Avinashilingam
Institute for Home Science and Higher Education for Women
University
(Estd. u/s 3 of UGC Act 1956)
Coimbatore - 641 043, Tamil Nadu, India

M.Sc. FOOD SCIENCE AND NUTRITION
(Two Year Programme with Practicals)
Scheme of Instruction and Examination
(for students admitted from 2012-2013 & onwards)

Part	Subject code	Name of paper / component	Hours of Instruction/week		Scheme of examination				
			Theory	Practical	Duration of exam	CIA	CE	Total	Credit
	FIRST SEMESTER								
I	12 MFNC01	Nutrition through Life Span	5	_	3	40	60	100	4
I	12MFNC02	Food Microbiology and Food Safety	5	_	3	40	60	100	3
I	12MFNC03	Community Nutrition and Public Health	5	_	3	40	60	100	3
I	12MFNCO4	Research Methods and Statistical Applications	5	_	3	40	60	100	3
I	12MFNC05	Chemistry of Foods - I	5	_	3	40	60	100	3
I	12MFNC06	Chemistry of Foods – II (Practicals)	–	3	3	40	60	100	3
II		CSS	2	-	-	-	-	-	-
	SECOND SEMESTER								
I	12MFNC07	Physiological Basis for Nutrition	5	_	3	40	60	100	4
I	12MFNC08	Food Biotechnology	4	-	3	40	60	100	3
I	12MFNC09	Post Production Systems (CIA paper)	4	-	3	100	-	100	3
I	12MFNC10	Analytical Instrumentation	3	_	3	40	60	100	3
I	12MFNC11	Techniques for Clinical Nutrition (Practicals)	–	6	3	40	60	100	4
I	12MFNC12	Mini Project	1	-	-	100	-	100	2
I		**Interdisciplinary Course I**	2	3	3	40	60	100	4
II	12MSXCS1	CSS	2	-	3	50	50	100	1
II		Certification	-	-	-	-	-	-	2
	Internship during summer vacation for one month								

	THIRD SEMESTER								
I	12MFNC13	Therapeutic Nutrition	3	2	3	40	60	100	3
I	12MFNC14	Readings in Macronutrients	4	_	3	40	60	100	3
I	12MFNC15	Biomolecules and Intermediary Metabolism	4	_	3	40	60	100	4
I	12MFNC16	Food Product development and Packaging (Open book exam)	3	_	3	40	60	100	3
I	12MFNC17	Techniques for Experimental Nutrition (Practicals)	_	6	3	40	60	100	4
I	12MFNC18	**Self Study Course** Functional Foods and Nutraceuticals	1	_	3	40	60	100	4
I		**Interdisciplinary Course II**	2	3	3	40	60	100	4
I		**Multidisciplinary Course**	2	_	3	40	60	100	2
II	12MFNC19	Internship				40	60		2
	FOURTH SEMESTER								
I	12MFNC20	Readings in Vitamins and Minerals	5	_	3	40	60	100	5
I	12MFNC21	**Thesis**	25			100	100	200	6
		Total							**85**

Semester			Hrs/Week
I	**12 MFNC01**	**Nutrition Through Life Span**	**5**

Objectives: Enable the students: To

1. Gain knowledge about the methods of assessment of nutritional problems and their implications.
2. Understand the role of nutrition in different stages of life cycle.

Unit	Topic	Hrs
1	**Assessment of Nutritional Status** Assessing the food and nutritional problems in the community methods available for the individual and community- direct methods Indirect methods, assessment of ecological factors techniques of diet and nutritional surveys ***computer assistance for consolidation and documentation of data(SS)***	10
2	**Maternal and Paediatric Nutrition** Stages of gestation, weight gain, complications of pregnancy physiological adjustments, nutritional problems and dietary management, Importance of nutrition during and prior to pregnancy and dietary allowances. Physiology of lactation, hormonal control and reflex action, efficiency of milk production, problems of breast feeding, nutritional composition of breast milk, galactogogues, dietary modification and allowances. Nutritional status of infants, infant feeding, nutritional needs and allowances, premature infant and their feeding, breast feeding ,formula feeding, ***Weaning foods and supplementary foods (SS)***	19
3.	**Nutrition During Early And Late Childhood And Adolescence** Growth and development of preschool children- nutrition and cognitive development, prevalence of malnutrition in preschool age, feeding programmes for preschool children, food habits and nutrient intake of preschool children, dietary allowances. Nutrition in school children - feeding school children and factors to be considered. ***Food habits and nutritional requirements, packed lunch. Dietary allowances (SS),*** school lunch programme, nutrition during adolescence - changes in growth and development, hormonal influences, psychological problems, disordered eating behaviour, nutritional problems, changes needed to prevent malnutrition	13
4 .	**Adult and Geriatric Nutrition** Nutritional requirement for the adults. Nutrition and work efficiency Menopausal and post menopausal women, hormonal changes, nutritional requirements.Physiological changes in aging ***Clinical, psycho-social and economical factors affecting eating behaviour, social situation, institutionalization, common health problems (SS),*** Nutritional requirements, modification in diet, feeding old people.	7

5.	**Nutritional Requirements For Special Events** Nutritional requirements and food modification in higher altitudes, ***space travels and sea voyage (SS)*** Sports nutrition	6
	Related Experience Assessment of nutritional status and nutritional knowledge through anthropometric measurements, vital statistics, mortality and morbidity rate, clinical, biochemical and biophysical assessments, Food and nutrition survey on selected groups Camp for 7 days in a village	20

References:

Books:

1. Nutrient requirements and Recommended Dietary Allowances for Indians, ICMR, National Institute of Nutrition, Hyderabad, 2010
2. Dietary guidelines for Indians, ICMR, National Institute of Nutrition, Hyderabad, 2010
3. Swaminathan,M. Advanced Textbook on Food Science and Nutrition, Vol:2, Second edition, Reprinted, Bangalore Printed and publishing Co Inc, Bangalore, 2008.
4. Krause,M.V and Hunsher,M.A, Food, Nutrition and Diet Therapy, 11th edition, W.B.Saunders company, Philadelphia, London, 2004.
5. Bamji M.S, Prahlad Rao N, Reddy V ,Textbook of Human Nutrition II Edition, Oxford and PBH Publishing Co. Pvt. Ltd , New Delhi,2004

Journals:

1. Reports of the State of World's Children, WHO and UNICEF, Oxford University.
2. Reports of National Family Health Survey, International Institute for Population Science, Mumbai.
3. Indian Journal of Medical Research, ICMR, New Delhi,
4. Indian Journal of Pediatrics, Valley Nicro, Missouri, U.P.
5. Indian Journal of Nutrition and Dietetics, Avinashilingam Deemed University, Coimbatore.
6. Proceedings of the Nutrition Society of India, NSI, Hyderabad.

Semester	Code	Title	Hrs/Week
I	**12MFNC02**	**Food Microbiology and Food Safety**	5

Objectives: To enable the students: To

1. Acquire knowledge and understand the relevance of microbiology and its application in food industry and maintenance of health.
2. Understand the importance of food safety and quality management in food processing.

Unit	Topic	Hrs
1	**Introduction to Microbiology- Structure, Growth and Multiplication of micro-organisms** **Definition and History:** ***Microscopy, General Morphology and Types of microorganisms Bacteria, Fungi, Algae, Yeast and Virus - Bacteriophage. (SS),*** growth curve, batch and continuous culture, factors affecting growth: intrinsic factors, nutrient content, pH, redox potential, antimicrobial barrier and water activity; extrinsic factors: relative humidity, temperature and gaseous atmosphere.	24
2	**Microbiology of Foods, Benefits of Microbes** Contamination, spoilage and ***preservation of cereal and cereal products, sugar and sugar products vegetables and fruits, milk and milk products and canned foods, meat and meat products, egg and poultry, fish(SS)*** food fermentation-types; fermented food products	6
3	**Introduction to Food Safety:** Food safety in processing, packaging and labeling, food spoilage, factors affecting food safety, food borne hazards of microbial origin.	12
4	**Food Additives and Contaminants, Hygiene and Sanitation** Food colors, flavoring agents, preservatives, antioxidants, emulsifiers, stabilizers, antimicrobial substances; natural contaminants, toxins alkaloids, lathyrogens, goitrogens, haemagglutinins, phytates; indirect additives, pesticides, metallic and microbial contaminants and adulterants ***Food hygiene and sanitation–personal hygiene (SS)*** and pest control in the food industry.	12
5	***Food Laws (SS)*** **and Quality Management, Recent Concerns in Food Safety.** International and National food laws, Essential Commodities Act(ECA). ISI, BIS, AGMARK,PGFA,FPO, Food Safety and Standards Bill 2005, FAO,WHO, Codex Alimentarius, WTO, JEFA, APDA, ISO 9000 series, ***HACCP- definition, principles, and affiliations(SS)***, consumer education, food safety education and training, food sampling and analysis of food	6
	Related Practical Experience : 1. Hanging Drop Method – motility of bacteria. 2. Staining of Bacteria – simple staining, gram staining 3. Preparation of media and microbiological analysis of foods 4. Detecting food contaminants in some common foods. 5. Introduction to microbiological kits	15

REFERENECES:

1. Adams M. R and Moss M. O, Food Microbiology, New Age International (P) Ltd., New Delhi, 2005.
2. Vijaya Ramesh, K. Food Microbiology, MJP Publishers, Chennai , 2007
3. James G.Cappuccino and Natalie Sherman, Microbiology – A Laboratory Manual, Pearson Education Publishers, USA, 2008.
4. Frazier.W, Food Microbiology, Mc,Grawhill co ltd, NewDelhi, 2005
5. James M.Jay Modern Food Microbiology, Fourth edition, CBS Publishers and Distributors, New Delhi, 2005.
6. Adam Tamine, Probiotic Dairy products, Blackwell Publishing, USA, 2005.6.
7. Curricula On Food Safety, Directorate of General of health Services, Ministry of health &family Welfare, Govt of India, New Delhi, 2003.
8. David A.Shapton, Naroh F, Shapton ,Priciples and practices for the safe processing of foods, Heineman ltd, Oxford,1991

Semester	Code	Title	Hrs/Week
I	12 MFNC03	Community Nutrition and Public Health	5

Objectives: To enable the students

1. Gain insight into the national nutritional problems and their implications and appreciate the nutritional and international contribution towards nutrition improvement in India.
2. Gain knowledge and skills to use computers in the study of nutrition
3. Organize and conduct nutrition education in the community.

Unit	Topic	Hrs
1. .	**Nutrition and National Development, Ecology of Malnutrition, Strategies To Overcome Malnutrition** Relation of nutrition to national development; Consequences of malnutrition; IMR, NMR,MMR and prevalence of common nutritional problems- PEM, Vitamin A Deficiency Diseases, Anaemia, Iodine Deficiency Disorders and Fluorosis Ecological factors leading to malnutrition; Synergism between malnutrition and infection; Measures to overcome malnutrition Nutrition Intervention programmes - Nutritious Noon Meal Programme. ICDS, Prophylaxis programme – Vitamin A deficiency, Iron deficiency anaemia, Iodine deficiency National Nutrition policy ***Empowering women towards improving the nutritional status of the family, community and nation at large (SS)***	19
2	**National, International And Voluntary Organizations To Combat Malnutrition** ***History of malnutrition in India (SS)*** National organization – ICAR, ICMR, SCWB, SSWB, NNMB, NIN, CFTRI, DFRL, NIPCCID and NFI; International Organizations - WHO, FAO, UNICEF, World Bank, FFHC, WFP; Voluntary organizations – Global Alliance for Improved Nutrition(GAIN), Micronutrient Initiatives, CARE, CRS, AFPRO, IDA; Concepts of Community Health Health care of the community	17
3.	**Nutrition Education** ***Meaning , nature and importance of Nutrition education to the community and lessons to be taught (SS)*** Training workers in nutrition education programmes Methods of education when to teach, whom to teach Use of computers to impart nutrition education Organization of Nutrition education programmes	6

4.	**Epidemiology Of Communicable Diseases** Definition of epidemiology - causes, signs and symptoms, treatment and prevention of communicable diseases, respiratory infections, intestinal infections, Other infections- dengue, filariasis. Types of immunity- active, passive and herd-group protection Immunization agents- vaccines, immunoglobulins ***Immunization schedules (SS)*** **-** Active- National and WHO Expanded Programme on Immunization- Universal Passive, Combined, Chemoprophylaxis, non-specific measures	13
5.	**Environmental Sanitation And Disaster Management** Pollution**,** ***Biomanure, Vermicomposting (SS),*** Effective Microorganisms Water purification and recycling Types of disaster - natural and man made –earthquakes, volcanic eruptions, flash foods, major floods, tsunami and drought, fire accidents , bomb blast. Disaster management-mitigation strategies-Role of NGO's and GO's and nutritionists . Prevention, warning systems and relief Major nutritional and health considerations in disaster Emergency feeding ,mass and supplementary feedings ,management of feeding operations ,water and food safety	5
	Related Experience Planning and conducting nutrition education programmes in a selected village for 3 days	15

References:

1. Park A. (2007), Park's Textbook of Preventive and Social Medicine XIX Edition M/S Banarasidas, Bharat Publishers, 1167, Prem Nagar, Jabalpur, 428 001(India)
2. Bamji M.S, Prahlad Rao N, Reddy V (2004). Textbook of Human Nutrition II Edition, Oxford and PBH Publishing Co. Pvt. Ltd , New Delhi
3. Bhatt D.P (2008), Health Education, Khel Sahitya Kendra, New Delhi
4. Gibney MJ, Margetts BM, Kearney JM, Arab L (2004) Public Health Nutrition Blackwell Publishing Co. UK
5. Swaminathan M (2007), Essentials of Food and Nutrition. An Advanced Textbook Vol.I, The Bangalore Printing and Publishing Co. Ltd, Bangalore

Journals:

1. Reports of the State of World's Children, WHO and UNICEF, Oxford University.
2. Reports of National Family Health Survey, International Institute for Population Science, Mumbai.
3. Indian Journal of Medical Research, ICMR, New Delhi,
4. Indian Journal of Pediatrics, Valley Nicro, Missouri, U.P.
5. Indian Journal of Nutrition and Dietetics, Avinashilingam Deemed University, Coimbatore.
6. Proceedings of the Nutrition Society of India, NSI, Hyderabad.

Semester	Code	Title	Hrs/Week
I	12 MFNC04	Research Methods and Statistical Applications	5

Objectives: To enable the students to

1. Understand the fundamental principles and techniques of methodology concerning research
2. Apply statistical procedure to analyze numerical data and draw inferences.

Unit	Topic	Hrs
1.	**Introduction to Research , Types of Research and Research Design** Definition, Objectives and characteristics of research Types of Research- Basic , applied , action , evaluation and experimental Surveys- Descriptive , diagnostic and exploratory Basic components of research design Sampling design- Probability and non probability sampling methods	10
2.	**Data and Tools of Data Collection** Primary and secondary data and data sources Interview schedules and questionnaires Interviews and type of Interviews Pre-testing and pilot study, Editing and coding of data	11
3	**Organization and Representation of Data , Report writing** Classification- qualitative, Quantitative- frequency distribution, discrete and continuous Tabulation of data- parts of a table, preparation of blank tables Diagrammatic – One dimensional diagrams, two dimensional diagrams, pictogram and cartographs Graphical- Frequency graphs- line , polygon, curve, histogram Cumulative frequency graphs- ogives ***Components or layout of a thesis (SS)***	12
4	**Descriptive Measures** Mean, median, mode and their applications Measures of dispersion- standard deviation, coefficient of variation, percentiles and percentile ranks Correlation coefficient and its interpretation, Rank correlation Regression equations and predictions. Association of attributes , contingency table	19
5	**Probability and Tests of Significance** Rules of probability and its applications Normal, binomial, their properties, importance of these distributions in research studies Large and small sample tests -‘t’, F and chi square tests ANOVA and applications	23

	Related Experience 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 and interpret 6. Numerical applications and drawing inferences, demonstration of SPSS	

References

1. Devadas.R.P. A Handbook on methodology of Research, Sri Ramakrishna Vidyalaya, Coimbatore, 2000
2. Gosh.B.N. Scientific Methods and Social Research Sterling Publishers Pvt.Ltd. New Delhi.
3. Kothari.G.R. Research Methodology, Methods and Techniques, Wiley Eastern Limited, New Delhi, 2004
4. Kulbir Singh Sidhu, Methodology of Research in Education Sterling Publishers Pvt. Ltd., New Delhi, 2006
5. Gupta.S.P. Statistical Methods, Sultan Chand & Sons, New Delhi, 2002
6. Srivastava.A.B.L and Sharma. K.K., Elementary Statistics in Psychology and Education, Sterling Publishers Pvt.Ltd.2003

Semester	Code	Title	Hrs/Week
I	12 MFNC05	Chemistry of Foods - I	5

Objectives: To enable the students to

1. Gain insight into the chemistry of foods and
2. Understand the scientific principles involved in food preparations

Unit	Topic	Hrs
1.	**Physico Chemical Changes in Foods** Physical properties of water – Role of water in food systems, Bound water in Food products, Hydrogen ion concentration(pH), Solubility, Solutions, Crystallization, Emulsification, ***Osmosis, Enzyme action (SS),*** Oxidation – reduction, Colloids – Stabilizations and properties, Denaturation and coagulation of proteins	15
2.	**Starch and Sugars** Components and characteristics of food starches, Swelling of starch granules, Gel formation, factors affecting gelatinization, Retrogradation, syneresis, effect of sugar, acid, fat and Surface Active Agents on starch ***Stages of sugar cookery (SS)***, Crystal formation, factors affecting, types of candies, Action of Acid, Alkalies and Enzymes	15
3.	**Chemistry of Vegetable and Animal Protein** Components of plant and animal protein – Nutritional importance and functional properties; Effect of soaking, fermentation and ***germination of pulse protein (SS)*** Action of Heat, Acid, Alkalies on vegetable and animal proteins – egg, milk, meat	15
4.	**Chemistry of Fats and Oils** Physico – chemical properties of Fats and Oils Rancidity, hydrogenation, winterization, decomposition of triglycerides, ***Shortening power of Fats (SS)*** Changes in Fats and Oils during heating and storage, Factors affecting fat absorption of foods	15
5.	**Chemistry of Pectic substances and Plant pigments** Pectin, phenolic components, enzymatic browning reactions in fruits and vegetables, preventive measures Volatile compounds from cooked vegetables, ***Different types of Plant Pigments (SS)***, water and fat soluble pigments, Action of heat, acid and alkali on vegetable pigments	15

References:

1. Brown. A. Understanding Food, Wadsworth, Thomson Learning Publications, 2000.
2. Mehas, K.Y., and Rodgers, S. L., Foodscience and You. Mcmillan Mcgraw Hill Company, 2000.
3. Paul, P.C., and Palmer, H. H., Food Theory and Applications. John Wiley and Sons, Newyork, 2000 Revised Edition.
4. Srilakshmi, M., Foodscience, New Age International (P) Ltd., Publishers 2010.
5. Swaminathan, M., Foodscience, Chemistry and Experimental Foods, Bappco Publishers, 2005.

Semester	Code	Title	Hrs/Week
I	**12 MFNC06**	**Chemistry of Foods – II (Practicals)**	**3**

Objectives: To enable the students to

1. Understand the changes occurring in foods during cooking and
2. Develop skills to judge the quality of foods

Unit	Topics	Hours
1.	Stages of sugar cookery, preparation of Fondant, Fudge, Caramel, Pulled toffees and brittles. Preparation of sugar syrups for various Indian traditional sweets Gelatinization of various starches, microscopic examination of starches, fermentation of batter in terms of volume and pH	12
2.	Smoking temperature of fats and oils. Factors affecting fat absorption of deep fried foods	6
3.	Effect of soaking time and types of water on pulses Effect of cooking, acid and alkali on pulses Effect of germination on pulses Principles involved in the preparation of cheese Setting of curds	6
4.	Changes in cooking of meat, factors affecting the tenderness of meat Effect of cooking time on egg protein, coagulation of egg, preparation of mayannaise	6
5.	Effect of acid, alkali and heat on vegetable pigments Principles involved in the preparation of tomato soup	3
	Product development – A mini project	12

Semester	Code	Title	Hrs/Week
II	**12 MFNC07**	**Physiological Basis for Nutrition**	**5**

Objectives: To enable the students: To

(i) Understand the physiological functions related to nutrition

(ii) Understand the alterations in physiology in diseases

S.No	Topics	Hours
1.	**Blood And Immunology** ***Blood composition (SS)*** and functions, plasma proteins- origin and its functions, blood volume haemostasis, ***coagulation (SS)*** Development of red blood cells and anaemia, white blood cells, platelets, blood groups and blood transfusion. Definition and types of immunity, lymphocytes in immunity, antigens, development of cellular immunity, development of humoral immunity, immune deficiency diseases and auto immune disease	15
2.	**Body Fluids and Circulatory System** Compartment of body fluids, composition of body fluids, significance of body fluids, methods of measuring body fluids, lymphatic system and lymph.***Introduction to cardiovascular system (SS)***, origin and spread of cardiac impulse, ***cardiac cycle (SS)*** heart sounds, electro cardiogram, ***heart rate (SS)*** blood pressure-factors influencing BP, hypertension, effect of exercise on cardio vascular system.	15
3.	**Digestive System** Organization and structural plan of gastrointestinal system, ***Functions of the stomach, liver and intestine(SS)***, mechanism of secretion of saliva, gastric juice, bile, pancreatic juice and intestinal juice, movements of gastrointestinal tract, Hormones in the gastrointestinal tract, gastric function tests and liver function tests	15
4.	**Respiratory Physiology and Renal Physiology** ***Physiological anatomy of respiratory tract (SS)***, mechanics of respiration, transport of respiratory gases in blood, exchange of respiratory gases pulmonary volumes, regulation of respiration, effect of exercise on respiration, high altitude and acclimatization. Structure of kidney and nephron, urine formation, renal disorders, renal function test, micturition, acid base balance by kidney and dialysis.	15
5.	**Endocrine and Nervous System** Introduction to endocrinology, structure and functions of pituitary glands, thyroid glands, endocrinal functions of pancreas, adrenal cortex and medulla, ***brief disorders of endocrine glands***(SS), Introduction to nervous system, neuron, receptors, synapse, neurotransmitters, reflex activity, general anatomy of nervous system, functions of the different parts	15
	Related Experience Determination of bleeding time, Determination of coagulation time, Estimation of haemoglobin, RBC count, Blood indices – Total Leucocyte Count (TLC), Differential Leucocyte Count (DLC) Recording of blood pressure and heart rate at rest and in exercise	

References

1. Guyton,A.C and Hall,J.B (1996): Text Book of Medical Physiology, 5th Edition, W.B,Sanders Company, Prism Books Private Limited, Bangalore.
2. Chatterjee,C.C (1998) Human Physiology, Volume I and II, Medical allied agency, 82/1 Mahathma Ganthi Road, Calcutta.
3. Subramanian and Mathavan Kutty,S.M (2001): Text Book of Physiology, Chand and Company, New Delhi.
4. Sembulingam,K and Prema Sembulingam (2000): Essential of Medical Physiology, 2nd Edition, Jay pee Brothers Medical Publishers (P) Limited, New Delhi.
5. Chaudhuri,K (1997) Concise Medical Physiology, 2nd Edition, New Central Book Agency (P) Limited, Calcutta-9.
6. Vidya Ratan (1993), Hand Book of Human Physiology, 7th Edition, Jay pee Brothers Medical Publishers (P) Limited, New Delhi.7 and 8 in the syllabus
7. Sembulingam and Prema Sembulingam, (2010) 8th Edition, Essential of Medical Physiology, Jay pee Brothers Medical Publishers (P) Limited

Semester	Code	Title	Hrs/Week
II	12 MFNC08	Food Biotechnology	4

Objectives: To enable the students

1. To understand the application of Biotechnology in the field of Foods and Nutrition
2. To create interest in related activities of tissue culture and fermentation technology and learn concepts of xenobiotics, nanotechnology and nutrigenomics

Unit	Topic	Hrs
1.	**Introduction and Genetic Engineering** ***Definition, scope and importance of biotechnology.(SS)***Tools of genetic engineering : enzymes-exonucleases, endonucleases, restriction endonucleases, ligases, reverse transcriptases and alkaline phosphatase Cloning vectors-plasmids bacteriophage, cosmids, phasmids: Steps in genetic engineering	10
2.	**Microbial Growth and Fermentation Systems** ***Microbial cell growth(SS***), microbial metabolism, regulation of metabolism and product secretion. Fermentation systems – batch and continuous process – fermenter design, bioprocess control Enzyme Technology – soluble enzymes, immobilized enzymes, amylases, invertase, glucose isomerases. – synthesis and applications of enzymes in food industries	10
3.	**Tissue Culture and Single Cell Protein (SCP)** Plant and animal tissue culture -principles and procedure, culture media; applications: transgenic plants - flavr savr tomato, golden rice, Bt brinjal, GM mustard and others, terminator seed technology, artificial seeds. Production of microbial protein- ***SCP, substrates, nutritional value, harvesting(SS)*** spirulina, mushroom culture and yeast biomass production.	9
4.	**Role of Biotechnology on Food Industries** a) Food additives, synthesis of acidulants – citric acid, gluconic acid, lactic acid, itaconic acid; sweeteners – glucose syrup and High Fructose Corn Syrup (HFCS): thickners and gelling agents - xanthan gums. b)Vitamins and amino acids – vitamin A., ergosterol, riboflavin, vitamin B_{12}, fatty acid; amino acids – lysine, methionine, glutamate. c) ***Food fermentations – alcoholic beverages, cheese making, fermented soya based foods, meat fermentation, vinegar (SS)***	12
5.	**Xenobiotics, Nanotechnology, Nutrigenomics and Regulatory Aspects of Biotechnological Methods** Definition, components,metabolism of xenobiotics- Phase I and Phase II reactions ,Bio- dynamics of xenobiotics : Definition , Concepts and applications o Nanotechnology and Nutrigenomics Downstream processing, biosensors, biochips, limiting factors and regulation. ***Impact of biotechnology on the nutritional quality of foods(SS)***, Safety aspects of foods produced by biotechnology and genetic engineering	13
	Related Experience Visit to biotechnology lab Visit to plant tissue culture laboratory Visit to animal tissue culture laboratory	6

References:

Books:

1. V.K.Joshi and Ashok Pandaey (2009) Biotechnology: Food Fermentation-Microbiology, Biochemistry and Technology ,volume –I. Asia Tech Publishers, New Delhi.
2. V.K.Joshi and Ashok Pandaey (2009) Biotechnilogy: Food Fermentation - Microbiology, Biochemistry and Technology ,volume- I . Asia Tech Publishers, New Delhi.
3. Satyanarayana, U, 2007. Biotechnology, Books and Allied (P) Ltd., Kolkata
4. Mansi, EMT, Bryce, CFA, Demain,A.L and Allman, R, Fermentation Microbiology and Biotechnology, Taylor and Francis, New York, 2007
5. Meenakshi Paul ,2007,Biotechnology and Food Processing Mechanics, Gene-Tech Publishers
6. Jayanto Achrekar ,2007 ,Fermentation Biotechnology, Dominant Publishers
7. Green P.J 2002, Introduction to Food Biotechnology, CRC press, U.S.A

Journals:

1. Food Technology, Journal of Institute of Food Technology, Illinois, USA
2. Journal of Food Science and Technology by Association of Food Scientists and Technologists, CFTRI India
3. Food Technology, Abstracts, Central Food Technological Research Institute, Mysore.
4. Food Processing, Pitman Publishing Company, New York, USA
5. Journal of Food Science, The Institute of Food Technologists, Illinois, USA.
6. Nutrition and Food Science, Forbes Publications Ltd., Hatree House, Queenway, London.
7. Trends in Biotechnology, USA .

Semester	Code	Title	Hrs/Week
II	**12MFNC09**	**Post Production Systems (CIA Paper)**	**4**

Objectives: To enable the students:

1. To understand the importance and methods of post production techniques for foods
2. To gain knowledge in food processing and food conservation
3.

Unit	Topic	Hrs
1.	**Introduction To Post Production Technology And Agencies Controlling Food Losses** Need for post production technology, important measures adopted by Government to augment food production, ***Green, Blue, and white revolution (SS)*** Role of SGC, FCI,CWC,SWC,IGS, Pest Control of India(PCI) in controlling food losses	10
2.	**Agents Causing Food Loss And Control Measures** Types and reasons for losses of foods ,extent and cost of losses Agents causing losses - insects, rodents, micro organisms, Birds and other physical agents ***Importance and methods of sanitary handling (SS)*** Physical, chemical ,biological measures to control insects, rats, rodents and birds; Fumigants, fumigation, safety measures and integrated pest control	22
3.	**Storage Of Grains** Importance and requirements of storage structures, ***Review of traditional structures and improvements needed (SS),*** modern storage structures, metalbins, silos, storage godowns	8
4.	**Food Processing I** Importance of processing- methods of processing cereals (wheat, rice, maize), breakfast cereals Processing of pulses Processing of fruits and vegetables, meat, fish, poultry, egg Processing of sugars	8
5.	**Food Processing II** Processing of oil seeds Processing of milk and milk products Processing of condiments and spices ***Beverages , tea, coffee and cocoa (SS)***	10
	Related Experience Visit to FCI, TNAU, Milk processing unit Visit to sugar manufacturing and oil processing unit	

References:

Books:

1. Fellows,P, Food Processing Technology-Principles and Practice.,2nd edition, CRC press WoodLead Publishing Ltd, Cambridge, England, 2000.
2. Srilakshmi,B, Foood science, New Age International (Pvt) Ltd, New Delhi, 2002.
3. Sivasankar B, Food Processing and Preservation, Prentice-Hall of India Private Limited, New Delhi, 2002
4. Mehas, K.Y., and Rodgers, S. L., Foodscience and You. Mcmillan Mcgraw Hill Company, 2000.
5. Swaminathan, M., Foodscience, Chemistry and Experimental Foods, Bappco Publishers, 2005.

Journals:

1. Journal of Technology, Institute of Food Technology, Illinois, USA
2. Food Technology- Abstracts Central Food Technological Research Institute.
3. Food Processing. Pitman publishing Company, New York, USA
4. Journal of Food Science, The Institute of Food Technologists, Illinois, USA.

Semester	Code	Title	Hrs/Week
II	**12MFNC10**	**Analytical Instrumentation**	**3**

Objectives: Enable the students : To

1. Learn advanced instrumentation required in food and biochemical analysis
2. Outline principles of instruments
3. Describe applications of instrumental technique in analysis

Unit	Topic	Hrs
1.	**Analytical Instrumentation and Spectroscopic Techniques** Need for analysis and instrumentation, Selecting an appropriate instrumental technique, criteria for selecting a technique, Limit Of Detection (LOD) and Limit Of Quantification(LOQ) Colorimetry, Spectrophotometry-definition and derivation of Lambert-Beer's Law, Atomic-Absorption Spectroscopy (AAS),Inductively Coupled Plasma – Optical Emission Spectrophotometry (ICP- OES/MS), ***Nuclear Magnetic Resonance Spectroscopy (NM*)(SS),**Fourier Transform Infrared Spectroscopy (FT-IR) - Principle, Instrumentation and Applications	11
2	**Chromatographic Techniques** Basics and Classification of Chromatography- Adsorption, partition, size exclusion, ion-exchange, affinity Gas Chromatography, Liquid Chromatography - Instrumentation, Sampling Techniques and Applications Applications of HPLC, Comparison of HPLC and GC	6
3	**Advanced Chromatographic Techniques and Electrophoresis** Thin Layer Chromatography, High Performance Thin Layer Chromatography (HPTLC), Hyphenated Techniques - Gas Chromatography-Mass Spectrometry (GC-MS), Liquid Chromatography-Mass Spectrometry (LC-MS), Principles and procedure of electrophoresis – ***Paper and Agar Electrophoresis***(SS) Moving boundary electrophoresis, PAGE	8
4.	**Fluorimetry and Flame Photometry** ***Theory of fluorescence (SS)***and instrumentation, Instrumentation in Flame Photometry- oxidant, fuel, filter, detector, amplifier, applications	8
5.	**Measurement of Radioactivity** ***Radio active isotopes(SS)*** Methods and Types Radioactive Counters- gas and liquid Scintillation- uses, applications and safety	5
	Related Experience Visit to laboratories Demonstration of one chromatographic technique or one electrophoretic technique	6

References :

1. Kaur.N. Instrumental Methods of chemical analysis. Pragati Prakashan Educational Publishing. 3rd Edition, 2006.
2. Alan H.Gowenlock, Jannet R Mc Murray and Donald M. Mc Lauchlex, Varley's Practical Clinical Biochemistry, sixth edition. CBS Publishers and distributors, New Delhi, 2006.
3. Egon Stahl, Thin Layer Chromotography, A Laboratory Handbook, second edition, Springer International Edition, Heidelberg, 2005.
4. Rodney Boyer, Biochemistry Laboratory- Modern Theory and Techniques; Pearson Education Inc. Publications, USA, 2006.
5. Official Methods of Analysis, Association of Official Analytical Chemists - Officially recognized methods of analysis for many food components. 18th ed,2011.
6. Y. Pomeranz and C.E. Meloan. *Food Analysis: Theory and Practice*. Springer, 2002

Semester	Code	Title	Hrs/Week
II	12 MFNC11	Techniques For Clinical Nutrition (Practicals)	6

Objectives:

To enable the students to get practical experience in the Laboratory and to develop skills to undertake research work on blood and urinary analysis.

Topic	Hrs
Determination of Blood for a. Glucose	3
b. Haemoglobin 1. Cyanmothaemoglobin method 2. Wong's method	6
c. Total Cholesterol	3
d. Triglycerides	3
e. High Density Lipoproteins(HDL)	3
f. Serum Calcium	3
g. Serum Total Protein and A/G ratio	6
h. Serum Phospholipid	6
i. Serum Creatinine	3
j. Serum Alkaline Phosphatase	3
k. Serum Glutamic Oxalate Transaminase	6
l. Serum Glutamic Pyruvate Transminase	6
m. Serum Bilirubin	6
Analysis of urine for	
a. Creatinine	3
b. Urea	6
c. Total nitrogen	9
d. Calcium	3
e. Phosphorus	3
f. Iodine	3
Demonstration of g. Serum Glycosylated Heamoglobin using biochemical analyser	6

References:

1. Raguramulu N. Madhavan Nair K. KalyanaSundram S., A manual of laboratory techniques Silver Printers, NIN.2007
2. Charles George Lewis Wolf, A laboratory hand-book of urine analysis and physiological chemistry,W. B. Saunders & co., 1901,Harvard University, 2007
3. Nancy A. Brunzel , Fundamentals of Urine & Body Fluid Analysis, Saunders; 2 edition , 2004

Semester	Code	Title	Hrs/Week
III	12MFNC13	Therapeutic Nutrition	5 (3+2)

Objectives: To enable the students to:

- Understand the role of nutrition for good health.
- Obtain knowledge of different therapeutic diet and their preparation
- Develop capacity and attitude for taking up the profession as a di titian

Unit	Contents	HRS
1.	**Introduction and concept of therapeutic nutrition** Growth and scope of dietetics, purpose and principles of therapeutic diets, modification of normal diet, classification of therapeutic diet. **Characteristics and role of dietitians and IDA (SS).** Basic concept of tube feeding (intravenous feeding & total parenteral nutrition) Pre and post operative nutrition, enteral and parenteral nutrition- **Enteral formula composition, advantages and disadvantages. Pharmacological use of nutrients (SS).**	8
2.	**Endocrine disorders and Diet in Fever and Infections** **Diabetes mellitus:** etiology, types, clinical and biochemical changes, Clinical signs and symptoms, diagnosis, mode of treatments. **Disorders of thyroid and para thyroid glands, tetany**, **gout and arthritis (SS).** **Obesity-** etiology, theories on Obesity, types, Dietary modification, complications. **Under weight-** etiology, nutritional and food requirement. **Fevers-** causes, types, metabolic changes, fevers of short duration and chronic fever and infections	10
3.	**Diseases of the gastrointestinal tract and liver** **Diseases of gastrointestinal tract**- etiology, type, clinical, signs and symptoms, diagnosis, diet modifications-peptic ulcer, diarrhoea, dysentery, constipation and **other GTI problem like gastritis, tropical sprue dumping syndrome, lactose intolerance, irritable bowel syndrome, diverticulosis (SS).** **Diseases of liver**: functions of liver, etiology, physiological and metabolic consequences, clinical signs and symptoms, Mode of treatment and diet modifications of jaundice, hepatitis, Cirrhosis, hepatic coma, cholescystitis, cholelithiasis and pancreatitis.	10

4.	**Diseases of cardiovascular system and renal disease** ***Prevalence and incidence of cardiovascular disease (SS***). Risk factors for coronary heart diseases, dietary management. ***Role of fat in the development of atherosclerosis (SS).*** **Hypertension**- causes, prevention and dietary modification. **Diseases of renal system**: function of kidney, etiology, physiological and metabolic consequences, clinical signs and symptoms and diet modification for Nephritis, nephrosis. Nephrosclerosis, renal failure-acute &chronic ***Dialysis: principles and types (SS).*** Kidney stones- etiology, types, dietary modification.	10
5.	**Diets in other disease conditions** Classification, risk factors, symptoms, general systemic reactions, nutritional problems of cancer therapy, nutritional requirement and diet modifications **Pulmonary diseases**- bronco pulmonary disease, asthma, respiratory failure. Nutritional care and requirement for head injury and major burns. **HIV and AIDS**- etiology, signs and symptoms, stages, diagnosis and diet modifications ***Allergy- definition, classification, manifestation***, ***common food allergies, tests for allergy and diet modification (SS).***	7
	Total	45

PRACTICALS/RELATED EXPERIENCE	**HRS**
Visits to dietary department of hospitals Preparation of Hospital diets	3 3
Preparation of diet for diabetes mellitus Diet in obesity and under weight Diet for fibrile condition- TB, Typhoid, Fever	3 3 3
Diet for peptic ulcer, Diarrhoea, constipation Diet for liver disease- jaundice, cirrhosis	3 3
Diet for Cardiovascular disease, atherosclerosis and hypertension Diet for nephritis, renal failure, acute and chronic	3 3
Diet for cancer and HIV patient	3
Total	30

References:

1. Robinson C.H. (2007) Normal and Therapeutic nutrition, 12th edition, Mac millan Publishing Co. Inc, Newyork.
2. Krause M.V and Mahan L.K (2010) Food, Nutrition and Diet therapy, 9th edition, W.B. Saunder Co, Philadeephia
3. Srilakshmi. B (2012), Dietetics, New Age International Pvt Ltd, New Delhi.
4. Dietary Guidelines of Indians- A Manual, National Institute of Nutrtition, Hyderabad, 2006.

Journals:

1. Journal of American Dietetic Association. The American Dietetic Association Mount Arris, Illinois-61054, USA.
2. The American Journal of Clinical Nutrition Published by the American society for Clinical Nutrition, Inc., USA.
3. The Indian Journal of Nutrition and Dietetics, Sri Avinashilingam Home Science College for Women, Coimbatore.
4. Clinical Nutrition, Bell and Bain Ltd., Scotland.
5. Food and Nutrition Bulletin, United Nations University Press, Japan

Semester	Code	Title	Hrs/Week
III	12MFNC14	MACRONUTRIENTS	4

Objectives:

Enable the students to

1. Gain knowledge about macronutrients
2. Understand their role in health and disease

Unit	Contents	No. of hours
I	**Energy** **Historical background, Energy Content of Foods, Basal metabolism,** **Total Energy Expenditure, Thermogenic Effect, Energy balance** **Energy requirements and Recommended Dietary Allowances- ICMR , FAO and WHO (SS)** Energy utilization in cells-Role of Mitochondria Energy metabolism during Physical Activity, CED and Obesity, Energy Metabolism and Vascular Homeostasis Energy Requirements for Strenuous Physical Activity -Sports, Expeditions. Nutritional Adaptation in Malnutrition	11
II	**Carbohydrates and Fibre** **Nutritional Importance of Carbohydrates. Review of Classification, Function, Digestion, Absorption, Utilization and Metabolism of Carbohydrates (SS)** Concept of Glycemic Index and Glycemic Load **Dietary Fibre – Classification, Components, Sources (SS)** Role of Dietary Fibre in Human Nutrition Abnormalities in the Regulation of Glucose Homeostasis, Inherited Disorders of Carbohydrate Metabolism, Carbohydrates and Exercise Performance, Role of Multiple Transportable Carbohydrates	14
III	**Proteins** **Historical Review, Functions and Classification, Sources,** **Digestion, Absorption and Utilization of proteins** **Protein Turnover, Synthesis and Stores** **Protein as Source of Energy** **Protein Requirements- ICMR, FAO and WHO. Computation of protein requirements through factorial method and balance study** **Amino acids- Classification, Functions and Sources (SS)** Evaluation of Protein Quality- Different methods based on albino rats and microbes – BV, DC, PER, NPR, NPU, PDCAAS, Supplementary value of Proteins, Novel Protein Foods, Role of specific proteins, their metabolites, transporters and inhibitors on specific body functions- growth, protection regulation, wound healing	15
IV	**Fats and Lipids** **Review of digestion and absorption of fats (SS)**, transport of lipids in blood. Lipid transformation in the liver Lipotropic factors, role of essential fatty acids, deposition of fat in the body Free radical formation and role of antioxidant enzymes in mammalian cells	

	Consequences of high and low fat intakes Recent Trends in Lipid Nutrition - saturated, poly unsaturated, mono unsaturated and trans fat, Fat Burners and Replacers	11
V	**Water** **Distribution of Water, Functions, Requirements, Sources, Water Balance (SS)**, Importance of Euhydration; Assessment of Hydration Status- Common indices Hazards of Hypo and Hyper Hydration with suitable examples	9

References:

Books:

1. Krause,M.V and Hunsher,M.A, Food, Nutrition and Diet Therapy, 11th edition, W.B.Saunders company, Philadelphia, London, 2007.
2. Advanced Nutrition: Macronutrients, Micronutrients, and Metabolism Carolyn D. Berdanier (Author), Lynnette A. Berdanier , Janos Zempleni Edition: 1 2008.
3. Recommended dietary allowances, ICMR, National Institute of Nutrition, Hyderabad, 2010.
4. Swaminathan,M. Advanced Textbook on Food Science and Nutrition, Vol:2, Second edition, Reprinted, Bangalore Printing and Publishing Co Inc, Bangalore, 2012.
5. Sri lakshmi,B, Nutrition Science, New Age International (Pvt) Ltd, New Delhi, 4th edition 2012.
6. Maurice Edward Shils, Moshe. Shike Modern Nutrition in Health and Diseases 10th edition 2006.
7.

Journals:

1. Annual Reports, National Institute of Nutrition, Hyderabad.
2. Indian Journal of Medical Research, Indian Council of Medical Research, New Delhi.
3. Proceedings of the Nutrition Society of India, Nutrition Society of India, Hyderabad.
4. The Indian Journal of Nutrition and Dietetics, Sri Avinashilingam Education Trust Institutions for Women, Coimbatore.

Semester	Code	Title	Hrs/Week
III	12MFNC15	**Biomolecules and Intermediary Metabolism**	4

Objectives:

1. To enable the students to obtain depth in the study of Biochemistry of major nutrients and metabolic pathways.

Unit	Contents	Hours
1.	**Carbohydrates** Introduction, Classification. Structure and Properties of monosaccharides (hexoses and pentoses). Reactions of monosaccharides – oxidation, reduction and reaction with hydrogen cyanide, hydroxyl amine and phenyl hydrazine. Oligosaccharides – Sucrose, maltose, lactose, isomaltose, cellobiose. Homopolysaccharides - Structures of storage polysaccharides (Starch and glycogen). Heteropolysaccharides – Structures of Hyaluronic acid, Heparin and Chondroitin sulphate. Metabolism – Glycolysis, TCA cycle, HMP Shunt and energy production in the above pathways. Oxidative phosporylation and Electron Transport Chain, Uronic acid pathway. ***Self study***: Glycogenesis and Glycogenolysis.	12
2.	**Lipids** Classification – Triglycerides (Fats), Phospholipids and other non-phosphorylated lipids – cerebrosides, gangleosides, sulfolipids. Characterisation of fats. Rancidity of fats. Chemistry of Essential fatty acids. Metabolism – Oxidation of fatty acids, biosynthesis of fatty acids (palmitic acid). **Self study**: Biosynthesis of triacyl glycerol, phospholipids.	12
3.	**Aminoacids and Proteins** Structure and classification of aminoacids. Classification of proteins – denaturation Metabolism – General breakdown of aminoacids, deamination, transamination, decarboxylation and urea formation. **Self study**: Structure of proteins with special reference to insulin, myoglobin and haemoglobin.	12
4.	**Nucleic acids** Composition and function. Structure and properties of DNA and RNA (t-RNA, m-RNA and r-RNA), minor RNA types. Metabolism – Biosynthesis and breakdown of purine nucleotides. Biosynthesis and breakdown of pyrimidine nucleotides. **Self study**: Defects in nucleic acid metabolism	12
5.	**Enzymes** Classification of enzymes. IUB classification Enzyme kinetics – Michaelis Menten equation. Factors affecting enzyme activity (pH, temperature, substrate concentration and enzyme concentration). Enzyme inhibition – Competitive, Non- competitive and Uncompetetive (Kinetics	12

	not necessary). **Self study**: Clinical significance of enzyme assays	
	TOTAL	**60**

References:

1. Murray, R.K., Granner, D.K., Mayes, P.A. and Rodwell, V.W. (2003), Harper's Illustrated Biochemistry, 26th edition, International Edition.
2. Deb, A.C. (2002), Fundamentals of Biochemistry, New Central Book Agency (P) Ltd.
3. Nelson, L. and Michael.M.Cox. (2005), Lehninger Principles of Biochemistry, 4th Edition, W.H. Freeman and Company, NewYork.
4. Palmer, T. (1995), Understanding enzymes, 4th Edition, Prentice Halls, Ellis Horwood, London.
5. Voet, D., Voet, G.J. and Pralt, W.C. (2002), Fundamentals of Biochemistry, Upgrade edition, John Wiley and Sons, Inc.
6. West, E.S., Todd, W.R., Mason, H.Sand and Van Brugge, T.J. (1966), Biochemistry, 4th edition, The Macmillan Company, London.

Semester	Code	Title	Hrs/Week
III	12 MFNC16	**Food Product Development and Packaging** (Open book exam)	3

Objectives: To enable the students to

1. Develop new marketable, nutritionally and economically viable food products
2. Gain knowledge about packaging of foods, packaging materials and systems of labeling, testing and evaluation of packaged foods.
3. Develop entrepreneurship skills for setting up small scale food industries

Unit	Contents	Hrs
1.	**Production and processing of food** Quality and quantity control in the selection of raw materials for food processing. Production systems used in the manufacture of food, eg small scale, large scale, manual, automated, computerised **Quality management considerations to achieve safe foods for public consumption (SS),** eg Hazard Analysis and Critical Control Point (HACCP)	5
2.	**Product Development** Principles and stages involved in product development, Sensory, chemical and microbiological evaluation of processed foods. Ex. Convenience Foods, Extruded foods, Health foods Nutritional supplements, **RTS, RTE foods(SS)**	10
3.	**Packaging Materials** An introduction to packaging materials, **Basic Packaging Materials – Paper, Wood, Plastics, Glass, Metal Containers (SS)** Packaging Films – Polyethylene, Cellophane, Aluminium foil, Laminates, New Polymeric Packaging Films, Shrink Film, Cling and Wrap Film, Edible Film. Packaging Methods and Systems-Traditional Food Packaging, Retortable, Lined Cartons, Bag in Box Aseptic, Modified Atmosphere Packaging, Vacuum, Gas Packaging, Bio Based Packaging, Eco-friendly and Safe Packaging for Exports Ovenable Packages, Transport Packages, Packaging Equipments	15
4.	**Storage, Handling and Distribution of Packages** Shelf Life Testing of Packaged Foods, Evaluation of Packaged Foods **Labeling – Definition, Purpose, Types, Materials, Adhesives (SS)** Food and Nutritional Labeling as per FSSAI specifications Packaging Laws and Regulations – National and International Specifications	5
5.	**Marketing of Food Products** Product Cost Calculation, Product Specifications, Marketing Strategies including Advertising Methods **,Consumer Behaviour and Food Acceptance (SS)**	10

References:

1. Food Packaging Technology Handbook, 2003, NIIR Board of Consultants and Engineers, National Institute of Research, New Delhi.
2. Potter, N.M., Food Science, The AVI Publishing Company Inc., West Post, Connecticut, USA
3. Modern Packaging Industries, 2004, NIIR Board of Consultants and Engineers, National Institute of Industrial Research, New Delhi.
4. Fuller, Gordon, W., New Food Product Development, 2nd Edition, CRC Press, Boca Raton, Florida, 2005.
5. Paul Baines, Bal Chansarkar, Introducing Marketing Research, John Wiley & Sons Ltd., 2002.
6. Sudhir Gupta, Handbook of Packaging Technology, Engineers India Research Institute, New Delhi, 2007.

Semester	Code	Title	Hrs/Week
III	12MFNC17	TECHNIQUES FOR EXPERIMENTAL NUTRITION (PRACTICALS)	6

Objectives:

Enable the students to get practical experience in the laboratory and develop the skills to undertake research work in Food Analysis

Contents	No. of hours
Analysis of Food for	
Calories	6
Fibre – Crude and Dietary	9
Moisture	6
Nitrogen by Kjeldahl Method	6
Ash	3
Calcium	3
Phosphorus	3
Iron	6
Total and β Carotene	6
Vitamin A	3
Thiamine	3
Riboflavin	3
Vitamin C	3
Fat	6
Starch	3
Fats – Saponification Value	3
Iodine Number	3
Acid Number	3
RM Value	3
Sorenson's Formal Titration Method	3
Estimation of Total Antioxidants	6

References:

1. Raghuramulu, N., Madhavan Nair, K., Kalyanasundaram, S. A Manual of Laboratory Techniques. Silver Printers, NIN, 2007.
2. Sadasivam, S and Manickam, A., Biochemical Methods, New Age International Pvt. Ltd., Publishers, New Delhi, Second Edition, 2003.
3. Oser, B. L. Hawk's Physiological Chemistry, XIV Edition, Tata Mc Graw Hill Publishing Company Ltd, Mumbai, 2001.
4. Varley, H., Gowenlak, A. H and Hell, M. Practical Clinical Biochemistry, William Itinmaon Medical Books, London, 2000.

Semester	Code	Title	Hrs/Week
III	12FMNC18	**SELF STUDY COURSE** **Functional Foods and Nutraceuticals**	1

Objectives

To enable the students to gain:

- Knowledge on sources of Functional Foods and Nutraceuticals
- Knowledge on the role of functional foods, nutraceuticals and dietary supplements in health and disease

UNIT - 1 ***Functional Foods and Nutraceuticals*** **-2 hrs**

Definition and History-Functional foods, traditional foods, nutraceuticals, designer foods and pharma foods, history of functional foods, components of functional foods, stages involved in development of functional foods.

UNIT- 2 ***Categorization of Nutraceuticals*** **- 3 hrs**

Classification - Based on food source, mechanism of action and chemical nature-isoprenoid, phenolic substances, fatty acids and structural lipids, carbohydrates and amino acid based derivatives, isoflavones.

UNIT- 3 ***Functional Foods and Nutraceuticals of Microbial Origin*** **- 4 hrs**

Functional foods of Microbial origin- Human gastrointestinal tract and its microbiota, functions, probiotic microflora and functions- Lactobacillus and Bifidobacterium, concept of probiotics and prebiotics with examples, role of probiotics in health and disease.

UNIT – 4 ***Functional foods and Nutraceutcals in Health and Disease*** **- 4 hrs**

Sources and role of ***Functional foods and*** **Nutraceuticals-** Sources of functional foods and Nutraceuticals, concept of dietary supplements, phytochemicals, phytosterols, omega 3 and 6 fatty acids, dietary fiber, role of nutraceuticals in health and disease management, non essential nutrients as dietary supplements, FOSHU foods.

UNIT - 5 ***Regulatory Aspects of Functional Foods and Nutraceuticals*** **- 2 hrs**

Regulatory aspects- International and national regulatory aspects of functional foods in India, ICMR guidelines for probiotics.

Text Books

- **Bamji (2003),** Textbook of Human Nutrition, 3rd edition, Oxford & IBH Publishing Co Pvt Ltd, New Delhi
- Srilakshmi.B (2012), Nutrition Science, 4th edition, New Age Internationl Pvt Ltd.

References

- **Webb G.P (2006),** Dietary Supplements and Functional Foods, Blackwell Publishing Ltd, New York.
- **Tamine. A (2005),** Probiotic Dairy Products, Blackwell Publishing Ltd, United Kingdom.
- **USFDA** regulations on functional foods

Journals

- **Journal of functional foods**
- **Journal of free radical research**

Semester	Code	Title	Hrs/Week
IV	12MFNC20	MICRO NUTRIENTS	5

Objectives: To enable the students to

1. Gain in-depth knowledge of the physiological and metabolic role of vitamins and minerals and their role in human nutrition.
2. Understand the pharmacological actions of various vitamins, minerals and their implications

Unit	Topic	Hrs
1	**Vitamins - Introduction** Number and naming of vitamins, units and measurements of vitamins, Factors influencing the utilization of vitamins **Fat soluble vitamins** A,D,E and K- History, structure, nomenclature, chemistry, physiological actions, absorption, transport, utilization, storage, excretion and methods of assay, biopotency, **Dietary sources and losses in preparation and handling, (SS)** conversion of carotenes into vitamin A in human beings, recommended intakes, human deficiency and diagnosis, hyper vitaminosis, antivitamins	12
2	**Water soluble vitamins** Thiamine, riboflavin, niacin, vitamin B12, folic acid, pyridoxine, panthothenic acid, biotin, ascorbic acid and pseudovitamins - History, structure, chemistry, physiological action, biochemical utilization and storage, transport, biosynthesis of vitamins, dietary sources, losses in preparation and handling, recommended intakes, human deficiency, **diagnosis, assessment of availability hypervitaminosis, antivitamins (SS)**	18
3	**Macro Minerals- Calcium, Phosphorus, Magnesium, Sulphur, Chorine, Sodium and Potassium** Distribution, absorption and utilization, sources, requirement, deficiency and toxicity, calcium - phosphorus ratio, absorption and utilization, Phosphates in blood, therapeutic uses of phosphates, calcium balance, Hypocalcemia and hypercalcemia, **Sodium and potassium balance (SS)**	15
4	**Micro minerals-Iron** Distribution, absorption, metabolism, transport and utilization, sources, requirement , deficiency, assessment of iron nutritional status, methods of assessing iron availability, **effect of excess iron retention and deficiency (SS)** **Iodine, Fluorine and Zinc** Metabolism, functions, sources, requirements, deficiency, assessment of nutritional status and toxicity. **Trace elements** Physiology, Function,sources, deficiency and toxicity of cobalt,copper, molybdenum, manganese, selenium, nickel, chromium, cadmium	20
5	**Interrelationship of nutrients** Interrelationship and interdependence between nutrients and hormones in general**, inter- relationship between calcium, phosphorus, vitamin D and parathyroid (SS)** Inter- relationship between the vitamins, between the minerals and between vitamins and minerals	10

References:

Books:

1. Recommended dietary intakes for Indian – Indian Council of Medical Research, New Delhi, 2012.
2. Gopalan,C Ramasastry, B.V. and Balasubramanian, S. Nutritive Value of Indian Foods, National Institute of Nutrition, Hyderabad, 2007
3. Swaminathan, M. Essentials of Foods and Nutrition, Volume I and II Ganesh and Co., Madras, 2003.
4. Mahan, Kathleen L. Krause's Food, Nutrition and Diet Therapy, W.B.Saunder's, 11th Edition 2004.
5. Srilakshmi. E. Nutrition Science, New Age International Publishers, 2012.
6. Swaminathan,M.Advanced Textbook on Food Sceince and Nutrition, Vol:2, Second edition, Reprinted, Bangalore Printind and publishing Co Inc, Bangalore, 2003.

Journals:

1. American Journal of Clinical Nutrition, The American Society for Clinical Nutrition, Inc., USA.
2. Annual Reports , National Institute of Nutrition, Hyderabad.
3. British Journal of Nutrition ,Cambridge University Press, London.
4. Indian Journal of Medical Research, Indian Council of Medical Research, New Delhi.
5. Nutrition, Newsletter, Food and Agricultural Organization of United Nations.
6. The Indian Journal of Nutrition and Dietetics, Sri Avinashilingam Education Trust Institutions for Women, Coimbatore.
7. Nutrition Reviews- The Nutrition Foundations Inc., New York.

DEPARTMENT OF FOOD SCIENCE AND NUTRITION

Semester III **Multi Disciplinary Course**

12MFNM01 **Wellness and Fitness** **Hrs of Instruction /Week: 2**

No. Of Credits: 2

Objectives:

To enable the students to acquire

- Elementary knowledge on wellness and fitness
- Knowledge on relationship between nutrition and wellness
- Insight into the relationship between physical activity, wellness and fitness

Unit 1	Wellness, Fitness and Health Definition and Indicators of Health - Parameters, Components and Relationship between Wellness, Fitness and Health - Challenges and Personalized Approach.	5
Unit 2	Nutrition and Health Introduction - Food Groups, Adequate Diet, My Pyramid, Gandhian Foods for Health, Millennium Development Goals, Role of Macro and Micro nutrients – Carbohydrates, Proteins, Fats, Vitamin D, Calcium, Iron, Optimum Nutrition and Hydration for Health,	10
Unit 3	Physical Activity Training Aerobic and anaerobic training -To enhance Cardio Vascular Endurance, Flexibility and Body Composition, Measurement of PAL, Benefits of Fitness training and Gadgets for measuring PA.	5
Unit 4	Diseases due to Faulty Food Habits and Physical Inactivity Non communicable Disease conditions- Underweight, Obesity, Diabetes mellitus, Hypertension, Cancer, Cardiovascular Disease, Anaemia	5
Unit 5	Stress and Health Management Stress Assessment and Management Techniques-Under Weight, Overweight and Obesity, Relaxation Techniques –Yoga and Meditation for Health	5

Text Books

- Werner W. K Hoejer, ‘Life time Physical Fitness and Wellness’, Morton Publishing Company Colorado, 1989.
- Swaminathan T, ‘Essential of Food and Nutrition’, Bangalore Printing Publishing Company, 2008.

Reference Books

- William D. Mc Ardle, Frank I. Katch, Victor L. Katch ‘Exercise Nutrition: Energy Nutrition and Human Performance” William & Wilkin Publishing, USA, 1996.
- Kathleen Mahan, Sylvia Escott Stump, “Krause’s Food and Nutrition and Diet Therapy’ W.B Saunders Company, USA, 2000.