REVISED REGULATION, CURRICULUM AND SYLLABI

(With effect from the academic year 2012 – 2013 onwards)

M.Sc Food Science and Nutrition

DEPARTMENT OF FOOD SCIENCE AND TECHNOLOGY

PONDICHERRY UNIVERSITY

R. Venaktaraman Nagar, Kalapet

Puducherry – 605 014

INDIA

PONDICHERRY UNIVERSITY

M.Sc Food Science and Nutrition

REGULATIONS

The department of Food Science and Technology was established in 2007. The major objectives of the department is to provide inter disciplinary high quality education in order to deepen their understanding of food science, clinical nutrition and dietetic, food process techniques, product development, food quality control. The department is offering M.Sc. and Ph.D programme in Food Science and Nutrition and Food Science and Technology. The subjects food science and technology have tremendous scope and significance in the national and international scenario. The specialists in food science and nutrition have unlimited job markets in the most innovative and challenging areas like Space nutrition, Therapeutic nutrition, Nutraceutical and Nutrigenomics industries and various other related fields. The specialized in food science and technology have unlimited job potential in food industry, food quality control lab and various other related things.

Aim of the Course

The curriculum integrating several soft courses, besides the core, has been formulated to provide professionally competent manpower for

a. Academic and research activities
b. Hospitals, food service institutions and industries
c. Managerial roles in agencies and institutions – both Government and NGO sector
d. Planning, monitoring and evaluation of nutrition and health programmes
e. Training and IEC activities of regional and national programmes
f. Ensuring food safety and quality for consumers
g. Entrepreneurial ventures
h. Advocacy and consultancy

A total of 72 credits have to be taken by the students to complete the programme. If the number of credits exceeds 72, it permissible, but the calculation of the grade point average will be done on the basis of 72 credits only. Internship/On Job Training is an integral part of the programme of study. This can be arranged during the course of study or after the completion of the programme. It can be arranged in one single assignment or two. Total duration of Internship/On Job Training shall be 4 – 6 weeks.

Eligibility for Admission

Bachelor's degree in Food and Nutrition / Food Technology / Food Science and Quality Control /Clinical Nutrition and Dietetics of Composite / General Home Science / Biochemistry / Biotechnology / Chemistry / Microbiology / Agriculture dairy or fisheries or any other allied science subjects under life sciences at B.Sc. level with a minimum of 55% of marks.

Curriculum - M.Sc Food Science and Nutrition

Semester	Course Code	Title of the Course	Category	Credits
I	FS&N411	Food Chemistry	HC	3
	FS&N412	Food Microbiology	HC	3
	FS&N413	Food Processing and Preservation Technology	HC	3
	FS&N414	Public Health Nutrition	HC	3
	FS&N425	Human Physiology	SC	3
	FS&N426	Food Toxicology	SC	3
	FS&N427	Food Economics and Food Security	SC	2
	LAB			
	FS&N451	Food Chemistry Lab	HC	1
	FS&N452	Food Microbiology Lab	HC	1
	FS&N453	Food Processing and Preservation Technology Lab	HC	1
	FS&N454	Techniques in Food Analysis lab	HC	2
II	FS&N431	Research Methodology and Biostatistics	HC	3
	FS&N432	Advanced Nutrition I	HC	3
	FS&N433	Food Product Development and Quality Evaluation	HC	3
	FS&N434	Nutraceuticals and Functional Foods	HC	3
	FS&N435	Clinical and Therapeutic Nutrition I	HC	3
	FS&N436	Food Ingredients and Processing	HC	3
	FS&N447	Food Additives	SC	2
	FS&N448	Nutrition and Physical Fitness	SC	2
	LAB			
	FS&N455	Food Product Development and Quality Evaluation lab	HC	1
	FS&N456	Food Ingredients and Processing Lab	HC	1
III	FS&N511	Food Biotechnology	HC	3
	FS&N512	Food Packaging	HC	3
	FS&N513	Food Safety and Quality Control	HC	3
	FS&N514	Nutritional Biochemistry	HC	3
	FS&N515	Advanced Nutrition II	HC	3
	FS&N516	Clinical and Therapeutic Nutrition II	HC	3
	FS&N517	Minor project and Seminar	HC	2
	FS&N528	Nutrition in Critical Conditions and Emergencies	SC	2
	LAB			
	FS&N551	Food Safety and Quality Control lab	SC	1
	FS&N552	Nutritional Biochemistry lab	SC	1
IV	FS&N571	Project work	HC	6

PONDICHERRY UNIVERSITY

Department of Food Science and Technology

M.Sc Food Science and Nutrition

Semester I

Course Code	Title of the Course	Credits
	Hard core	
FS&N411	Food Chemistry	3
FS&N412	Food Microbiology	3
FS&N413	Food Processing and Preservation Technology	3
FS&N414	Public Health Nutrition	3
FS&N451	Food Chemistry Lab	1
FS&N452	Food Microbiology Lab	1
FS&N453	Food Processing and Preservation Technology Lab	1
FS&N454	Techniques in Food Analysis lab	2
	Soft core	
FS&N425	Human Physiology	3
FS&N426	Food Toxicology	3
FS&N427	Food Economics and Food Security	2

FS&N411 **FOOD CHEMISTRY** **CREDIT 3**

UNIT - I **10 hours**

Water and Ice: Physical properties, structure of water and ice, water soluble interaction, water activity and relative vapor pressure. **Dispersed systems:** Surface phenomena, colloidal interactions, Liquid dispersions, gels, emulsions and Foam.

UNIT - II **9 hours**

Carbohydrates: Monosaccharides,Oligosaccharides,Polysaccharides,Starch,Cellulose,Guar and Locust Bean Gum, Xanthan, Carrageenans, Algins, Pectins, Gum Arabica and Dietary fiber

UNIT - III **9 hours**

Lipids: Classification, physical aspects, chemical aspects, chemistry of fats and oil processing, role of food lipids in flavor, physiological effects of Lipids.

UNIT - IV **10 hours**

Amino Acids, Peptides and Proteins: Physiochemical properties of amino acids, protein structure, protein denaturation, functional properties of proteins, nutritional properties of proteins, processing induced physical and chemical changes of protein.

UNIT - V **10 hours**

Food colorants: pigments in animal and plant tissues. **Flavors:** Taste and nonspecific saporous sensations, vegetable, fruit and spice flavor. **Food additives:** Acid, bases, buffer systems, chelating agent, antioxidant, antimicrobial agent, sweeteners, fat replacers and Mastigatory substances.

Text books and Reference materials

1. Beltz, H.D. 2005. *Food Chemistry*. Springer Verlag.
2. Fennema, O.R, 2006, Food Chemistry, Academic Press.
3. Meyer, L.H. 1987. *Food Chemistry*. CBS publishers and Distributors, New Delhi.
4. Potter, N.N. and Hotchikiss, J.H. (2006), Food Sciences, Fifth edition, CBS publishers and Distributors, New Delhi.
5. Fennema, O.R.2006. *Food Chemistry*. Marcel Dekker.

FS&N412 FOOD MICROBIOLOGY CREDIT 3

UNIT I **9 hours**

Importance and significance of microorganisms in food science. Micro-organisms importance in food - Factors affecting the growth of micro organisms in food - Intrinsic and Extrinsic parameters that affect microbial growth.

UNIT II **10 hours**

Determination of micro organisms and their products in food: Sampling, sample collection, transport and storage, sample preparation for analysis. Microscopic and culture dependent methods- Direct microscopic observation, culture, enumeration and isolation methods; Chemical and Physical methods-Chenical, immunological and nucleic acid based methods; Culture independent techniques – PCR Based, DGGE, Metagenomics, etc.; Analytical methods for microbial metabolites- microbial toxins and metabolites.

UNIT III **10hours**

Protection and preservation of Foods: Chemical, Modified atmosphere, Radiation in foods from the microbiological angle. Indicators of water and food safety and quality: Microbiological criteria of foods and their Significance. The HACCP and ISO systems for food safety.

UNIT IV **9 hours**

Food spoilage: characteristic features, dynamics and significance of spoilage of different groups of foods - Cereal and cereal products, vegetables and fruits, meat poultry and sea foods, milk and milk products, packed and canned foods.

UNIT V **10 hours**

Food borne diseases: *Bacterial food borne diseases* (Staphylococcal intoxification, Botulism, Salmonellosis, Shigellosis, Enteropathogenic Escherichia Coli Diarrhoea, Clostridium Perfringens gastroenteritis, Bacillus cereus Gastroenteritics) *Food Borne Viral Pathogens* (Norwalk virus, Norovirus, Reovirus, Rotavirus, Astrovirus, Adenovirus, Parvovirus, Hepatitis A Virus) *Food Borne Animal Parasites* Protozoa – Giardiasis, Amebiasis, Toxoplasmosis, Sarcocystosis, Crypotosporiodiosis. Cysticercosis/Taeniasis. Roundworm – Trichinosis, Anisakiasis. *Mycotoxins:* Aflatoxicosis, Deoxyni valenol Mycotoxicosis, Ergotism

Text books and reference materials

1. Pelezar, M.I and Reid, R.D. (1993) Microbiology McGraw Hill Book Company, New York, 5th Edition.

2. Jay, James, M(2000) Modern Food Microbiology, 2nd Edition. CBS Publisher
3. Adams, M.R. and M.G. Moss (1995): Food Microbiology, 1st Edition, New Age International (P) Ltd.
4. Frazier, W.C. (1988) Food Microbiology, Mc Graw Hill Inc. 4th Edition.
5. Doyle, P. Bonehat, L.R. and Mantville, T.J-(1997): Food Microbiology, Fundamentals and Frontiers, ASM Press, Washington DC.

FS&N413 FOOD PROCESSING AND PRESERVATION TECHNOLOGY CREDIT 3

UNIT I **9 hours**

Principles of fresh food storage: Nature of harvested crop, plant, animal; product storage; effect of cold storage and quality – storage of grains.

UNIT II **10 hours**

Processing and preservation by heat: Blanching, pasteurization, sterilization and UHT processing, canning, extrusion cooking, dielectric heating, microwave heating, baking, roasting and frying. Retort processing of Ready to eat (RTE) products. Drying – water activity, microbial spoilage due to moisture. Dehydration of fruits, vegetables, milk, animal products Newer methods of thermal processing – batch and continuous

UNIT III **9 hours**

Processing and preservation by low Temperature – refrigeration, freezing, CA, MA , and dehydro-freezing. Food irradiation, history and mechanism, the electro-magnetic spectrum, forms of radiant energy. Principles of using electromagnetic radiation in food processing, ionizing radiations and non ionizing radiations, advantages and disadvantages. Controlling undesirable changes in food during irradiation.

UNIT IV **10 hours**

Processing and preservation by drying, concentration and evaporation : Various methods employed in production of dehydrated commercial products, selection of methods based on characteristics of foods to be produced, advantages and disadvantages of different methods, sun-drying, tray or tunnel drying, spray drying, drum drying, freeze drying, fluidized bed drying. Physical and chemical changes during drying control of chemical changes, desirable and undesirable changes. Packaging and storage of dehydrated products. Ultra-filtration, reverse osmosis, Freeze drying and freeze concentration.

UNIT V **10 hours**

Processing and preservation by non-thermal methods: High pressure, pulsed electric field, hurdle technology. GRAS and permissible limits for chemical preservatives and legal aspects for gamma irradiation. Use and application of enzymes and microorganism in processing and preservation of foods; food fermentations, pickling smoking etc; Food additives; Definition, types and functions, permissible limits and safety aspects.

Text books and Reference materials

1. Desrosier NW & James N. (2007). Technology of food preservation. AVI. Publishers

2. Fellows, P.J. (2005). Food processing technology: Principle and Practice. 2nd Ed. CRC Publishers

3. Jelen, P. (2005). Introduction to Food Processing. Prentice Hall

FS&N414 PUBLIC HEALTH NUTRITION CREDIT 3

UNIT -I **10hours**

Concept of public nutrition - Relationship between health and nutrition, role of public nutritionists in the health care delivery system. Population dynamics - Demographic transition, population structure, population policy, fertility behaviour, , nutrition and quality of life inter-relationship. Nutritional status -methods for assessing nutritional status – Indirect methods – demography, population dynamics and vital events and their health implications, indicators of health an nutrition (IMR, TMR, MMR) - Direct – anthropometry, biochemical, clinical, dietary and functional methods of assessments.

UNIT -II **9 hours**

Nutrition during life span – pregnancy, lactation , infancy ,preschool age, school going and adolescents, adults and old age.

UNIT -III **10 hours**

Assessment and surveillance of nutritional status in emergency affected populations- Scope for malnutrition assessment, indicators and simple screening methods. Organization for nutritional surveillance. Nutritional relief and rehabilitation-Assessment of food needs, food distribution strategy, targeting food aid, mass and supplementary feeding, special foods/rations for nutritional relief, organization for mass feeding/food distribution, transportation and storage, feeding centers, sanitation and hygiene and public nutrition approach to tackle nutritional and health problems in emergencies, ethical considerations.

UNIT -IV **9 hours**

Approaches and strategies for improving nutritional status and health - Programmatic options – their advantages and demerits. Intervention Programmes – Health based interventions, Food – based interventions including fortification and genetic improvement of foods, supplementary feeding. Malnutrition and Health economics - Its impact on productivity and national development. Cost management.

UNIT -V **10hours**

Information Education Communication approaches to improve health and nutrition : Concepts – Scope- Elements- Models of communication - Communication Process - Approaches and Barriers to communication, Communication for Extension Education and Development - Introduction to IEC Aims and Objectives, Importance of IEC, relevance to programmes - Nutrition education for behaviour change – Rationale, Planning Execution and evaluation of

Intervention Programmes -Different Media, their characteristics and use- IEC for different target groups.

Text books and Reference materials

1. Owen, A.Y. and Frackle, R.T., (2002): Nutrition in the Community. The Art of Delivering Services, 2nd Edition Times Mirror/Mosby.
2. Part, K. (2000): Part's Textbook of Preventive and Social Medicine, 18th Edition, M/s. Banarasidas Bhanot, Jablpur.
3. Beaton, G.H. and Bengoa, J.M. (Eds) (2000): Textbook of Human Nutrition, Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.
4. Bamji, M.S., Rao, P.N., Reddy, V (Eds) (2003): Textbook of Human Nutrition, Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.

FS&N425 HUMAN PHYSIOLOGY CREDIT 3

UNIT - I **9 hours**

Cell structure and function: Levels of cellular organization and function – organelles, tissues, organs and systems – Brief review - Cell membrane transport across cell, membrane and intercellular communication Regulation of cell multiplication. Musculo-skeletal system: Structure and function of bone, cartilage and connective tissue. Disorders of the skeletal system. Types of muscles structure and function.

UNIT - II **12 hours**

Review of the following systems

Digestive system: Review of structure and function - Secretory, Digestive and Absorptive functions - Role of liver, pancreas and gall baladder and their dysfunction - Motility and hormones of GIT. Regulation of food intake – role of hunger and satiety centers, effect of nutrients.

Nervous System: Review of structure and function of neuron - conduction of nerve impulse, synapses, and role of neurotransmitters - Organization of central and Peripheral nervous system. Hypothalamus and its role in various body functions-obesity, sleep, memory.

Endocrine system: Endocrine glands (Pituitary gland, Thyroid, parathyroid, Islets of Langerhans, Adrenals, Ovary and Testis, Thymus, Pineal gland – structure, function, role of hormones, regulation of hormonal secretion, Disorders of endocrine glands Emphasis on physiology of diabetes and stress hormones.

Respiratory system: Review of structure and function. Role of lungs in the exchange of gases. Transport of oxygen and Co_2. Role of haemoglobin and buffer systems. Cardio-respiratory response to exercise and physiological effects of training.

UNIT - III **9 hours**

Circulatory and Cardio Vascular system: Blood - formation, composition, clotting and haemostasis **.**Formation and function of plasma proteins. Erythropoesis. Blood groups and histocompatibility. Blood indices - Use of blood for investigation and diagnosis of specific disorders, Structure and function of heart and blood vessels - Regulation of cardiac output and blood pressure, heart failure, hypertension.

UNIT - IV **9 hours**

Excretory system :Structure and function of nephron - Urine formation - Role of kidney in maintaining pH of blood -Water, electrolyte and acid base balance - diuretics

UNIT - V **9 hours**

Immune system: Cell mediated and humeral Immunity - Activation of WBC and production of antibodies. Role in inflammation and defense.

Text books and Reference materials

1. Guyton, A.G. and Hall, J.B. (2005): Text Book of Medical Physiology, 9th Edition, W.B. Sanders Company, Prism Books (Pvt.) Ltd., Bangalore.
2. Wilson, K.J.W and Waugh, A. (2003): Ross and Wilson Anatomy and Physiology in Heath and Illness 8th Edition, Churchill Livingstone.
3. Jain, A.K.: Textbook of Physiology. Vol.I and II. Avichal Publishing Co., New Delhi.
4. McArdle, W.D., Katch, F.I. and Katch V.L(2001): Exercise Physiology. Energy, Nutrition and Human Performance, 4th Edition, Williams and Wilkins, Baltimore.

FS&N 426 FOOD TOXICOLOGY CREDIT 3

UNIT- I **10hours**

Principles of Toxicology: Classification of toxic agents; characteristics of exposure; spectrum of undesirable effects; interaction and tolerance; biotransformation and mechanisms of toxicity. Evaluation of toxicity: Risk vs. benefit: Experimental design and evaluation: Prospective and retrospective studies: Controls :Statistics (descriptive, inferential): Animal models as predictors of human toxicity: Legal requirements and specific screening methods: LD50 and TD50: In vitro and in vitro studies; Clinical trials.

UNIT – II **9 hours**

Natural Toxins in Food: Natural toxins of importance in food- Toxins of plant and animal origin; Microbial toxins (e.g. Algal toxins, bacterial toxins and fungal toxins). Natural occurrence, toxicity and significance. Food poisoning; Mycotoxicoses of significance. Determination of toxicants in foods and their management.

UNIT – III **10hours**

Food allergies and sensitivities: Natural sources and chemistry of food allergens; true/untrue food allergies; handling of food allergies; food sensitivities (anaphylactoid reactions, metabolic food disorders and idiosyncratic reactions); Safety of Genetically Modified food: potential toxicity and allergenisity of GM foods. Safety of toys and children consumables.

UNIT – IV **9 hours**

Environmental Contaminants and Drug Residues in Food: Fungicide and pesticide residues in foods; heavy metal and their health impacts; use of veterinary drugs (e.g. Malachite Green in fish and β- agonists in pork); other contaminants in food. Radioactive contamination of food, Food adultration and potential toxicity of food adultrants.

UNIT – V **10hours**

Food Additives and toxicants added or formed during Food Processing: Safety of food additives; toxicological evaluation of food additives; food processing generated toxicants: nitroso-compounds, heterocyclic amines, Dietary Supplements and Toxicity related to Dose: Common dietary supplements; relevance of the dose; possible toxic effects.

Text Books and Reference material

1. Helferich, W., and Winter, C.K. Food Toxicology CRC Press 2001Shibamoto, T. and Bjeldanes, L. 2009. Introduction to Food Toxicology, 2nd Ed. Elsevier Inc., Burlington, MA.
2. Duffus, J.H. and Worth, H.G. J. Fundamental Toxicology The Royal Society of Chemistry 2006.
3. Stine, K.E. and Brown, T.M. Principles of Toxicology (2nd ed.)CRC Press 2006.
4. Tönu, P. 2007. Principles of Food Toxicology. CRC Press, LLC. Boca Raton, FL.
5. Tönu, P. 2007. Principles of Food Toxicology. CRC Press, LLC. Boca Raton, FL.

FS&N427 FOOD ECONOMICS AND FOOD SECURITY CREDIT 2

UNIT I **9 hours**

Statistical profile of the world food economy. The Structure of the World Food System. Early human food systems and subsistence agriculture. Semi-subsistence food systems and commercial, market-oriented food systems. Global supply-demand balance and projections

UNIT II **10 hours**

Statistical profile of the Indian economy Agricultural production and the supply of food. Economic causes and consequences of resource degradation. Components of Indian Food Systems, Food Policies in India **:**Food and agricultural policies, Supply side policies, Agricultural research and development Infrastructure and production policies, Demand side policies, Income support and redistribution Food assistance programs

UNIT III **10hours**

Global Institutions and the WTO, World food systems: food security, food self-sufficiency and the role of trade. Foreign aid, food aid and development. Global sustainability: environmental impacts of the world food system. Hunger, conflict, government failure and international intervention. Globalization of the food system.

UNIT IV **10 hours**

Food security: Hunger and malnutrition, Definition and measurement. Food security model, Food availability. Foreign aid, food aid and development. Global sustainability: environmental impacts of the world food system. Hunger, conflict, government failure and international intervention. Globalization of the food system.

UNIT V **9 hours**

Food and agricultural policies including Supply side policies, Agricultural research and development, Infrastructure and production policies, Demand side policies, income support and redistribution, Food assistance programs.

Text books and Reference materials

1. Leathers, H.D. and Fosters, P., The World Food Problem: Tackling the Causes of Under nutrition in the Third World, 3rd Edition. Lynne Rienner Publishers, 2004.

2. Southgate, D., Graham, D.H. and Tweeten, L., The World Food Economy, Blackwell Publishing, 2007.

3. Fogel, R. W. 2004. Health, nutrition, and economic growth. Economic Development & Cultural Change 52(3): 643-658.

4. Asbjorn, E. 2007. Freedom from Hunger as a Basic Human Right, in Ethics, Hunger, and Globalization, edited by Per Pinstrup-Andersen and Peter Sandoe. The netherlands:Springer Press.

5. Pinstrup-Andersen, Per and Peter Sandoe, editors. *Ethics, Hunger, and Globalization*. 2007. The Netherlands: Springer Press.

1. Determination of boiling point and freezing point of water
2. Estimation of sugars
3. Stages of sugar cookery
4. Estimation of gluten content
5. Estimation of polyphenols
6. Determination of acidity
7. Determination of gelatinization
8. Determination of natural pigments in foods
9. Fat acidity in foods- flour
10. Determination of refractive index of fats

1. Preparation of common laboratory media and special media.
2. Staining: Gram's staining, acid-fast, spore, capsule and flagellar staining, Motility of bacteria, Staining of yeast and molds..
3. Identification of important molds and yeast.
4. Microbiology of milk.
5. Microbiology of water.
6. Microbiology of hand and effect of sanitation on the hand microbiology in a small food joint.
7. Microbiological analysis of typical processed food.
8. Microbiological analysis of a typical unprocessed food.
9. Isolation of specific culture

FS&N453 FOOD PROCESSING AND PRESERVATION TECHNOLOGY LAB CREDIT 1

1. Blanching and browning control
2. Preparation of fruit preserves (jam, jelly).
3. Preparation of vegetable preserves (pickle)
4. Dehydrated products – vegetables dices tray drying, osmotic dehydration of seasonal fruit.
5. Tomato processing
6. Fruit pulping / juice / beverage preparation
7. Preparation and standardization of traditional Indian fermented foods
8. Bread making - texture.
9. Confectionery
10. Visit to food processing and preservation unit.

1. Estimation of moisture content
2. Estimation of soluble and insoluble ash content
3. Estimation of sugars
4. Estimation of fat
5. Estimation of free fatty acids
6. Estimation of Iodine number
7. Estimation of Peroxide value
8. Estimation of protein
9. Estimation of crude fibre
10. Estimation of ascorbic acid
11. Estimation of calcium
12. Estimation of Total Antioxidants
13. Estimation of thiamine
14. Estimation of Riboflavin
15. Estimation of Vitamin A
16. Estimation of β carotene
17. Estimation of cholesterol
18. Estimation of calorific value

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M.Sc Food Science and Nutrition

Semester II

Course Code	Title of the Course	Credits
	Hard core	
FS&N431	Research Methodology and Biostatistics	3
FS&N432	Advanced Nutrition I	3
FS&N433	Food Product Development and Quality Evaluation	3
FS&N434	Nutraceuticals and Functional Foods	3
FS&N435	Clinical and Therapeutic Nutrition I	3
FS&N436	Food Ingredients and Processing	3
FS&N455	Food Product Development and Quality Evaluation lab	1
FS&N456	Food Ingredients and Processing Lab	1
	Soft core	
FS&N447	Food Additives	2
FS&N448	Nutrition and Physical Fitness	2

FS&N431 RESEARCH METHODOLOGY AND BIOSTATISTICS CREDIT 3

UNIT I **10 hours**

Research Methodology: Meaning, objectives and types of research, research approaches, Significance of research, Research and scientific methods, research process and criteria of good research Definition and identification of a research problem – Selection of research problem, Justification, theory, hypothesis, basic assumptions, limitations and delimitations of the problem.

UNIT II **9 hours**

Introduction of Bio statistics – Meaning and its scope; Population and Sample. Parameter and Statistics; types of statistical data; Diagrammatic representation data; Mean, Median, Mode, Standard deviations, Coefficient of Variation, Skewness and Kurtosis. Probability – Definition, Axioms of Probability; Addition and Multiplication theorem.

UNIT III **9 hours**

Concept of Correlation – Simple, Partial Regression – Simple Methods of Association – Chi square test of association of attributes, Goodness of Fit.

UNIT IV **10 hours**

Concepts of Hypothesis _ Null, Alternative Hypothesis, Type I and type II errors, Sampling Distribution Standard error t & F distribution: t test based on single samples, two sample mean, paired samples, F test two sample variances, F test for several mean (One way ANOVA only). Z-test for proportion – One sample, two sample. MS- excel support for above procedures.

UNIT V **10hours**

Framing Proposal for acquiring grants: The question to be addressed – Rationale and importance of the question being addressed – Empirical and theoretical framework – Presenting pilot study / data or background information - Research proposal and time frame – Specificity of methodology – Organization of different phases of study – Expected outcome of study and its implications – Budgeting - Available infra-structure and resources - Executive summary

Text books and Reference materials

1. Bandarkar, P.L. and Wilkinson T.S. (2000): Methodology and Techniques of Social Research,Himalaya Publishing House, Mumbai.
2. Copper, H.M. (2002). Intergrating research : A guide for literature reviews (2nd Edition). California: Sage
3. Harman, E & Montages, I. (Eds.) (2007). The thesis and the book, New Delhi : Vistar.
4. Mukherjee, R. (1989): The Quality of Life: Valuation in School Research, Sage Publications, New Delhi.
5. Stranss, A and Corbin, J. (1990): Basis of Qualitative Research: Grounded Theory Procedures and Techniques, Sage Publications, California

FS&N 432 ADVANCED NUTRITION-I CREDIT 3

UNIT - I **10 hours**

Basis for computing nutrient requirements - latest concepts in dietary recommendations,: their uses and limitations. Body fluids and water balance - Body water compartments - Regulation of water balance - disorders of water balance - Body composition Methods of study - compositional changes during life cycle - nutritional disorders and their effect body composition.

UNIT - II **9 hours**

Energy metabolism Basal and resting metabolism –influencing factors. Methods to determine energy requirements and expenditure. Thermo genesis, adaptation to altered energy intake, latest concepts in energy requirements and RDA-ICMR and WHO

UNIT - III **10hours**

Carbohydrates: Occurrence and physiological functions**,** Review of metabolism of carbohydrates. Lactose intolerance. Dental caries. Sugar alternatives. Role of dietary fiber in health and disease. Disorders related to carbohydrate metabolism. Glycemic index of foods and its uses. RDA-ICMR and WHO

UNIT - IV **9 hours**

Lipids – Classification and Functions, Review of metabolism of Lipid, Concepts of visible and invisible fats, EFA, SFA, MUFA, PUFA – sources and physiological functions. Role of lipoproteins and cholesterol, triglycerides in health and disease.

UNIT - V **10hours**

Proteins – Classification and Functions, Review of metabolism of Protein, Concepts of essential and non-essential amino acids – their role in growth and development. Physiological functions of proteins. Requirements, nitrogen balance concept. Methods of evaluating protein quality. Protein malnutrition – clinical features and biochemical changes. RDA-ICMR and WHO

Text books and Reference materials

1. Shils, M.E., Olson, J., Shike, M. and Roos, C (2003). Modern Nutrition in Health and Disease, 9" edition Williams and Williams. A Beverly Co. London.
2. Bodwell, C.E.. and Erdman, J.W. (2008) Nutrient Interactions. Marcel Dekker Inc. New York
3. Sareen, S, James, J (2005). Advanced Nutrition in Human Metabolism, 4th Edition, Thomson Wordsworth Publication, USA.
4. Chandra, R.K. (eds) (2002): Nutrition and Immunology, ARTS Biomedical. St. John's Newfoundland.

FS&N 433 FOOD PRODUCT DEVELOPMENTS AND QULAITY EVALUATION CREDIT 3

UNIT I **9 hours**

Food needs and consumer preference: market survey and its importance in; designing a questionnaire to find consumer needs for a product or a concept; advantages of processed foods in urbanized modern society; why people buy processed foods. Developing a product to meet the requirements

UNIT II **10 hours**

Designing new products new food product development(NPD)process and activities, NPD success factors, new product design, food innovation case studies , market –oriented NPD methodologies, organization for successful NPD ; recipe development; use of traditional recipe and modification; recent development in food ingredients\additives flavorings, colourings, emulsifiers, stabilizer and sweeteners; Involvement of consumers, chefs and recipe experts; selection of materials\ingredients for specific purposes ; modifications for production on large Scale , cost effectiveness, nutritional needs or uniqueness

UNIT III **10 hours**

Standardization & large scale production: process design, equipment needed and design; establishing process parameters for optimum quality; sensory evaluation; lab requirements; different techniques and test; statistical analysis ; application in product development and comparison of market samples; stages of the integration of market and sensory analysis.

UNIT IV **9 hours**

Quality , safety and regulatory aspects: product stability ; evaluation of shelf life; changes in sensory attributes and effects of environmental conditions; accelerated shelf life determination; developing packaging systems for maximum stability and cost effectiveness; interaction of package with food; regulatory aspects; whether standard product and conformation to standards; approval for proprietary product.

UNIT V **10 hours**

Advertisement, marketing and case studies; product performance testing; market positioning, marketing; developing test market strategies; various tools and methodologies to evaluate consumer attitudes, preferences and market acceptance factors; case studies of some successes and failures – factors that influence NPD success, innovation case studies to highlight best practice in terms of the integration of technological and marketing approaches to NPD; food choice models and new product trends.

Text books and Reference materials

1. Lyon, D.H.; Francombe, M.A.; Hasdell, T.A.; Lawson, K. (eds) (2002): Guidelines for Sensory Analysis in Food Products Development and Quality Control. Chepman and Hall, London.

2. Lawless, H.T. and Klein, B.P. (2001): Sensory Science Theory and Applications in Foods. Marcel Dekker Inc. New York.

3. Piggott, J.R. (ed) (2008): Sensory Analysis of Foods. Elservier Applied Science, London.

4. Ranganna S. 2006. HandBook of Analysis and Quality Control for Fruits and Vegetables Products 2nd Ed. Tata McGraw- Hill Publishing company Limited. New Delhi.

FS&N434 NUTRACEUTICALS AND FUNCTIONAL FOODS CREDIT 3

UNIT -I 9hours

Nutraceuticals and functional Foods –Definition, concept, history and market; Evolution of nutraceuticals and functional foods market. Classification of nutraceuticals and functional foods. Significance and relevance of nutraceuticals and functional foods in the management of diseases and disorders.

UNIT -II 10 hours

Natural occurrence of certain phytochemicals- Antioxidants and flavonoids: omega – 3 fatty acids, carotenoids, dietary fiber, phytoestrogens; glucosinates; organosulphur compounds. Dosage for effective control of disease or health benefit with adequate safety; studies with animals and humans; acute and chronic studies. Regulatory issues.

UNIT -III 9 hours

Isolation of phytochemicals from plant materials: Care in handling and storage of raw materials with minimal damage to sensitive bioactive compounds; Extractive methods for maximum recovery and minimal recovery and minimal destruction of active material; stability studies. Recent developments in the isolation, purification and delivery of phytochemicals.

UNIT -IV 10 hours

Prebiotics, probiotics and symbiotics- Probiotics: Definition, types and relevance; Usefulness in gastro intestinal health and other health benefits; development of a probiotic products; recent advances in probiotics; Challenges and regulatory issues related to probiotic products. Prebiotics: Prebiotic ingredients in foods; types of prebiotics and their effects on gut microbes; health benefits of prebiotics; recent development in prebiotics. Symbiotics.

UNIT -V 10hours

Functional foods - Definition, development of functional foods, use of bioactive compounds in appropriate form with protective substances and activators; Effect of environmental condition and food matrix; Effects of processing conditions and storage; Development of biomarkers to indicate efficacy of functional ingredients; Research frontiers in functional foods; delivery of immunomodulators /vaccines through functional foods. Nutrigenomics- concept of personalized medicine. Use of anotechnology in functional food industry.

Text Books and Reference materials

1. Wildman, R.E.C. (2007) Handbook of Nutraceuticals and Functional Foods, second edition. CRC Press.

2. Gibson GR & William CM. *Functional Foods - Concept to Product*. 2000.

3. Goldberg I. *Functional Foods: Designer Foods, Pharma Foods*. 2004.

4. Brigelius-Flohé, J & Joost *HG*. *Nutritional* Genomics: Impact on Health and Disease. Wiley VCH. *2006*.

5. Cupp J & Tracy TS. *Dietary Supplements: Toxicology and Clinical Pharmacology*. Humana Press. 2003.

FS&N435 CLINICAL AND THERAPEUTIC NUTRITION I CREDIT 3

UNIT I **9 hours**

Guidelines for dietary planning: Weights and Measures, Determining nutritional needs, Basic Guidelines for diet planning, Nutritional status of Indians, Cultural aspects of dietary planning.

UNIT II **9 hours**

Nutritional assessment: Anthropometrics , Laboratory and Biochemical Assessment, Clinical Assessment. Nutritional imbalance and Nutritional screening.

UNIT III **10hours**

Nutritional care process: Identification of high risk patients- nutritional assessment, nutritional diagnosis, nutrition intervention, monitoring and evaluation of nutritional care. Assessment components-medical and nutritional care record types and uses Format for medical and nutrition charting and documentation record. Nutritional intervention and diet modification-diet prescription, modifications of the normal diet. Nutrition care for hospitalized patients- standard hospital diet, other types of diet in hospital, modifications of food intake

UNIT IV **10 hours**

Nutrition counseling: Nutritional counseling –concept, recipient and counseling environment, the problem solving counseling method. Activities for behavior changes, intervention counseling models, types of counseling session in patients. Empowerment, interpersonal skills. Nutritional counseling components – planning, implementation and evaluation.

UNIT V **10hours**

Role of dietitian on hospitalized and outdoor patients and development of nutritional care plan. Specific functions of a therapeutic, administrative and consultant dietitian. Team approach in patient care. Psychological considerations in patient care. Inter personal relationship with patients. Objectives of diet therapy- regular diet and rationale for modifications in energy and other nutrients, texture-fluid, soft diets etc.

Text books and Reference materials

1. Mahan, L.K. and Escott-Stump, S. (2000): Krause's Food Nutrition and Diet-Therapy, 10th Edition, W-13 Saunders Ltd.
2. Shills, M.E., Olson, J.A, Shike, M and Ross, A.C. (2002): Modern Nutrition in Health and Disease, 9th Edition, A. vaiiiams and Willdns..
3. Sareen, S, James, J (2005). Advanced Nutrition in Human Metabolism, 4th Edition, Thomson Wordsworth Publication, USA.
4. Chandra, R.K. (eds) (2002): Nutrition and Immunology, ARTS Biomedical. St. John's Newfoundland.

FS&N 436 FOOD INGREDIENTS AND PROCESSING CREDIT 3

UNIT I **9 hours**

Cereals and Legumes: Structure and composition of cereals and legumes. Processing and Toxic constituents in cereals and legumes. Fermented products, method of cooking and germination .

UNIT II **10hours**

Fats and Oils: Effect of processing on chemical structure and physical properties- Precursors of aroma compounds. Functional properties of fat and uses in food preparation, inter- estrification of fats. Hydrogenated fat, Lipid- protein complexes, emulsion, fat deterioration and fat substitutes.

UNIT III **9 hours**

Milk and Milk products: Composition , physical and functional properties. Denaturation. Effect of processing and storage. Cultured milk, yogurt, butter, whey,cheese, concentrated and dried products, frozen desserts, dairy product substitutes.

UNIT IV **10hours**

Meat and meat products: Muscle composition, post mortem changes. Characteristics and structure of meat, poultry, egg and fish. Processing and preservation of meat, poultry, egg and fish.

UNIT V **10 hours**

Fruits and Vegetables: Enzymes in fruits and vegetables. Flavour constituents. Plant Phenolics Pigments. Post harvest changes. Texture of fruits and vegetables. Effect of storage , processing and preservation

Textbooks

1. Potter,N. and Hotchkiss,J.H.(2005).Food Science, Fifth Edition, CBS Publishers and Distributors, New Delhi.
2. Charley,H.(2002).Food Science ,JohnWiley and Sons, New York.
3. Salunke,D.K and Kodam,S.S. (2001).Handbook of vegetable science and Technology, Marcel Dekker,Inc,270,Madison Avenue, New York.
4. Borwankar,R.P and Shoemaker,C.E.(1992).Rheology of Foods.Elsevier Science Publishers Ltd., England.
5. Salunke,D.K and Kodam,S.S . (2001). Handbook of Vegetable Science and Technology, Marcel Dekker,Inc., 270,Madison Avenue, New York,NY,10016

FS&N 447 **FOOD ADDITIVES** **CREDIT 2**

UNIT I **10hours**

Food additives – definitions, classification and function , preservatives, antioxidants, colours and flavours, emulsifiers, sequesterants, humectants, hydrocolloids, sweeteners, acidulents, buffering salts, anticaking agents, etc. – chemistry, food uses and functions in formulations, indirect food additives; toxicological evaluation of food additives. Proteins, starches and lipids as functional ingredient; isolation, modification, specifications, fuctional properties and applications in foods.

UNIT II **10hours**

Functionality of food additives, regulatory and legal aspects, sensory properties of foods objectives of additives, functional classification of additives, additives of natural origin, synthetic additives. Health and safety aspects of food additives. Present status of various food additives.. Controversial food additives Saccharin, history, function, controversy status, aspartame, nitrite and nitrate compounds, nitrosamines.

UNIT III **10 hours**

Additives to improve acceptability, permitted food colors, natural and artificial, food flavours, natural and artificial, sweeteners natural and artificial. acidulents, antimicrobials, aerating agents, ant staling agents, bodying agents, clouding agents, curing agents clarifiers, dietary supplements, dietary fiber , emulsifiers, enzymes, fat replacers, gelling agents, leavening agents, stabilizers, surfactants, tenderizers, texturizers, thickeners, vitamins, nerutraceuticals, viscosity modifiers, whipping agents.

UNIT IV **9 hours**

Flavor technology; types of flavours, flavours generated during processing – reaction flavours, flavor composites, stability of flavours during food processing , analysis of flavours, extraction techniques of flavours, flavours emulsions; essential oils and oleoresins; authentication of flavours etc.

UNIT V **9 hours**

Food adulteration, definition, reasons for food adulteration, methods of adulteration, and methods of detection. Consumer's responsibilities, consumer organizations. The prevention of food adulteration Act, 1954. The consumer protection Act 1986, normal food adulterants in coffee, tea leaves, edible oil, milk, cereals, spice powders.

Text books and Reference materials

1. Branen, A.L., Davidson PM & Salminen S. 2001. Food Additives. 2nd Ed. Marcel Dekker.
2. Gerorge, A.B. 2006. Encyclopedia of Food and Color Additives. Vol. III. CRC Press.
3. Gerorge, A.B. 2004. Fenaroli's Handbook of Flavor Ingredients. 5th Ed. CRC Press.
4. Madhavi, D.L., Deshpande, S.S & Salunkhe, D.K. 2006. Food Antioxidants: Technological, toxicological and Health Perspective. Marcel Dekker
5. Nakai S & Modler HW. 2000. Food Proteins. Processing Applications. Wiley VCH.

FS&N 448 NUTRITION AND PHYSICAL FITNESS CREDIT 2

UNIT -I 11hours

Basic Nutrition – Relation between foods and nutrition, Nutrients - Macro nutrients-their functions, food sources digestion, absorption deficiency symptoms and toxicity. Micro nutrients functions, food sources digestions and absorption, deficiency and toxicity. Non nutrient components of foods and their association to health. Fluid balance – Water compartments in human body, fluid regulation water intake in different conditions, dehydration and water intoxication. Recommended dietary allowances and balanced diet.

UNIT - II 8 hours

Factors influencing dietary intake: Food habits, food fads and fallacies, their influence on health and wellbeing. Gender and health. Nutritional status: Definition methods to assess nutritional status – (Relevant to maintenance of fitness), specific fitness and health.

UNIT -III 10 hours

Approaches to the management of fitness and health. Diet and exercise – Effect of specific nutrients on work performance and physical fitness. Fuel and other nutrients that support physical activity (metabolic pathways). Mobilization of fuel stores during exercise. Importance of carbohydrate loads. Nutrition, exercise, physical fitness and health – their inter relationship.

UNIT -IV 9 hours

Nutrition in sports – Sports specific requirements diet manipulation pre game and post game means, Use of different nutragenic aids and commercial supplements. Sports drinks, Diets for persons with high energy requirements stress, fracture and injury

UNIT 5 10 hours

Significance of physical fitness and nutrition in prevention and management of weight control diabetes mellitus, CVD, bone health and cancer. Awareness about the alternative systems for health and fitness, like ayurveda, yoga, meditation vegetarianism and traditional diets.

Text books and Reference materials

1. Mahan, L.K. & Ecott-Stump, S. (2000): Krause's Food, Nutrition and Diet Therapy, 10th Edition, W.B. Saunders Ltd.
2. Sizer, F & Whitney, E. (2000): Nutrition – Concepts and Controversies, 8th Edition, Wadsworth Thomson Learning.
3. Whitney, E.N. & Rolfes, S.R. (2003): Understanding Nutrition, 8th Edition, WestWadsworth, An International Thomson Publishing Co.
4. Ira Wolinsky (Ed) (2003): Nutrition in Exercise and Sports, 3rd Edition, CRC Press
5. Parizkova, J. Nutrition, physical activity and health in early life, Ed. Wolinsky, I. CRC Pres

FS&N455 FOOD PRODUCT DEVELOPMENT AND QULAITY EVALUATION LAB CREDIT 1

Product development

1. Permutation combination method
2. Response surface methodogy

Evaluation of product

3. Analysis of physical properties
4. Analysis of chemical properties

Sensory evaluation

5. Selection of panel
6. Threshold test

Collection and analysis of sensory data

7. Statistical analysis
8. Interpretation
9. Reporting

FS&N456 FOOD INGREDIENTS AND PROCESSING LAB CREDIT 1

1. Development of gluten in fermented doughs
2. Effect of cooking on whole and split pulses
3. Factor affecting gelatinization and setting quality of food starches
4. Determination of smoking points of fats and oils
5. Effects of pre preparation techniques on meat tenderization
6. Effect of cooking on the coagulation property of eggs
7. Effect of pH on cooking of vegetables and fruits
8. Determination of subjective evaluation on foods

PONDICHERRY UNIVERSITY

Department of Food Science and Technology

M.Sc Food Science and Nutrition

Semester III

Course Code	Title of the Course	Credits
	Hard core	
FS&N511	Food Biotechnology	3
FS&N512	Food Packaging	3
FS&N513	Food Safety and Quality Control	3
FS&N514	Nutritional Biochemistry	3
FS&N515	Advanced Nutrition II	3
FS&N516	Clinical and Therapeutic Nutrition II	3
FS&N517	Minor project and Seminar	2
	Soft core	
FS&N528	Nutrition in Critical Conditions and Emergencies	2
FS&N551	Food Safety and Quality Control lab	1
FS&N552	Nutritional Biochemistry lab	1

FS&N511 FOOD BIOTECHNOLOGY CREDIT 3

UNIT -I **10hours**

Basics of Molecular Biology and genetics– Fundaments of molecular biology and genetics. Central dogma of protein synthesis. Concept of genetic engineering and molecular cloning. Plant and animal culture, transgenic plants, application of genetic engineering in food science and technology. Genetically modified foods – concept, types and application.

UNIT -II **10hours**

Prospectus of biotechnology- Definition, scope and applications. Application of biotechnology in food. Basic principles of molecular biology and biotechnology: Introduction to Genetics, Mendelian genetics, Population & Evolutionary genetics, Gene Mapping. Microbial gene transfer mechanisms, Mutation, Types of mutations, Molecular mechanism of mutations, practical applications, DNA repair Mechanisms, Recombinant DNA Technology.

UNIT -III **9 hours**

Traditional applications of food biotechnology - Fermented foods: eg dairy products, oriental fermentations, alcoholic beverages, and food ingredients. Health benefits of fermented foods. Types of fermented foods and importance of food fermentation in food preservation and nutritional enhancement.

UNIT -IV **10hours**

Starter cultures – types, designing and development, micro encapsulation and packaging, scopes and challenge; Development and formulation of novel products such as probiotic foods. Nutrogenomics - concept, working, significance and relevance. Biosensors and novel tools and their application in food science.

UNIT -V **9 hours**

Ethical issues concerning GM foods; testing for GMOs; current guidelines for the production, release and movement of GMOs; labeling and traceability; trade related aspects; biosafety; risk assessment and risk management. Public perception of GM foods. IPR. GMO Act –2004.

Text books and reference materials

1. Lopez, G.F.G. and Canovas, G.V.B. “Food Science and Food Biotechnology” CRC Press, Florida, USA. 2003.
2. Joshi, V.K., and Pandey, A. Biotechnology: Food Fermentation. Vols.I,II. Education Publ. 2002.
3. Bains, W. Biotechnology from A to Z. Oxford Univ. Press. 2009.
4. Lee, B.H. Fundamentals of Food Biotechnology.VCH. 2006

FS&N512 FOOD PACKAGING CREDIT 3

UNIT I **9 hours**

Introduction to food packaging: Packaging terminology- definition . Functions of food packaging, Packaging environment. Characteristics of food stuff that influences packaging selection.

UNIT II **10hours**

Packaging material and their properties: Glass, Paper and paper board, Corrugated fibre board (CFB), Metal containers: Tin Plate and Aluminum, Composite containers, Collapsible tubes, Plastic Films, Laminations, Metalized films, Co extruded films, Testing of packaging material.

UNIT III **9 hours**

Packaging Systems and methods: Vacuum Packaging, Controlled atmospheric packaging, Modified atmospheric packaging, Aseptic Packaging, Retort processing, Microwave packaging, Active Packaging, intelligent packaging, Edible packaging, Shrink and stretch packaging.

UNIT IV **10hours**

Packaging of fresh and processed foods: Packaging of Fruits and vegetables, Fats and Oils, Spices, meat, Poultry and sea foods, Dairy Products, Bakery, beverages, Dehydrated and frozen foods. Liquid and powder filling machines – like aseptic system, form and fill (volumetric and gravimetric), bottling machines. Form Fill Seal (FFS) and multilayer aseptic packaging machines.

UNIT V **10hours**

Packaging Design & Environmental Issues in Packaging: Food marketing and role of packaging- Packaging aesthetic and graphic design; Coding and marking including bar coding; Consumer attitudes to food packaging materials; Packaging Laws and regulations, safety aspects of packaging materials; sources of toxic materials and migration of toxins into food materials; Packaging material residues in food products; Environmental & Economic issues, recycling and waste disposal.

Text Books and Reference materials

1. Robertson, G.L. 2006 Food Packaging: Principles and Practice (2nd ed.), Taylor & Francis
2. NIIR. (2003). Food Packaging Technology Handbook, National Institute of Industrial Research Board, Asia Pacific Business Press Inc.
3. Ahvenainen, R. (Ed.) 2003 Novel Food Packaging Techniques, CRC Press,

4. Han, J.H. (Ed.) 2005 Innovations in Food Packaging, Elsevier Academic Press,
5. Coles, R., McDowell, D. and Kirwan, M.J. (Eds.) 2003 Food Packaging Technology, CRC Press

FS&N513 FOOD SAFETY AND QUALITY CONTROL CREDIT 3

UNIT I **9 hours**

Food safety concept - Importance of food safety in the food processing industry Risk classification, National and international food regulatory agencies, General food laws and food safety regulations, Nutritional labeling regulation (mandatory and optional nutrients, nutritional descriptors and approved health claims); Microbial contamination (including cross-contamination/indirect contamination) Chemical contamination, Physical contamination, Allergen contamination

UNIT II **10hours**

Food Safety Programs: Definitions and importance, Good Manufacturing Practices (GMPs), Pest Control Program, Facility Maintenance, Personal Hygiene, Supplier Control, Sanitary Design of Equipment and Infrastructure, Procedures for Raw Material Reception, Storage and Finished Product Loading, Sanitation Program. (Sanitation Standard Operating Procedures (SSOPs)., Product Identification, Tracking and Recalling Program, Preventive Equipment Maintenance Program, Education and Training Program

UNIT III **9 hours**

Hazard Analysis and Risk Assessment: Physical hazards (metals, glass, etc), Chemical hazards (food additive toxicology, natural toxins, pesticides, antibiotics, hormones, heavy metals and packaging components), Biological hazards (epidemiology of biological pathogens: virus, bacteria and fungi), Evaluation of the severity of a hazard Controlling Food Hazards . Hazard Analysis Critical Control Point (HACCP) system.

UNIT IV **9 hours**

Food Hygiene Programs: Personal hygiene, Training programs, Infrastructure, Personal habits, Hygiene verification, Water in the food industry, Water sources, Water uses, Water quality, Treatments, Cleaning and sanitation, Cleaning agents, Sanitizing agents, Equipment and systems, Evaluation of sanitation efficacy,. Pest Control, Pest Classification (insects, rodents and birds), Prevention and control

UNIT V **11hours**

Food Safety regulations and management systems: National and international food quality regulations, Quality systems- Introduction to the legal system, principles in the general food law, principles of self control, risk analysis on food, international food trade, Codex Alimentarius, traceability, EU-regulations on the hygiene of foodstuffs, and EU-regulations on the official food control. Food quality standard: IPM, GAP, Organic farming, GMP, Standard of food quality and food quality analysis, Environmental risk assessment in food safety aspect, Food hygiene and surveillance system, Standard of food quality and control system, Food industries and quality

assurance in food production, ISO certifications. Indian Food regulations – History of Indian Food Regulations: BIS, ISI, FPO, PFA and FDA. Food Safety and Standards Act 2006

Text books and Reference materials

1. Early, R. (2005): Guide to Quality Management Systems for the Food Industry, Blackie, Academic and professional, London.
2. Gould, W.A and Gould, R.W. (2006). Total Quality Assurance for the Food Industries, CTI Publications Inc. Baltimore.
3. Pomeraz, Y. and MeLoari, C.E. (2006): Food Analyasis: Theory and Practice, CBS publishers and Distributor, New Delhi.
4. Bryan, F.L. (2000): Hazard Analysis Critical Control Point Evaluations A Guide to Identifying Hazards and Assessing Risks Associated with Food Preparation and Storage. World Health Organisation, Geneva.
5. FSSAI, FSIS, EU and FAO website for updates

FS&N514 NUTRITIONAL BIOCHEMISTRY CREDIT 3

UNIT -I **10 hours**

Metabolic pathways: Carbohydrates – Aerobic and anaerobic degradation, glycogenesis, glycogenolysis, gluconeogenesis, HMP shunt pathway.Hormonal regulations of blood glucose.Bioenergetics – Principles of bioenergetics, free energy – endergonic and exergonic process, role of high energy compounds in energy storage, formation of ATP- Biological oxidation and electron transport chain - Reduction potentials, anatomical site and components of oxidative phosphorylation, enzymes involved membrane location of electron transport, chemiosmotic theory, inhibitors of respiratory chain.

UNIT -II **9 hours**

Protein and amino acids: Protein degradation, fate of nitrotgen (urea cycle), metabolism of aromatic, sulfur containing, BCAA and other amino acid pool. Glutamine and alanine cycle, protein biosynthesis. Nucleic acids- metabolism of nucleic acid components, biosynthesis of nucleotides.

UNIT -III **10hours**

Lipids- Metabolism of triaclyglycerol, β oxidation of fatty acids, cholesterol. Regulation of lipid metabolism and ketone bodies.Oxidative stress and antioxidants – Free radicals – definition, formation in biological systems, defense against free radicals. Role of free radicals and antioxidants in health and disease Determination of free radicals, lipid peroxides and antioxidants

UNIT -IV **9hours**

Regulation of metabolism – Interrelationship of carbohydrate, protein and lipid metabolism, Role of Vitamins and Minerals in Metabolism,metabolic adaptation during starvation, exercise, stress and diabetes mellitus

UNIT -V **10hours**

Significances of enzymes in food metabolism Classification, Chemical nature - Enzyme inhibition, enzyme pattern in disease pattern.Hormones: Classification – synthesis - regulatory functions and mechanism of hormone action - Prostaglandin – structure, biosynthesis, metabolism and biological action and their role in pathology.

Text books and Reference materials

1. Murray, R.K., Graner, D.K., Mayes, P.A. and Rodwell, V.W. (2000): 25th Ed. Harpers Biochemistry Macmillan Worth Publishers.
2. Nelson, D.L., and Cox, M.M. (2000): 3rd Ed. Lehninger's Principles of Biochemistry, Macmillan Worth Publishers.

3. Conn, E.E., Stumpf, P.K., Bruening, G. and Doi, R.H. (2001): 5th Ed. Outlines of Biochemistry, Heinemann Medical Books Ltd.
4. Raghuramulu, N., Madhavan Nair and K. Kalyanasundaram, S. (2003). A Manual of Laboratory Techniques, NIN, ICMR.

Note: All the nutrients will be dealt with Digestion, absorption and transport and excretion, functions, interaction with other nutrients (if any), RDA, deficiency and toxicity, major sources, Assessment of nutritive and analysis in food material.

UNIT -I **9 hours**

Macro minerals: Calcium, phosphorus magnesium, sodium, potassium, chlorine.

UNIT -II **12 hours**

Micro minerals: Iron, zinc, copper, selenium, chromium, iodine, manganese, Molybdenum and fluoride. Ultra trace minerals: arsenic, boron, nickel, silicon, vanadium and cobalt.

UNIT -III **9 hours**

Fat soluble vitamins**:** Vitamin A, D, E& K.

UNIT -IV **9 hours**

Water soluble vitamins**:** vitamin C, thiamine, riboflavin, niacin, pantothenic acid, biotin, folic acid, vitamin B_{12}, vitamin $B_{6.}$

UNIT -V **9 hours**

Detoxication –Definition, xenobiotics, enzyme systems involved mechanism of detoxification.

Text books and Reference materials

1. Shils, M.E., Olson, J. Shike, M. and Roos, C (2003). Modern Nutrition in Health and Disease, 9th edition Williams and Williams. A Beverly Co. London.
2. Bodwell, C.E.. and Erdman, J.W. (2004) Nutrient Interactions. Marcel Dekker Inc. New York
3. Sareen, S, James, J (2005). Advanced Nutrition in Human Metabolism, 4th Edition, Thomson Wordsworth Publication, USA.

FS&N 516 CLINICAL AND THERAPEUTIC NUTRITION II CREDIT 3

UNIT I **10 hours**

Enteral and Parenteral nutritional support: Enteral nutrition, parenteral nutritional, Transitional feeding, Nutrition support in long-term and home care.

Disease etiology, Metabolic and clinical complications, Disease process and medical treatment ,Biochemical and nutritional issues, nutritional assessment, Diagnostics, lab indices, Dietary history and recalls ,Nutrition prescription, Feed, food and fluid issues, Adequacy of nutrition therapy ,Efficacy of nutrition therapy ,Goals of nutrition therapy, follow ups.(Unit II and Unit II)

UNIT II **9 hours**

Weight imbalances-overweight and obesity, anorexia nervosa and Bulimia nervosa-cardio vascular disorders-Diabetes mellitus-Type I, II, neurological disorders(Parkinson's disease, Huntington's chorea, Amyotrophic lateral sclerosis, multiple sclerosis, myasthenia gravis, Alzheimer's disease, Wilson's disease, stroke)

UNIT III **10 hours**

Gestational diabetes, GI tract disorders-liver and gall bladder, Pancreatic disorders-renal disorder-gout-cancer- Musculo -skeletal disorders(Rheumatoid Arthritis, Osteoarthritis, Osteoporosis)- Immune – deficiency disorders- Genetic disorders-Infections and AIDS-Respiratory problems- Inborn errors of metabolism.

UNIT IV **9 hours**

Food- Drug Interaction: Effect of Food on Drug Therapy. Effect of Drug on Food and Nutrition. Modification of Drug Action by Food and Nutrition. Effect of Drug on Nutritional Status. Excipients and Food-Drug Interaction. Medical nutritional therapy.

UNIT V **10 hours**

Recent trends in concepts of medical nutrition therapy: delivery of nutritional care and dietary counseling-nutritional support recent advances in techniques and feeding substrates-management of diet related health disorders-alcohol,drugs,food poisoning, allergy ,anorexia etc.

Text books and Reference materials

1. Mahan, L.K. and Escott-Stump, S. (2000): Krause's Food Nutrition and Diet-Therapy, 10th Edition, W-13 Saunders Ltd.
2. Shills, M.E., Olson, J.A, Shike, M and Ross, A.C. (2003): Modern Nutrition in Health and Disease, 9th Edition, A. vaiiiams and Willdns..
3. Williams, S.R. (2003): Nutrition and Diet Therapy, 7th Edition, Times Mirror/Mosby Collage Publishing.

FS&N517 MINOR PROJECT AND SEMINAR CREDIT 2

A minor project work would be modulated for the students for hands on experience and the findings of the projects would be presented as seminar and report will be submitted.

FS&N528 NUTRITION IN CRITICAL CONDITIONS AND EMERGENCIES **CREDIT 2**

UNIT – I **10 hours**

Nutritional screening and nutritional status, assessment of the critically ill. Preparation of nutritional care plan. Nutritional support systems. Monitoring nutrient intake and providing nutrition support service, role of immuno enhancers, conditionally essential nutrients, immune suppressants and special diets. Complications of nutritional support systems including refeeding syndrome, palliative care, rehabilitation diets.

UNIT -II **10 hours**

Enteral and parental feeding-Basis, principles, designer and commercial feed techniques, applications and limitations.

UNIT -III **9hours**

Medical nutrition therapy (including pathophysiological, clinical and metabolic aspects) in the following conditions- Gastro intestinal and cardiovascular complications , renal failure, hepatic failure, cancer, AIDS, general surgery, neuro surgery and fractures.

UNIT -IV **9 hours**

Medical nutrition therapy (including pathophysiological , clinical and metabolic aspects) in the following conditions: burns, multiple organ failure and other conditions of stress, trauma and sepsis.

UNIT – V **10hours**

Nutritional problem in Natural/man made disasters and communicable diseases -Famine,drought, flood, earthquake, cyclone and war. Factors contributing to the rise and development of emergency situations (Use illustrations from Indian case studies.) Diet in communicable diseases-causes, major deficiencies.

References

1. Goyet, fish.. V.; Seaman, J. and Geijer, u-(2008): The Management of Nutritional Emergencies in Large Populations, World Health Organisation, Geneva
2. Mahan, L.K. and Escott-Stump, S. (2000): Krause's Food Nutrition and Diet-Therapy, 10th Edition, W-13 Saunders Ltd.
3. Shills, M.E., Olson, J.A, Shike, M and Ross, A.C. (2003): Modern Nutrition in Health and Disease, 9th Edition, A. vaiiiams and Willdns..

Market sample evaluation and statistical application of:

1. Qualitative tests for detection of adulterants
2. Test for assessment of purity of water
3. Test for assessment of quality of milk and milk products
4. Test for assessment of quality of cereals/millets
5. Test for assessment of quality of pulses
6. Test for assessment of quality of fats and oils
7. Test for assessment of quality of meat/fish products
8. Test for assessment of quality of canned/bottle fruits and vegetables
9. Test for assessment of quality of baked foods

FS&N552 NUTRITIONAL BIOCHEMISTRY LAB CREDIT 1

1. Estimation of blood and urine glucose
2. Estimation of hemoglobin and iron
3. Estimation of total protein , serum albumin and globulin
4. Estimation of phosphorus in urine
5. Estimation of ascorbic acid in urine
6. Estimation of cholesterol
7. Estimation of urea in urine
8. Estimation of creatinine in urine
9. Estimation of nitrogen in urine

PONDICHERRY UNIVERSITY

Department of Food Science and Technology

M.Sc Food Science and Nutrition

Semester IV

Course Code	Title of the Course	Category	Credits
FS&N571	Project work	HC	6

FS&N571 **PROJECT WORK** **CREDIT 6**

The Dissertation work continues in IV Semester. Preparation of Thesis report and Thesis Viva-voce are to be done in IV Semester