using RVA (Demonstration)
5. Determination of gelatinization and retrogradation properties of cereal / pulse flour using DSC (Demonstration)
6. Microscopic examination of flour / starches

Protein

7. Determination of gluten content in wheat flour
8. Determination of relative density and casein content in milk.
9. Effect of salt in meat processing.

Fat

10. Determination of smoking point of oil
11. Determination of Iodine number of oil
12. Determination of saponification number of oil

Fiber

13. Determination of pectin content in fruits

References

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 elhi.
4. Weaver, C. (1996). The food chemistry laboratory: a manual for experimental foods, dietetics, and food scientists. CRC Press, LLC.
5. Wrolstad, R.E. 2012. Food carbohydrate chemistry**.** John Wiley & Sons, Inc, and Institute of Food Technologists.
6. American Association of Cereal Chemists (AACC). 2000. Approved Methods of the AACC method 22-08. 10th ed. St. Paul, MN.
7. Ranganna, S. (1986): Handbook of Analysis and Quality Control for Fruit and Vegetable Products, 2nd edition, Tata McGraw Hill Publishing Co. Ltd., New Delhi.

PAPER VI
THERAPEUTIC NUTRITION II

SUB. CODE : 14FSNC06 **HOURS** : L + T+P=C
MARKS : 100 5 + 0+0= 5

Objectives

To educate the students on causes, symptoms, dietary management and drug treatment interaction with nutrients in various disorders.

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

Disorders of pancreas- structure and functions. Pancreatitis, Diabetes mellitus – classification, etiology 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 nervous disorders- Structure and function of nervous system, Epilepsy, Alzheimer disease, Parkinsons disease, Autism. Management of neurological disorders- neuropathies, migraine, stroke. Management of musculoskeletal system disorders- Structure and

function of musculoskeletal system, osteoporosis, osteomalasia, 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.

Practical Experience

1. Diet counseling techniques for studied disorders.

References

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
NUTRITIONAL BIOCHEMISTRY II

SUB. CODE: 14FSNC07 **HOURS**: L + T+P=C

MARKS : 100 5 + 0+0=5

Objectives

1. To study the biochemistry of digestion, absorption and utilization of micronutrients and its interactions.

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, role of dietary fiber and resistant starch, effect of over consumption of fiber.

UNIT II

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

UNIT III

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

UNIT IV

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

UNIT V

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

Practical Experience

1. *In vivo* deficiency and toxicity of vitamins and minerals using animal model.
2. Demo on determination of energy value of foods using Bomb calorimeter.

References

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.

PAPER VIII
COMMUNITY NUTRITION

SUB. CODE: 14FSNC08 **HOURS**: L + T+P=C
MARKS :100 5 + 0+0=5

Objectives

1. To study the insights of nutritional parameters, nutritional organizations, nutritional programmes and strategy to combat nutritional problems in the community.

UNIT I

Nutritional status assessment – Direct parameters – anthropometry, Dietary survey, Clinical and Biochemical methods, Growth monitoring methods, Body composition studies, Tests of intelligence related to nutrition, mental ability tests.

UNIT II

Nutritional status assessment – Indirect parameters – Vital statistics - Health indicators, population tests and indicators, socio- economic indices, KAP surveys, nutrition indicators. Per capita availability and adult consumption unit. Assessment and surveillance of nutritional status in emergency affected populations.

UNIT III

Methodology in incidence, prevalence and epidemiological studies. Incidence, prevalence, epidemiology and preventive programmes of nutritional problems in India – PEM, vitamin A

deficiency, Anaemia, Iodine deficiency disorder and Flurosis. Food security- Definition, Factors affecting food security system, National and international approaches to improve food security.

UNIT IV

Nutrition Intervention Policies and Programmes in India- National Nutritional Policy, PDS, Objectives and operation of Chief Minister Noon Meal Programme (CMNMP), Integrated Child Development Service(ICDS), Primary Health Center (PHC). National organizations– ICMR, NIN, NNMB, CFTRI, DFRL, ICAR, NIPCCD, NSI, NFI and IDA. International Organization– FAO, WHO, UNICEF, UNESCO, UNDP and World Bank.

UNIT V

International voluntary services – CARE, CRS, IDRC, Micronutrient Initiative (MI), IFPRI, WFS, WFP, AUSAID, CIDA, SIDA, DANIDA,USAID. Nutrition Education- Types and Methods of education, principles of planning, executing and evaluating nutrition education programmes, problems of nutrition education.

Practical Experience

1. Application of nutritional assessment parameters and nutrition education kit in a nutrition camp organized by the departments' Nutrition and Health Club.

References

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.

PAPER IX
THERAPEUTIC NUTRITION PRACTICAL

SUB. CODE: 14FSNC09 **HOURS**: L + T+P=C

MARKS :100 0 + 0+3=2

Objectives

1. To inculcate practical experience in preparation of nutritionally balanced diet specific to disorders.

Diet Planning

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 (Calcium oxalate, Calcium acetate, Citrate)
g. Diet in cancer, AIDS and allergy (Gluten sensitive enteropathy).
h. Diet in obesity and underweight.
i. Diet for CVD – Hypertension, atherosclerosis.

References

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

PAPER X
FOOD COMPOSITION ANALYSIS PRACTICALS

SUB. CODE: 14FSNC10 **HOURS**: L + T+P=C
MARKS : 100 0 + 0+6 =4

Objectives

1. To educate the students on analytical techniques and accuracy in food composition analysis.

I. **Quantitative**

Macronutrients

1. Total sugar by phenol sulphuric acid method
2. Protein by Kjeldhal and Lowry's method
3. Fat by Soxhlet method
4. Moisture by hot air oven method
5. Ash content by AOAC method
6. Crude fiber by acid and alkali digestion method
7. Energy value by bomb calorimeter

Micronutrients

Vitamins

8. Thiamine and
9. Riboflavin by Flourimeter
10. Total carotenoids
11. Ascorbic acid

Minerals

12. Calcium
13. Iron
14. Phosphorus
15. Sodium and
16. Potassium by Flame Photometer

Qualitative

1. Test for sugars
2. Test for amino acids
3. Test for phytochemicals

Demonstration

1. Analysis of sugar fractions by HPLC.
2. Analysis of mineral content by AAS.

References

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.
5. Pomeranz, Y. and Meloan, C. E (1996): Food Analysis: Theory and Practice, CBS Publishers and Distributor, New Delhi.

PAPER XI
FOOD PROCESSING AND QUALITY CONTROL

SUB CODE: 14FSNC11 **HOURS**: L+T+ P=C

MARK : 100 5 + 0+0= 5

Objectives

1. To disseminate knowledge on processing of food in industry.

UNIT I

Cereal Processing- Rice- parboiling, milling, by products of rice milling; Wheat- milling, by products of wheat milling; malting, manufacture of breakfast cereals, extruded products, puffed and flaked cereals. Pulse/legume Processing – milling and germination. Starch – Starch isolation, modification of starch. Manufacturing of food Hydrocolloids – CMC and gaur gum.

UNIT –II

Milk Processing - Separation, standardization, pasteurization, homogenization, sterilization, evaporation, drying, condensation, membrane fractionation, milk products -butter, ghee, cream, paneer, yoghurt and cheese. Egg Processing – manufacturing of egg powder. Fleshy food Processing – canning, dehydro freezing, dehydration of meat, poultry and fish, smoking and curing of meat, fish oil extraction.

UNIT-III

Fruits and vegetables Processing–dehydration, juices extraction, concentrates preparation, Minimal processing and Hurdle technology. Sugar – Manufacturing of sugar from sugarcane and palm, sugar cubes and powdered sugar. Spices Technology - Extraction of essential oils - oleoresin and colors. Oil Seeds Processing– milling, extraction of oil and it's processing, inter – esterification and production of meal concentrates and isolates, specialty fats from non-traditional oilseeds, modification of fat, use of fat replacers in processed food.

UNIT – IV

Food quality evaluation – physical, chemical, nutritional, functional, microbial, sensory, shelf life evaluation methods, rapid diagnostic methods and kits to test food quality and safety. Food fortification and Enrichment.

UNIT – V

Food laws and regulations: Food legislation/authorities and their role- Essential commodities act (1955), Standard of weight and measures act (1976), Export (quality control and inspection) act (1963), Voluntary based product certifications (ISI mark of BIS and Agmark), Food Safety and Standards Authority of India (2011). International organizations and agreements- Codex

Alimentarius, Codex India, joint FAO/WHO expert committee on food additives (JECFA), World trade organization (WTO), Sanitary and Phytosanitary measures (SPS) and technical barriers to trade (TBT), International organization for standardization (ISO). Food safety management tools- GRAS, HACCP.

Practical Experience

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

References

1. Rick Parkar, Introduction to Food Science, Library of Congress Cataloging-in-Publication Data, First Edition, 2002.
2. Suman Bhatti & Uma Varma, Fruit & Vegetable Processing Organizations and Institutions, CBS Publishers and Distributors, New Delhi, Reprint 2003.
3. Thoms Richardson and Johan W. Finley, Chemical Changes in Food during Processing, CBS Publishers and Distributors, New Delhi, 2003.
4. Yeshajahu Pomeranz Clifton E.Meloan, Food Analysis theory and Practice, CBS Publishers and Distributors, New Delhi Third Edition, 2004.
5. Miridula Mirajkar, Sreelatamenon, Food Science and Processing Technology, Volume-II Commercial Processing and Packaging, Kanishka Publishers & Distributors, New Delhi, 2005.
6. Early, R. (1995), Guide to Quality Management Systems for the Food Industry, Academic and Professional, London.
7. Gould, W.A. and Gould, R.W. (1988), Total Quality Assurance for the Food Industries, CTI Publications Inc. Baltimore.
8. Askar, A. and Treptow, H. (1993): Quality Assurance in Tropical Fruit Processing, Springer – Vertag, Bertin.
9. Marth, E.H. (1978): Standard Methods for the Examination of Dairy Products 14th ed or edition. Interdisciplinary Books and Periodicals, Washington, D.C.
10. Ranganna, S. (1986): Handbook of Analysis and Quality Control for Fruit and Vegetable Products, 2nd edition, Tata McGraw Hill Publishing Co. Ltd., New Delhi.
11. Hagstad, H.V. and Hubbert, W.T. (1986): Food Quality Control, Foods of Animal Origin, lowa State University press, AMES.

PAPER XII
RESEARCH METHODOLOGY AND STATISTICS

SUB. CODE: 14FSNC12 **HOURS**: L + T+P=C

MARKS :100 5 + 0+0= 5

Objectives

1. To gain knowledge on methods of research and statistical techniques in food science and nutrition.

UNIT I

Meaning of research, objectives of research, types of research and their application, selection and formulation of research problem. Hypothesis. Research design – different types. Census and sample method, Sampling - theoretical basis of 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. Method of collecting 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.

Practical 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. Working out numerical sums for all statistical analysis and interpret.

References

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 .

PAPER XIII
STATISTICS AND COMPUTER APPLICATIONS PRACTICAL

SUB. CODE : 14FSNC13 **HOURS**: L + T+P=C

MARKS : 100 0 + 0+3= 2

Objectives

1. To give practical insights into the application of MS office programs in food science and nutrition research.

Exercises

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. Nutritional 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 power point presentation with animations on nutrition related topics, creating posters and Brochures.
6. Creating Email ID, sending and receiving Emails.
7. Statistical packages- application of data analysis package in calculation of mean, SD,'t' test, ANOVA, Correlation, Regression etc. with suitable nutrition research examples.

References

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

PAPER XIV
FOOD PROCESSING AND QUALITY CONTROL PRACTICAL

SUB. CODE: 14FSNC14 **HOURS**: L + T +P=C
MARKS :100 0 + 0+3 = 2

Objectives

1. To develop skills related to safety and quality evaluation of foods.

Physical and Functional

1. Determination of bulk density, WAC, FAC of flour.

Chemical

2. Determination of pH, titrable acidity and total soluble solids of fruit pulp.
3. Test for non nutritive sweeteners in bakery products, beverages
4. Determination of sulfur dioxide in dried fruits
5. Test for class II additive (benzoic acid) in sauces and ketchups

Microbial

6. Determination of total microbial count.
7. Determination of pasteurization effect in milk by MBRT.
8. Isolation and identification of microorganisms in food samples.

Sensory

9. Taste sensitivity tests.
10. Subjective evaluation of sensory profile.

Adulteration

11. Tests for adulterants using kits available in AGMARK.

References

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 control 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 : 14FSNC15 **HOURS**: L + T+P=C
MARKS :100 5 + 0+0= 5

Objectives

1. To explore the functional components of food and its role in prevention of diseases.

UNIT I

Introduction to nutraceuticals- definitions, synonymous terms. Nutraceuticals – The link between nutrition and medicine, A brief review of historical and teleological aspects, basis of claims for a compound as a nutraceutical and classifying nutraceuticals.

UNIT II

Properties, structure and functions of various Nutraceuticals- pigments, structural lipids, flavor and odor compounds, alkaloids, terpenoids, glycosides, polyphenols, isoprenoid derivatives, natural antioxidants.

UNIT III

Functional components and health effects of Soya, olive oil, tea, common beans, *Capsicum annum*, mustards, Ginseng, garlic, grape, citrus fruits, fish oils, sea foods, sports drink and infant formula as functional foods. Bioavailability and safety issues of functional foods.

UNIT IV

Concept and the role of nutraceuticals/functional foods, Nutraceuticals for cardiovascular diseases, cancer, diabetes, cholesterol management, obesity, immune enhancement, endurance performance and mood disorders – compounds and their mechanisms of action, dosage levels, contraindications if any etc.

UNIT V

General idea about role of Probiotics and Prebiotics as nutraceuticals. Dietary supplements- GMPs and shelf life of dietary supplements. Role of changing food preferences and globalization on selection of nutraceutical products, nutrigenomics – an introduction and its relation to nutraceuticals

Practical Experience

1. A visit to Siddha Pharmaceutical Company/Homeopathic medicine manufacturing company.

References

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. Robert easy Wildman , Handbook of Nutraceuticals and Functional Foods, Culinary and hospitality industry publication services, 2001.

4. David, H.Watson , Performance, Functional Foods, Culinary and hospitality industry publication services, 2003.
5. Chatwick, R et al. , Functional Foods, Springer, 2003.
6. Jeffery Horst, Methods of Analysis for Functional Foods and Nutraceuticals, CRS Press, 2002.
7. Paresh, C. Dutta , Phytosterols as Functional Food Components and Nutraceuticals, Marcel Dehker Inc, New York, 2004.
8. Guo M. 2009, Functional Foods – Principles and technology, Woodhead publishing company, UK.

PAPER XVI
BIOCHEMICAL ANALYSIS PRACTICAL

SUB. CODE: 14FSNC16 **HOURS : L + T+P=C**
MARKS :100 0 + 0+6=6

Objectives

1. To demonstrate the methodologies for biochemical examination of blood and urine and physical fitness.

Exercises

1. Microscopic Examination of various tissues and blood vessels
   a. Epithelial b. Muscular c. Connective d. Bone e. Artery f. Vein (Specimens)
2. Determination of clotting and bleeding time
3. Enumeration of RBC and WBC count
4. Determination of blood group and Rh factor
5. Measurement of BP, Pulse rate
6. ESR test
7. PCV - determination
8. Tests for physical fitness – Flexibility, Endurance & Muscular strength tests.
9. Body composition measurement of ht, wt, BMI, Body fat, Waist to hip ratio.
10. Assessment of lung capacity - Demonstration / visit to hospital.
11. Demonstration of ECG, Dialysis
12. Blood glucose by glucometer method
13. Blood Hemoglobin by Cynmeth haemoglobin method.
14. Serum Cholesterol
15. Serum protein
16. Serum A:G ratio
17. Urine sugar (Benedicts test)
18. Urinary creatinine
19. Urinary urea
20. Urinary iodine

References

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 AgeInternational P.Ltd. Publishers, New Delhi, Second edition, 1996
5.

ELECTIVE PAPERS
PAPER I
FOOD MICROBIOLOGY

SUB. CODE : 14FSNE01 **HOURS:** L + T+P=C
MARKS :100 4 + 0+0=4

Objectives

1. To integrate knowledge on microorganisms and its identification in food.

UNIT I

Introduction – Types of microorganisms, Classification and Nomenclature, Morphology, Structure, reproduction and their importance in food (bacteria, fungi, viruses and prions, protozoans and others).

UNIT II

Microbial growth- Bacterial growth curve, intrinsic and extrinsic parameters of food affecting the microbial growth. Food spoilage - types of food spoilage, Factors responsible for microbial spoilage – Acidity, temperature, time, oxygen, moisture, water activity, Changes caused by micro-organisms during spoilage (breakdown of proteins, carbohydrates, fats and other constituents).

UNIT III

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

UNIT IV

Isolation and identification of microorganisms methods for the microbiological examination of foods – Indicator organisms, Direct examination, cultural techniques, Enumeration methods – plate counts, most probable number counts, Alternative methods – dye reduction tests, electrical methods, ATP determination; Rapid methods for the detection of specific organisms and toxins.

UNIT V

Prevention of contamination and spoilage – Principles of preservation, classification of food preservation. Physical- high temperature, low temperature, irradiation and microwave heating, concentration, drying and dehydration. Chemical methods- Preservatives. Biological - Fermentation, Hurdle technology. Non destructive method of preservation – High pressure processing, pulse electric field, pulse light field, ultrasound, MAP, CAP and Vaccum packaging.

Practical Experience

1. Visit to Microbiology laboratory

References

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.
5. Bensaon, H.J, Microbiological applications, C. Brown publishers, U.S.A, 1990.

PAPER II
FOOD BIOTECHNOLOGY

SUB. CODE : 14FSNE02 **HOURS**: L + T+P=C
MARKS :100 4 + 0+0=4

Objectives

1. To generate knowledge on biotechnological approaches in food preservation and processing.

UNIT – I

Biotechnology - Definition, Scope, Application. 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 II

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 III

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 IV

Microbial products - Primary, secondary metabolites, Vit B_{12}, Citric Acid, Penicillin & alcohol. Microbial biomass production- baker's yeast, single cell protein and mushroom.

UNIT V

Food industrial wastes- Types, sources and characteristics of industrial wastes, waste disposal – physical, chemical and biological treatment, management of waste byproducts 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.

Practical experience

1. Visit to Biotech industries

References

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

PAPER III
FOOD PACKAGING

SUB. CODE : 14FSNE03 **HOURS**: L + T+P=C
MARKS :100 4 + 0+0=4

Objectives

1. To gain knowledge on packaging requisites of food and its products.

UNIT I

History, Packaging Functions and Requirements- Historical background, importance and scope of food packaging, functions of food packaging and requirements for effective food packaging. Graphics, Package Design, Printing and Labeling- Function of packaging graphics, main printing processes, printing inks, varnishes, adhesives and labels.

UNIT II

Paper and paper-based materials, corrugated fiber board (CFB). Injection molding, blow molding, types of plastics and their properties, co-extrusion, lamination, Biodegradable plastics, edible packaging and bio-composites. Environmental Concerns- recycling and disposal of packaging waste. Metal and Glass packaging- Metals: Tinplate, tinning process, components of tinplate, tin free can (TFC), types of can, metallic films, lacquers, Glass: composition, properties, methods of bottle making, types of closures.

UNIT-III

Package design for fresh horticultural produce and animal foods, dry and moisture sensitive foods, frozen foods, fats and oils, thermally processed foods and beverages**.**

UNIT IV

Testing Procedures for Packaging Materials- thickness, tensile strength, puncture resistance, bursting strength, seal strength, water vapor permeability, CO2 permeability, oxygen permeability, grease resistance. Testing Procedures for Packaged Foods - Compatibility and shelf life studies, evaluation of transport worthiness of filled packages. Food Packaging Laws and Regulations.

UNIT V

Bottling machines, cartoning systems, seal and shrink packaging machine. Form, fill and sealing machine (FFS). Vacuum, controlled and modified atmosphere packaging systems. Aseptic packaging systems. Retort packaging, Active and Intelligent packaging systems.

Practical experiences

1. Visit to food package and label manufacturing industry.

References

1. Robertson GL, Food Packaging – Principles and Practice, CRC Press Taylor and Francis Group, 2012.

2. Paine FA and Paine HY, A Handbook of Food Packaging, Blackie Academic and Professional, 1992.
3. Coles R, McDowell D, Kirwan MJ Food Packaging Technology. Blackwell, 2003.

PAPER IV
FOOD TOXICOLOGY

SUB. CODE : 14FSNE04 **HOURS**: L + T+P=C
MARKS :100 4 + 0+0=4

Objectives

1. To enable the students to learn natural and artificial toxicants in food.

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
FOOD ANALYSICAL TECHNIQUES

SUB. CODE : 14FSNE05 **HOURS**: L + T+P=C
MARKS :100 4 + 0+0=4

Objectives

1. To understand the recent advances in food analytical techniques.

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.

Practical Experiences

1. Demo on working principles of instruments available in the department.

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.
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PAPER VI
PHYSIOLOGICAL ASPECTS OF NUTRITION

SUB. CODE : 12FSNE06 **HOURS**: L + T+P=C
MARKS :100 4 + 0+0=4

Objectives

1. To learn the physiological conditions related to nutrition.

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.

Practical Experience

1. Attending the special lecture by doctors and biochemists relevant to the unit contents.

References

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PAPER VII
FOOD PRODUCT DEVELOPMENT AND MARKETING STRATEGY

SUB. CODE: 14FSNE07 **HOURS**: L + T+P=C
MARKS : 100 4 + 0+0=4

Objectives

1. To understand the concept of development of a new product and prepare new products based on special dietary requirements, functionality, convenience and improvisation of existing traditional Indian foods.

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 food product development- Market and literature survey to identify the concepts of new products based on special dietary requirements, functionality, convenience and improvisation of existing traditional Indian foods, Screening of product concept on the basis of techno-economic feasibility, Development of prototype product and Standardization of formulation process, Proximate Analysis of New Product, Packaging, labeling and shelf-life studies, Cost analysis and Final Project Report.

UNIT III

Case studies of Food Processing Business and its aspects, Business opportunity Identification and Assessment techniques, Business Idea Generation and evaluation exercise, Market Assessment study, Analysis of competitive situation, SWOT Analysis for business and for competitors, Preparation of business plan, Preparation of project report, Methods of Arrangement of inputs – finance and material.

UNIT IV

Criteria for formulation of new food products for infants, pre-school children, adolescents, pregnant and nursing mothers, old age, sports persons, armed sources personnel, emergencies and therapeutic uses. Standard and safety of food and food products; criteria for ingredients and finished products laid down in the FSSAI regulations, 2011.

UNIT – V

Concept of market and marketing –Market promotion and positioning of food products, role of advertisement and technologies in promotion of new products. Export potential for selected

Indian food products, Role of export promoting agencies and Export Quality control and Inspection Act, 1963.

Practical Experiences

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.

References

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.
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6. Edited by Catherine Side, Food Product Development based on experience, Iowa State Press, A Blackwell Publishing Company.
7. Fuller, Gordon W. 2004. New Product Development- From Concept to Marketplace, CRC Press.
8. Anil kumar, S., Poornima, S.C., Abraham, M.K.& Jayashree, K.2004. Entrepreneurship Development. New Age International Publishers.
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PAPER VIII
INSTRUMENTATION IN FOOD PROCESSING

SUB CODE 14FSNE08 **HOURS**: L + T+P=C

MARKS :100 4 + 0+0=4

Objectives

1. To acquaint with fundamentals of food engineering and its process.

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.

Practical Experiences

1. Visit to Food Processing Industry.

References

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: 14FSNS01 **HOURS**: L + T+P=C

MARKS :100 3 + 0+0=4

Objectives

1. To impart basic knowledge of food processing and preservation to non major students.

UNIT I

Basic principles of food preservation, classification of foods according to moisture/perishability, pH, water activity, classification of food preservation- physical, chemical, biological, combination of methods, nondestructive methods.

UNIT II

Physical methods – Heat treatment- sterilization, pasteurization, blanching, cold processing – refrigeration, cold storage, freezing, control of water content- minimal processing, concentration, drying and dehydration, irradiation and microwave heating.

UNIT III

Chemical methods – salting, curing, smoking, food additives and preservatives. Hurdle technology.

UNIT IV

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

UNIT V

Non destructive methods – High pressure processing, pulse electric field, pulse light field, ultrasound, MAP, CAP, vaccum packaging.

Practical Experiences

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

References

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.

PAPER II
FOOD SAFETY AND REGULATIONS

SUB. CODE : 14FSNS02 **HOURS:** L + T+P=C
MARKS : 100 3 + 0+0=4

Objectives

1. To understand the food safety and regulations in India.

UNIT I

Introduction to food safety- definition, food safety issues, factors affecting food safety, importance of safe foods. Recent concerns on food safety- genetically modified foods. Shelf life of Food Products- factors affecting shelf life and methods to check the shelf life. Food Packaging- Need, material used and labeling.

UNIT II

Food additives- meaning, various kinds of additives- food colour, preservatives, antioxidants, antimicrobial substances, artificial sweeteners, flavouring, emulsifying, stabilizing agents. Permissible limit of food additives and contaminants.

UNIT III

Food contaminants of natural origin- seafood toxins, toxic aminoacids and lathyrism, goitrogens, Haemagglutinins, phytates, cyanogenic glycosides, indirect additives, pesticides, contaminants and adulterants, pesticide residues, metallic contaminants, radionuclides. Food safety testing kits and rapid procedures.

Unit IV

Food laws and regulations: national food legislation, other food legislations/authorities and their role- Essential commodities act (1955), Standard of weight and measures act (1976), Export (quality control and inspection) act (1963), Voluntary based product certifications (ISI mark of BIS and Agmark), Food Safety and Standards Authority of India (2011).

UNIT V

International organization and agreements- Codex Alimentarius, Codex India, joint FAO/WHO expert committee on food additives (JECFA), World trade organization (WTO), Sanitary and Phytosanitary measures (SPS) and technical barriers to trade (TBT), International organization for standardization (ISO). Food safety management tools- Prerequisites, HACCP, ISO series, TQM and Risk analysis. Consumer protection procedures, laws and regulations.

Practical Experiences

1. Workshop on Food Safety and Regulations with practical exposure to test for adulterants.

References

1. Lawley, R., Curtis L. and Davis,J. The Food Safety Hazard Guidebook , RSC publishing, 2004.

2. De Vries. Food Safety and Toxicity, CRC, New York, 1997
3. Marriott, Norman G. Principles of Food Sanitation, AVI, New York, 1985
4. Forsythe, S J. Microbiology of Safe Food, Blackwell Science, Oxford, 2000

PAPER III
FAMILY MEAL MANAGEMENT

SUB. CODE: 14FSNS03 **HOURS**: L + T+P=C
MARKS : 100 3 + 0+0=4

Objectives

1. To educate other disciplinary students about meal planning and management through different stages of life cycle.

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.

Practical Experiences

1. Planning meal for different age groups.

References

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.
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PAPER IV

NUTRITION AND PHYSICAL FITNESS

SUB. CODE:14FSNS04 **HOURS**: L + T+P=C
MARKS :100 3 + 0+ 0=4

Objectives

1. To educate the students about active life and its nutritional considerations.

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 fat in exercise, body fluid and electrolytes changes in exercise, water, electrolytes & temperature regulation. Fluid & Electrolyte losses and 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, endocrine system, nervous system, digestive system and muscular system, Health benefits of yoga.

Practical Experiences

1. Practical training on Physical fitness tests.
2. Basic yoga class for at least two days.

References

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.
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