VIDYASAGAR UNIVERSITY

Post Graduate Syllabus
in
FOOD SCIENCE & NUTRITION
under Choice Based Credit System
(CBCS)
[w.e.f.: 2018-2019]

SYLLABUS
FOR
M.Sc in
FOOD SCIENCE & NUTRITION

FIRST SEMESTER

SL NO	PAPER CODE	COURSE TITLE	CONDUCT HOURS PER WEAK				MARKS		
THEORY			**L**	**T**	**P**	**CREDITS**	**Int Asst.**	**End Sem**	**Total**
1	FSN 101	BASIC NUTRITION AND HEALTH	3	1		4	10	40	50
2	FSN 102	FOOD CHEMISTRY & NUTRITIONAL BIOCHEMISTRY	3	1		4	10	40	50
3	FSN 103	CELL BIOLOGY AND APPLIED PHYSIOLOGY	3	1		4	10	40	50
4	FSN 104	FOOD ITEMS AND ITS CONSTITUENTS	3	1		4	10	40	50
		Total in Theory				**16**			**200**
PRACTICAL									
5	FSN 195	EXPERIMENTS ON NUTRITIONAL BIOCHEMISTRY AND ANTHROPOMETRY			4	4		50	50
6	FSN 196	EXPERIMENT ON FOOD ITEMS AND ITS CONSTITUENTS			4	4		50	50
		Total in Practical				8			100
		Total of Semester				**24**			**300**

SECOND SEMESTER

SL NO	PAPER CODE	COURSE TITLE	CONDUCT HOURS PER WEAK				MARKS		
THEORY			**L**	**T**	**P**	**CREDITS**	**Int Asst.**	**End Sem**	**Total**
1	FSN 201	HEALTH MODULATING NUTRIENTS	3	1		4	10	40	50
2	FSN 202	FOOD MICROBIOLOGY AND FOOD PRESERVATION	3	1		4	10	40	50
3	FSN 203	DIETARY MANAGEMENT OF DISEASES	3	1		4	10	40	50
4	FSN 204	(CBCS) BASICS OF NUTRITION AND HEALTH	3	1		4	10	40	50
Total in Theory						**16**			**200**
PRACTICAL									
5	FSN 295	FOOD MICROBIOLOGY LAB AND REVIEW WORK			4	4		50	50
6	FSN 296	THERAPEUTIC NUTRITION AND DIETETICS			4	4		50	50
Total in Practical						**8**			**100**
Total of Semester						**24**			**300**

THIRD SEMESTER

SL NO	PAPER CODE	COURSE TITLE	CONDUCT HOURS PER WEAK				MARKS		
THEORY			**L**	**T**	**P**	**CREDITS**	**Int Asst.**	**End Sem**	**Total**
1	FSN 301	FUNCTIONAL FOODS AND NUTRACEUTICALS, FOOD NANOTECHNOLOGY AND FOODOMICS	3	1		4	10	40	50
2	FSN 302	STATISTICS, COMPUTER APPLICATION AND RESEARCH METHODOLOGY	3	1		4	10	40	50
3	FSN 303	FOOD PROCESSING	3	1		4	10	40	50
4	FSN 304	(CBCS) FOOD HYGIENE AND SANITATION	3	1		4	10	40	50
Total in Theory						**16**			**200**
PRACTICAL									
5	FSN 395	BIOSTATISTICS AND COMPUTER APPLICATION LAB			4	4		50	50
6	FSN 396	FOOD PROCESSING LAB AND FOOD INDUSTRY VISIT			4	4		50	50
Total in Practical						**8**			**100**
Total of Semester						**24**			**300**

FOURTH SEMESTER

SL NO	PAPER CODE	COURSE TITLE	CONDUCT HOURS PER WEAK				MARKS		
THEORY			**L**	**T**	**P**	**CREDITS**	**Int Asst.**	**End Sem**	**Total**
1	FSN 401	GENETICALLY MODIFIED FOODS, FOOD FORTIFICATION AND FOOD TOXICOLOGY	3	1		4	10	40	50
2	FSN 402	FOOD STANDARD, QUALITY CONTROL, FOOD LAWS AND ENTREPRENEURSHIP DEVELOPMENT	3	1		4	10	40	50
Total in Theory						**8**			**100**
PRACTICAL									
5	FSN 493	INTERNSHIP			8	8		100	100
6	FSN 494	PROJECT WORK			8	8		100	100
Total in Practical						**16**			**200**
Total of Semester						**24**			**300**

FIRST SEMESTER

BASIC NUTRITION AND HEALTH

Code: FSN 101 **Full Marks - 50**
3L+1T=4
Credit-4

1. **Nutrition during life span-**
   a. **Pregnancy:** Physiological & Biochemical changes during Pregnancy, Nutritional requirements, Nutritional status of Indian pregnant women. Effect of malnutrition on outcome of pregnancy, Risk of pregnancy, Dietary management.
   b. **Lactation:** physiology of lactation, Factors affecting lactation, nutritional requirements. Effect of lactation on maternal malnutrition and fertility
   c. **Infancy:** Growth and development, nutritional requirements. Feeding pattern, Milk substitute and their suitability for infant feeding. Weaning practices, and problems.
   d. **Preschool age:** Growth and development, nutritional requirements, special care in feeding pre-schoolers, nutritional problems specific to this age.
   e. School age and adolescent children: Growth and development, nutritional requirements.
   f. Adults: Nutritional requirements, Modern aspect of balanced diet.
   f. **Elderly:** Nutritional requirements, Special needs, Nutritional problems
2. **Nutrition policy and programs-**
   a. National nutrition policy: need for nutrition policy, policy strategies and their implementation
   b. Nutrition programs: National anemia prophylaxis programme, Prevention of night blindness, Vitamin A prophylaxis program, National iodine prophylaxis program, Goiter control program, ICDS
   c. National nutrition surveillance system. Food for work etc.
   d. NGO in community development operations
3. **Nutrition Education-** Rationale, planning, Methods, Planning, execution and evaluation
4. **Community Nutrition**
   a. Clinical,
   b. Biochemical
   c. Anthropometric measurements
   d. Dietary surveys
   e. Nutritional Surveillance
5. **Food security:**
   Food production, distribution, access, availability and consumption. Socio cultural aspects and dietary patterns: their implication for nutrition and health

Recommended Reading:

1. Srilakshmi, B. 2000. Dietetics. Wiley Eastern Ltd. 4835/24, Ansari Road, Daryaganj. New Delhi.
2. Swaminathan, H. 1995, Essentials of Food and Nutrition Vol I &Vol. II Bappco. Bangalore.
3. Mahan, L.K. and Escott-Stump, S. (2000): Krause's Food Nutrition and Diet- Therapy, 10th Edition, W-13 Saunders Ltd.

FOOD CHEMISTRY & NUTRITIONAL BIOCHEMISTRY

Code: FSN 102 **Full Marks=50**
3L+1T=4
Credit-4

1. **Proteins and amino acids**:
   a. **Amino acids**- Classification and structure, properties and functions. Formation of peptide linkages
   b. **Proteins**- Structure and organization, physico-chemical properties, classification and functions**.**
2. **Carbohydrates**: Monosaccharide and related compounds, disaccharides, polysaccharides. Inter conversion of hexoses, sugar derivatives of biomedical importance. Artificial sweeteners, Dietary fibre.
3. **Lipids**: Classification, chemical structure, and properties of fatty acids, Triglycerides, phospholipids and derivatives, cholesterol and derivatives. Dietary fats, biological functions of lipids, glycolipids. Methods to determine crude fat and fatty acids. Lipoproteins: Types, Structure and physicochemical properties.
4. **Nucleic acids**: Components, structure and level of organization, Physiochemical properties, biological importance, DNA replication and enzymes in DNA replication, Genetic Code, Protein synthesis.
5. **Dietary Fiber**
6. Water
7. **Fat soluble Vitamins:** Vitamin A, Vitamin D, E & K. **Water soluble vitamins:** Vitamin C, Thiamine, Riboflavin, Niacin, Pantothenic acid, Biotin, Folic acid, Vitamin B_{12}, Vitamin $B_{6.}$
8. **Enzymes**: Regulation of enzyme activity. Role of Coenzymes and cofactors in enzyme activity. Factors affecting enzyme activity Enzyme inhibition, Isoenzymes, immobilized enzymes, clinical significance of enzyme assays
9. **Bioenergetics and oxidative metabolism**: Energy producing and utilizing systems, Sources of and fates of acetyl CO A, The Kreb's cycle, structure of mitochondria, Electron transport chain, oxidative phosphorylation.
10. **Macro minerals**: Calcium, Phosphorus Magnesium, Sodium, Potassium chloride.
11. **Micro minerals**: Iron, Zinc, copper, selenium, chromium, iodine, manganese, Molybdenum and fluoride.
12. **Ultra trace minerals:** Arsenic, Boron, Nickel, Silicon, Vanadium & cobalt: Functions, Toxicity, interaction with other nutrients. Cofactors, Antioxidants.

Note: Vitamins and minerals will be dealt with transport and excretion, functions, interaction with other nutrients (if any), RDA, Deficiency and toxicity, major sources.

Recommended Reading:

1. Nelson, D.L. and Cox, M.M. (2000): 31'd Ed. Lehningcl"s Principles of Biochemistry, Macmillan Worth Publishers.
2. Devlin, T.M. (1997): 4th Ed. Text book of Biochemistry with Clinical Correlations, Wiley Liss Inc
3. Stryer, L. (1998): 4th Ed. Biochemistry, WH Freeman and Co.
4. Conn, E.E., Stump: P.K., Bruening, G. and Doi, R.H. (2001): 5th Ed. Outlines of Biochemistry, John Wiley and Sons.
5. Voet, D. Voet, J.G. and Pratt, C.W. (1999). Fundamentals of Biochemistry.

CELL BIOLOGY AND APPLIED PHYSIOLOGY

Code: FSN 103 **Full Marks - 50**
3L+1T=4
Credit-4

1. **Cell Structure and Function**: Components, cell membrane composition, fluid mosaic model, membrane lipids, proteins and carbohydrates, membrane receptors, functional role of sub cellular organelles and membrane systems.
2. **Biological membranes**: Structure and membrane transport, membrane receptors, fundamentals of signal transduction.
3. **Digestive system:** Review of structure and function - Secretory, Digestive and Absorptive functions - Role of liver, pancreas and gall bladder and their dysfunction - Motility and hormones of GIT. Regulation of food intake **–** role of hunger and satiety centres, effect of nutrients.
4. **Nervous System:** Review of structure and function of neuron - conduction of nerve impulse, synapses, and role of neurotransmitters - Gastro intestinal reflexes

   (a) Endocrine system: Hormones on carbohydrates, protein, fat metabolism

   (b) Hormone signalling system at genomic and non-genomic level
5. **Respiratory system:** Review of structure and function. Role of lungs in the exchange of gases. Transport of oxygen and CO_2. Buffer systems. Cardio-respiratory response to exercise and physiological effects of training.
6. **Circulatory and Cardio Vascular system:** Blood - formation, composition, clotting and haemostasis. Formation and function of plasma proteins. Erythropoiesis. 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.
7. **Excretory system :** Structure and function of nephron - Role of kidney in maintaining pH of blood -Water, electrolyte and acid base balance – diuretics. Endocrine role of Kidney.
8. **Immune system:** Cell mediated and humeral Immunity - Activation of WBC and production of antibodies. Role in inflammation and defence, Autoimmunity, Immunodeficiency, Hypersensitivity, Structure of Ab.

Recommended Reading:

1. Guyton, A.C. and Hall, J.E. (1999): Textbook of Medical Physiology, 9th Edition,
2. W.B. Saunders Co. Stuart Ira Fox, Human Physiology 11th Ed. William F Ganong, Review of Medical Physiology

FOOD ITEMS AND ITS CONSTITUENTS

Code: FSN 104 **Full Marks=50**
3L+1T=4
Credit-4

1. a. **Processing of foods**: Primary, secondary and tertiary processing, historical perspective, traditional technologies used in food processing.
   b. Effects of processing on components, properties and nutritional value of foods.
2. **Processing of wheat**: Structure, composition, primary processing, study of preparation/ manufacture of common unleavened and leavened products like chapathi, bread, cake etc.
3. a. **Rice**: Structure, composition, primary and secondary processing, rice processed products.
   b. **Millets**: Types, composition, malting, other food uses.
4. a. **Legume**:-Types, composition, cooking & processed products.

b. **Oilseeds**: Use of oilseeds and oilseed meals, soya bean and groundnut - composition, processing and food uses.

c. **Fruits and vegetables**: Composition, pectins, plant acids, types of pigments, effect of cooking on colour and texture of vegetables.

5. **Fats and oils**: Properties, manufacture, uses in food systems (as cooking media and shortening). Rancidity-types, mechanism and prevention. Uses of fat replacers in processed foods.
6. a. **Milk and milk products** : Composition, functionality in food system, processing of different products like ghee, butter, milk powders, khoa, paneer, cheese, milk products and ice creams.
   b. **Eggs**: Quality grading, structure, composition, functional properties and products.
7. a. **Flesh foods**: Types, composition, structure of muscle, conversion of muscle to meat-physio –chemical changes, cooking and processing.
   b. **Marine foods**: Types, composition, cooking and processing.
8. a. **Sugar and Jaggery**: Principles of sugar crystallization, stages of cookery and role in Indian traditional sweet preparations, manufacturing of candies and sweets.
   b. Brief manufacturing process of coffee, tea, cocoa, alcoholic beverages (fruit wines). Ready to serve beverages.
9. **Fast foods, Junk foods**
10. **Sensory evaluation of foods:** Texture, Colour, Aroma, flavour etc of different foods

Recommended Reading:

1. Jelen, P. (2005). Introduction to Food Processing. Prentice Hall.
2. Fellows, P.J. (2005). Food processing technology: Principle and Practice. 2nd Ed. CRC Publishers.
3. ICMR.2010. Nutrient Requirements and Recommended Dietary Allowances for Indians, NIN, ICMR. New Delhi.
4. Srilakshmi, B. 2000. Food Science. Wiley Eastern Ltd. 4835/24, Ansari Road, Daryaganj. New Delhi.

NUTRITIONAL BIOCHEMISTRY AND ANTHROPOMETRY LAB

Code: FSN 195 **Full Marks - 50**
4P
Credit-4

Nutritional Biochemistry

1. **Determination of pH:** in acids, alkalis and buffers using pH meter and indicators.
2. **Colorimeters:** Use of colorimeter in UV and visual range, (principle to be explained and demonstrated with one example for each).
3. **Separation techniques**: Chromatography-
   Thin layer Chromatography. (**Aa- or Fa-** One example for each may be demonstrated from extraction of any food item).
4. **Enzyme Assays: A**lkaline phosphatase, GOT, GPT by semiautoanalyser by kit method.
5. Estimation of Creatinine and uric acid in blood by kit method.
6. Estimation of Serum cholesterol, triglyceride, HDL, LDL by kit method.
7. Estimation of serum glucose by GOD POD method.
8. Estimation of Serum proteins by Biuret method.
9. Extraction method of foods by various solvents.

Recommended Reading:

1. Tietz, N.W. (1976) Fundamentals of Clinical Chemistry. WB Saunders Co.
2. King, EJ. and Wootton, LD.P. (1956). 3rd ed. Micro-Analysis in Medical Biochemistry. J and A Churchill Ltd.
3. Plummer, D.T. (1987). 3rd Ed. An Introduction to Practical Biochemistry. McGraw-Hill Book Co.

Nutritional Anthropometry

1. Measurement of body fat percentage by skinfold thickness.
2. Nutrition status of Pre-school children using anthropometric parameters.
3. Nutrition status of school going children using anthropometric parameters
4. Nutritional status of adolescence using anthropometric parameters.
5. Nutrition status of geriatric person.
6. Measurement of BP, heart rate and respiratory rate.

(Above nutritional assessments should be made by measuring height, weight, head circumference, Mid-arm circumference, BMI and other anthropometric indices and skin fold thicknesses)

Recommended Reading:

1. Gibson, R. S.1990. Principles of Nutritional Assessment. Oxford University Press. New Delhi
2. Gopaldas, T and Seshadri, S. 1987. Nutrition – Monitoring and Assessment. Oxford University Press. New Delhi
3. Jelliffe, D.B. Latest Ed. The Assessment of Nutritional Status of Community WHO/FAO Monograph series No.53, WHO Geneva.
4. Mann, S.K; Sangha, J.K; Mehta, U and Jain, R.1999. Manual on Community Nutrition, College of Home Science, PAU, Ludhiana
5. Obert, J.C. 1986. Community Nutrition. Mac Millan New York
6. Park, K.2000. Park's Text Book of Preventive and Social Medicine 22th Ed. M/s Banarsidas Bhanot Pub. Jabalpur, India
7. Sri Lakshmi, B. 2000 Nutrition Science. New Age International (P) Ltd. Pub. Ansari Road Daryaganj. New Delhi

FOOD ITEMS AND ITS CONSTITUENTS LAB

Code: FSN 196 **Full Marks - 50**
4P
Credit-4

Study of preparation variables and quality factors of products from the following food commodities

1. Determination of glucose contents from various rice, wheat and millets
2. Determination of Protein from various pulses and legumes
3. Determination of fat from food products.
4. Estimation of Calcium in Milk.
5. Estimation of Ascorbic acid in lemon
6. Determination of acid number from fresh and used oils.
7. Determination of saponification value from fresh and used oils.
8. Determining frying quality of different oils.
9. Manufacturing of different sweets, candies and biscuits.
10. Studying the textural characteristics of curds prepared using different milk (cow, buffalo and dairy milk).
11. Preparation of sugar and Jaggery based Indian sweets.
12. Demonstrate the different methods of cooking (frying, boiling, grilling and baking) on the quality of chicken, fish and meat.
13. Estimation of Lactose in Milk.
14. **Sensory evaluation of foods:** Analysis of texture, colour, aroma, flavour etc of different foods

Recommended Reading:

1. Swaminathan, M.1995. Food Chemistry and Experimental Foods Bappco, Bangalore
2. Belle and Lowe, Experimental Cookery. John Willey & Sons, 1937 **OR** latest Ed.
3. H.C. Meyer, Food Chemistry. CBS Pub. & Distributors 1960. Litton Educational Pub. Inc. OR latest Ed.
4. M. Shadaksharaswany; N. Shakuntala Manay. Food Facts and Principles, Mohindra Singh Sejwal for Wiley

SECOND SEMESTER

HEALTH MODULATING NUTRIENTS

Code: FSN 201 **Full Marks - 50**
3L+1T=4
Credit-4

1. **Nutrients & Cardiovascular activities including pathophysiology** :
   a. Biogenesis of cardiovascular activities like TG, TC, HDL, LDL & VLDL.
   b. Atherosclerosis, Role of nutrients for its protection
   c. Role of PUFA & MUFA on cardiovascular disease.

2. **Nutrients as Immunomodulators:**
   a. Immuno-Supression : Role of Nutrients
3. **Nutrients on Endurance & Performance modulators:**
   a. Bio-energetics & Metabolism in exercise
   b. Hormonal response & Exercise
   c. Ergogenic aids
   d. Body composition & Performance
4. **Xenobiotic and its metabolism**
   a. Sources of xenobiotics
   b. Xenobiotics in the environment
   c. Role of xenobiotics
5. **Nutrition and body fat**
   a. White and brown adipose tissue and their hormone
6. **Formulated foods:** Definition, Criteria, Applied value
   a. Polymeric foods: Types, characters and application
   b. Monomeric foods: Types, characters and application
7. **Drug-Nutrient Interaction-**Pharmacokinetics, Pharmacodynamics, Role of drug on nutrient absorption, transportation, bioavailability and vise-versa. Role of nutrient on drug absorption, bioavailability, metabolism and transportation and vise-versa.
8. **Inborn Error of Metabolism**
   Phenylketonuria, MSU, Galactosemia, Albunism

Recommended reading:

1. Mahan, L.K. and Escott Stump, S.2000. Krause's Food Nutrition and Diet Therapy 10th Ed., WB Saunders & Co. London
2. Antia, F.P. and Abraham, P. 1997. Clinical Dietetics and Nutrition 4th Ed., Oxford University Press, New Delhi
3. Anderson, L; Dibble, M.U. and Turkki. 1982 Nutrition in Health and Disease. JB Lippincott Co. Toronto.
4. Srilakshmi, B. 2000. Dietetics. Wiley Eastern Ltd. 4835/24, Ansari Road, Daryaganj. New Delhi.

FOOD MICROBIOLOGY AND FOOD PRESERVATION

Code: FSN 202 **Full Marks - 50**
3L+1T=4
Credit-4

1. **Fundamentals of Microbiology**
   a. Bacteria- growth curve and biochemical changes in bacteria.
   b. Yeast- process of hybridization, physiology, classification and importance of yeast.
   c. Moulds-, significance of moulds and common household moulds.
   d. Viruses-, human viral disease, identification and control and viruses in relation to food science.

2. **Microbiology of natural products**
   a. Water-sources and Bacteriology.
   b. Bacteriological examination and purification of water

3. **Microbiology of milk and milk products**
   a. Kinds of microorganisms in milk, sources of contamination, pathogens in milk, control of microorganisms, quality & methods of study.
   b. Microbiology of dairy products-fermented milk, butter & cheese.

4. **Microbiology of fruits and Vegetables**
   a. Fruits and vegetables –external contamination,
   b. Preservation, Spoilage & control of microorganism

5. **Microbiology of cereals & cereal products**
   a. Cereal & cereal products- organism associated with grains
   b. Classification & control of moulds in bread

6. **Microbiology of Fleshy Foods**
   Flesh Foods- Microbiology of meat & meat products, poultry, fish & eggs

7. **Role of sugar, spice & salt**
   a. Effect of salt on microorganism

8. **Principle of Food Spoilage**
   a. Food spoilage- microbiological, biochemical, biological, physical & chemical factors
   b. Spoilage & examination of Canned Foods.

9. **Heat processing**: Mechanism of action, methods of application to foods (Equipments), effect on food and micro-organisms
   a. Sterilization,
   b. Pasteurization,
   c. Blanching,
   d. Canning.
   e. Dehydration

11. **Cold preservation** ; Mechanism of action, methods of application to foods (Equipments),effect on food and micro-organisms
   a. refrigeration,
   b. freezing,
   c. freeze drying,
   d. refrigerated gas storage

12. a. **Food irradiation**: technology, application and safety assessments, effects on food and microorganisms.
    b. Chemicals in food preservation, safety of preserved foods.

Recommended reading:

1. Jay, James, M (2000) Modern Food Microbiology, 2nd Edition. CBS Publisher. Adams, M.R. and M.G. Moss (1995): Food Microbiology, 1st Edition, New Age International (P) Ltd.
2. Frazier, W.C. (1988) Food Microbiology, Mc Graw Hill Inc. 4th Edition.
3. Doyle, P. Bonehat, L.R. and Mantville, T.J-(1997): Food Microbiology, Fundamentals and Frontiers, ASM Press, Washington DC.
4. Pelezar, M.I and Reid, R.D. (1993) Microbiology. McGraw Hill Book Company, New York, 5th Edition.
5. Fellows, P.J. (2005). Food Processing Technology: Principle and Practice. 2nd Ed. CRC Publishers.
6. Jelen, P. (2005). Introduction to Food Processing. Prentice Hall.

THERAPEUTIC NUTRITION AND DIETETICS

Code: FSN 203 **Full Marks - 50**
3L+1T=4
Credit-4

1. **Metabolic disease-**
   a. Epidemiology, pathophysiology, diagnosis, causes & dietary management of type I and type II Diabetes.
   b. Epidemiology, pathophysiology diagnosis, causes & dietary management of Hypertension.
   c. Epidemiology, pathophysiology diagnosis, causes & dietary management of Atherosclerosis.
   d. Epidemiology, pathophysiology diagnosis, causes & dietary management of Renal diseases
   e. Epidemiology, pathophysiology diagnosis, causes & dietary management of Nutritional anaemia.
2. Food Allergy–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.
3. **Gastro Intestinal Diseases**
   a. Epidemiology, Pathophysiology, Cause and dietary management of Liver Disorder
   b. Epidemiology, Pathophysiology, Cause and dietary management of Peptic ulcer.
   c. Epidemiology, Cause & dietary management of GERD, Inflammatory Bowel disease, Irritable bowel syndrome,
   d. Epidemiology, Cause & dietary management of Crohn's Disease, Diverticular disease.
4. **Rheumatic diseases**
   a. Epidemiology, Pathophysiology, Cause &dietary management of Artharitis.
   b. Epidemiology, Pathophysiology, Cause & dietary management of Osteoarthritis, Osteopenia.
5. **Cell proliferation related diseases**
   a. Pathophysiology and dietary management of cancer
6. **Critical care condition**
   a. Nutrition in critical care conditions like Sepsis, trauma, burns, pre and post-surgical conditions

Recommended reading:

1. Mann, S.K; Sangha, J.K; Mehta, U and Jain, R.1999. Manual on Community Nutrition, College of Home Science, PAU, Ludhiana
2. Robinson, C.H. and Lawler, M.R.1982 Normal and Therapeutic Nutrition. Oxford & IBH Pub. Co. New Delhi
3. Swaminathan, H. 1995, Essentials of Food and Nutrition Vol I &Vol. II Bappco. Bangalore
4. Maclaren, D.S. 1986. Nutrition in the Community 2nd Ed. John Willey and Sons, New York
5. Obert, J.C. 1986. Community Nutrition. Mac Millan New York
6. Park, K.2000. Park's Text Book of Preventive and Social Medicine 22th Ed. M/s Banarsidas Bhanot Pub. Jabalpur, India
7. Robinson, C.H. and Lawler, M.R.1982 Normal and Therapeutic Nutrition. Oxford & IBH Pub. Co. New Delhi
8. Srilakshmi, B. 2000. Dietetics. Wiley Eastern Ltd. 4835/24, Ansari Road, Daryaganj. New Delhi.

CBCS
BASICS OF NUTRITION AND HEALTH

Code: FSN 204 **Full Marks - 50**
3L+1T=4
Credit-4

Basics of Nutrition and Health

1. Introduction to nutrition –
   Food as source of nutrients, functions of food, definition of nutrition and health, nutrients & energy, adequate, optimum & good nutrition, malnutrition. Basic five food groups How to use food guide (according to R.D.A.)
2. Nutrition and fitness.
3. Interrelationship between nutrition & health
4. Use of carbohydrate, protein and fat, minerals and vitamins from food sources and its significances.
5. Role of dietary fibres in human nutrition.
6. Effect of cooking on the nutritive value and Food sanitation in hygiene.

Recommended reading:

1. Robinson, C.H. and Lawler, M.R.1982 Normal and Therapeutic Nutrition. Oxford & IBH Pub. Co. New Delhi
2. Swaminathan, H. 1995, Essentials of Food and Nutrition Vol I &Vol. II Bappco. Bangalore
3. Eastwood, M. A. and Passmore, R. 1987. Human Nutrition and Dietetics. VIII Ed. ELBS Churchill Livingston, London.
4. Bamji, M.S; Rao, N.P and Reddy, V. 1996. Textbook of Human Nutrition. Oxford & IBH Publishing Co Pvt. Ltd. Delhi.
5. ICMR.2010. Nutrient Requirements and Recommended Dietary Allowances for Indians, NIN, ICMR. New Delhi.

FOOD MICROBIOLOGY LAB AND REVIEW WORK

Code: FSN 295 **Full Marks=50**
4P
Credit-4

Food microbiology:

1. Identification of microorganism - Yeast, mould, algae.
2. Simple staining, grams staining and hanging drop preparation.
3. Identification of microorganisms in curd.
4. Identification of mould in bread.
5. Bacteriological testing of milk.
6. Observation of culture characteristics and preparation of culture media.

Recommended reading:

1. Doyle, P. Bonehat, L.R. and Mantville, T.J-(1997): Food Microbiology, Fundamentals and Frontiers, ASM Press, Washington DC.
2. Pelezar, M.I and Reid, R.D. (1993) Microbiology. McGraw Hill Book Company, New York, 5th Edition.

Review work:

An independent review work should be undertaken by student under the guidance of a teacher. A report should be submitted at the end of semester in a standard format. The review topic can be selected in consultation with the supervisor.
The student will be required to appear before examiners board and to deliver a seminar on the review work.

THERAPEUTIC DIET PREPARATION

Code: FSN 296 **Full Marks - 50**
4P
Credit-4

1. **Therapeutic diet preparation for metabolic disease**
    a. Therapeutic diet chart preparation for Diabetes
    b. Therapeutic diet chart preparation for Hypertension
    c. Therapeutic diet chart preparation for Atherosclerosis
    d. Therapeutic diet chart preparation for Nutritional anaemia

2. **Therapeutic diet preparation for Gastro Intestinal Diseases**
    a. Therapeutic diet chart preparation for Diarrhoea
    b. Therapeutic diet chart preparation for Dysentery
    c. Therapeutic diet chart preparation for Flatulence
    d. Therapeutic diet chart preparation for Jaundice
    e. Therapeutic diet chart preparation for Hepatitis
    f. Therapeutic diet chart preparation for Irritable bowel Syndrome, Inflammatory bowel disease
    g. Therapeutic diet chart preparation for Constipation
    h. Therapeutic diet chart preparation for Colitis
    i. Therapeutic diet chart preparation for Ulcer.

7. **Therapeutic diet preparation for rheumatic diseases**
    a. Therapeutic diet chart preparation for Artharitis.
    b. Therapeutic diet chart preparation for Osteoarthritis**.**
8. **Food sensitivity and cell proliferation related diseases**
    a. Therapeutic diet chart preparation for cancer and food allergy
9. **Critical care condition**
    a. Therapeutic diet chart preparation for critical care conditions like Sepsis, trauma, burns, pre and post-surgical conditions

THIRD SEMESTER

FUNCTIONAL FOODS, NUTRACEUTICALS, FOOD NANOTECHNOLOGY & FOODOMICS

Code: FSN 301 **Full Marks - 50**
3L+1T=4
Credit-4

1. **Probiotics, Prebiotics and their effect on health**
   a. Probiotics and Symbiotics concept, nutrient Vs. non nutrients, metabolism.
   b. Important features of probiotic microorganisms & prebiotic.
   c. Health effects of probiotics and prebiotics including mechanism of action
   d. Probiotics in fermented milk product and non-milk products
   e. Quality assurance of probiotics and safety

2. **Nutrients as gene modulators:**
   a. Its effect on puberty, reproduction, Polycystic Ovary and nutritional management.
   b. Mechanism of action of Xenoestrogen
   c. Food sources of xenoestrogen
   d. Nutrigenomics
   e. Epigenetics

3. **Nutrients as anticarcinogen**:
   a. Oncogene and Tumor suppressor gene interaction
   b. Apoptotic & Antiapoptotic factor
   c. Role of nutrients on its management

4. **Nutraceuticals & its effect on health**
   a. Nutraceuticals with potential health benefit definition, Chemistry, sources, metabolism and bio availability
   b. Physiological effects of Nutraceuticals, effects on human health and application in risk reduction of diseases
   c. Perspective for food applications for Polyphenols like flavonoids, chatchins, tannins
   d. Phytoestrogens, phytosterols, pigments like lycopene, carcumin.
   e. Phytatics ,Protease inhibitors, amalysae inhibitors, Heamagglutinins, Saponins
   f. Non nutrient effect of PUFA and MUFA, Vitamins and Mineral as proteins, Peptides and Neucleotides

5. **Foodomics, Nutrigenomics, nutrimetabolomics, and nutriproteomics**

6. **Food Nanotechnology**
   a. Functionality and applicability of food nanotechnology
   b. Nanocarrier systems for delivery of nutrients and supplements
   c. Nanocoatings on food contact surfaces
   d. Safety concerns

Recommended reading:

1. Mahan, L.K. and Escott Stump, S.2000. Krause's Food Nutrition and Diet Therapy 10th Ed., WB Saunders & Co. London
2. Wildman, R.E.C. (2007) Handbook of Nutraceuticals and Functional Foods, second edition. CRC Press.
3. Gibson GR & William CM. Functional Foods - Concept to Product. 2000.
4. Goldberg I. Functional Foods: Designer Foods, Pharma Foods. 2004.
5. Brigelius-Flohé, J & Joost HG. Nutritional Genomics: Impact on Health and Disease. Wiley VCH. 2006.

STATISTICS, COMPUTER APPLICATION AND RESEARCH METHODOLOGY

Code: FSN 302 **Full Marks - 50**
3L+1T=4
Credit-4

1. Statistics:

I. Conceptual understanding of statistical measures
   a. Classification and tabulation
   b. Measurement of central tendency
   c. Measurement of variation
   d. Vital Statistics in Nutrition

II.
   a. Frequency distribution
   b. Histogram
   c. Frequency polygon
   d. Binomial distribution
   e. Normal distribution-use of probability table

III.
   a. Parametric and nonparametric tests
   b. Testing of hypothesis- Type I and Type II errors
   c. Chi-square test
   d. Goodness of fit
   e. Application of student 't' test for samples
   f. Difference in proportion for mean and difference in means

IV.
   a. Correlation
   b. Coefficient of correction and rank correlation
   c. Regression and prediction
   d. Analysis of variance-one way and two way classification

2. Computer Application

I.
a. Basic computer architecture
b. Software's-use of MS word
c. MS EXCEL-Bar diagram
d. Pie diagram and line diagram
e. MS power point

II.
a. Application of Statistics
b. Application of SPSS, Origin lab, Software
c. Use of software for food analysis

3. RESEARCH METHODOLOGY

I. **Types of research**
   a. Historical, Descriptive, Experimental
   b. Case study
   c. Social research, Participatory research
   d. Single group research
   e. Quasi experiment research

II. **Definition & Identification of Research Problem**
   a. Selection of research problem, Justification, Theory, Basic assumption
   b. Limitation & delimitation of the problems
   c. Types of variables
   d. Hypothesis in research

III. **Theory of Probability**
   a. Probability, Sampling
   b. Simple Random Systematic, Random Sampling
   c. Two stages & multistage sampling
   d. Non-probability sampling : purpose
   e. Quota & Volunteer Sampling/Screwball sampling

IV. **Basic principle of research design**
   a. Purpose of research design/ fundamental
   b. Applied & Action
   c. Explanatory & descriptive
   d. Experimental survey & case study
   e. Longitudinal & Cross Sectional study
   f. Co-relational study

V. **Qualitative research in food and nutrition**
   a. Type of quality of research
   b. Tools
   c. Techniques and methodology
   d. Rapid assessment procedure
   e. Project reorientation and evaluation

VI. **Quantitative research method**
   a. Theory and design in quantitative research
   b. Definition and quantitative research
   c. Methods and techniques ofdata collection
   d. Group discussion
   e. Interviews: key information, in depth interview
   f. Critical analysis of research
   g. Writing a research proposal
   h. Analysis of data and research report

VII. **Ethics in research**

Recommended reading:

1. Statistics in Biology & Psychology.1980. D. Das and A. Das. Academic Publishers.
2. Basis of Qualitative Research. Strann A and Corbin J Grohnded Theory Procedures and Techniques.
3. Gupta, S. (2001) "Research Methodology and Statistical Techniques", Deep and Deep, New Delhi,

FOOD PROCESSING

Code: FSN 303 **Full Marks - 50**
3L+1T=4
Credit-4

A. FERMENTATION

1. Fermentation, types of fermentation, Fermentation Pathways for Industrial Products: Biochemical pathways of metabolic reactions for utilization of carbon sources and formation of different metabolites by microorganisms; Strain Development -Various techniques of modifying the strains for increased production of industrial products. Use of chemicals, UV rays, genetic engineering to produce newer strains.
2. Sensory characteristics of fermented foods
3. Typical media, Media formulation: - Carbon Source, Nitrogen source, Minerals, Growth Factors, Buffers, Precursors and Inhibitors, O2 requirement and antifoams.
4. **FERMENTATIVE PRODUCTION**
   Foods: Processes for preparing fermented products including Yogurt (curd) and other Traditional Indian Products like idli, dosa, dhokla, etc.,Soya based products like soya sauce, natto, etc., Cocoa, Cheese etc.; Alcoholic Beverages based on fruit juices (wines) etc. Process description, quality of raw materials, fermentation process controls etc.) Industrial chemicals: Fermentative Production of Organic acids like (Citric Acid, Lactic Acid), Amino Acids (Glutamic acid, Lysine), Antibiotics (Erythromycin, Penicillin).

B. BAKING AND CONFECTIONARY

1. Raw materials required for bread making and their functional properties. Essential ingredients: Flour, yeast, water, salt. Other ingredients: Sugar, colour, flavor, fat, milk and milk powder and bread improvers. Functions of various raw materials used in baking industries Materials of Baking. Leaveners and yeast foods, shortenings, emulsifiers and antioxidants, Sweeteners and, water and salt, Ingredients from milk and eggs. Fruits, vegetables, and nuts, Spices, flavour's and colours. Sensory characteristics, Preservation methods.
2. **BAKERY EQUIPMENT:** Introduction to utensils and equipment's used in bakery UNIT and their uses small equipment's, big equipment's and oven. Bulk handling of ingredients, Dough mixing and mixers, dividing, rounding, sheeting, and laminating, fermentation enclosures and brew equipment. Ovens and Slicers, Biscuits and Cookies.
3. **BREAD MANUFACTURING PROCESS**: Straight dough fermentation, Sponge and dough, Accelerated processing. Chorley wood bread process, Dough retarding and freezing, Stages in processing of bread and bread making methods and advantages and disadvantages of various methods of bread-making. Characteristics of good bread: Internal characters; external characters. Bread defects/faults and remedies. Spoilage of bread Causes, detection and prevention.
4. **BISCUITS AND COOKIES**: Production of cakes and cookies/biscuits. Types of biscuit dough's – Developed dough, short dough's, semi-sweet, enzyme modified dough's and batters – importance of the consistency of the dough. Cake making: Ingredients and their function structure builders. Tenderizers, moisteners and flavour enhancers – Selection and preparation of mould Temperature and time required for different type of cake, problems of baking.
5. **CONFECTIONERY PRODUCTS**: Definition, importance of sugar confectionery and flour confectioner. Types of confectionery products-chocolate boiled sweets caramels toffees. Fondants. Manufacturing process and spoilage of confectionery products. Good manufacturing practices (GMP) in baking and confectionery industries. Computerization in plant and laboratory, Sanitation and safety.

C. FOOD PACKAGING –Types, specific packaging materials, equipment's quality control**,**
D. MEAT AND FISH PROCESSING-Types of processing, Nutritional Values
E. FRUITS AND VEGETABLES PROCESSING- Jam, Jelly, Fruit juice, Marmalade

Recommended reading:

1. Doyle, P. Bonehat, L.R. and Mantville, T.J-(1997): Food Microbiology, Fundamentals and Frontiers, ASM Press, Washington DC.
2. Pelezar, M.I and Reid, R.D. (1993) Microbiology. McGraw Hill Book Company, New York, 5th Edition.
3. Fellows, P.J. (2005). Food Processing Technology: Principle and Practice. 2nd Ed. CRC Publishers.
4. Jelen, P. (2005). Introduction to Food Processing. Prentice Hall.
5. Belle and Lowe. Experimental Cookery. John Willey & Sons, 1937 OR latest Ed.
6. M. Shadaksharaswany; N. Shakuntala Manay. Food Facts and Principles, Mohindra Singh Sejwal for Wiley

CBCS
FOOD HYGIENE AND SANITATION

Code: FSN 304 **Full Marks - 50**
3L+1T=4
Credit-4

1. **General principle of food hygiene**, Hygiene in rural and urban areas in relation to food preparation, personal hygiene and food handling habits. Place of sanitation in food plants. Sanitary aspects of building and equipment: Plant layout and design.
2. A. **Safe and effective insect and pest control**: Extraneous materials in foods, Principles of Insects and pests control.
   B. **Physical and chemical control**. Effective control of micro-organisms: micro-organisms important in food sanitation, micro-organisms as indicator of sanitary quality
3. **Sanitary aspects of water supply**: Source of water, quality of water, water supply and its uses in food industries. Purification and disinfection of water preventing contamination of potable water supply**.**
4. A. **Effective detergency and cleaning practices**: Importance of cleaning technology, physical and chemical factors in cleaning, classification and formulation of detergents and sanitizers, cleaning practices.
   B. **Sanitary aspects of waste disposal**. Establishing and maintaining sanitary practices in food plants, role of sanitation, general sanitary consideration and sanitary evaluation of food plants.

Recommended reading:

1. Doyle, P. Bonehat, L.R. and Mantville, T.J-(1997): Food Microbiology, Fundamentals and Frontiers, ASM Press, Washington DC.
2. Pelezar, M.I and Reid, R.D. (1993) Microbiology. McGraw Hill Book Company, New York, 5th Edition.
3. Jelen, P. (2005). Introduction to Food Processing. Prentice Hall.

BIOSTATISTICS AND COMPUTER APPLICATION LAB

Code: FSN 395 **Full Marks - 50**
4P
Credit-4

Experiment on biostatistics

a. Computation of mean, median and mode of grouped and ungrouped data
b. Data representation by, bar diagram, histogram and pie diagram
c. Computation of standard deviation and standard error of mean
d. Students t-test – a) for Independent group b) paired group
e. Chi square test
f. Computation of correlation coefficient
g. Computation of one way ANOVA

Experiment on Computer application

a. Formulation Bar diagram, Pie diagram, Line diagram from the supplied data using MS Excel.
b. Analysis of nutritional data using computer – use of software packages.
c. Use of Ms Word – data representation in tabular form, manipulation of tables
d. Use of Ms Excel – data tabulation, data representation by charts
e. Statistical analysis of data by Ms Excel
f. Ms power point- Presentation of a latest topic.

Recommended reading:

1. Statistics in Biology & Psychology.1980. D. Das and A. Das. Academic Publishers.
2. Basis of Qualitative Research. Strann A and Corbin J Grohnded Theory Procedures and Techniques.
3. Gupta, S. (2001) "Research Methodology and Statistical Techniques", Deep and Deep, New Delhi,

FOOD PROCESSING LAB AND FOOD INDUSTRY VISIT

Code: FSN 396 **Full Marks - 50**
4P
Credit-4

FOOD PROCESSING

1. Determination of yeast-ferment test and dough rising capacity
2. Studies of flour and dough characteristics
3. Preparation of biscuits – different types.
4. Preparation of cookies-different types
5. Preparation of chocolates, fruit drops.
6. Preparation of fruit toffees candies and preserves.
7. Assessment of some important nutraceuticals in foods.
8. Antioxidative sensor of foods: Estimation of antioxidative compounds in doods like Vitamin C, Vitamin E, Zinc and other natural antioxidants
9. Proximate analysis of foods: Ash content, Moisture content, P^H etc.

FOOD INDUSTRY VISIT

Students are required to visit any type of food industry or nutrition research institute to learn about the new techniques and instruments, processing and packaging of foods etc.
A report should be prepared according to the visit. Evaluation of the report shall be made on the viva-voce examination.

FOURTH SEMESTER

GENETICALLY MODIFIED FOODS, FOOD FORTIFICATION AND FOOD TOXICOLOGY

Code: FSN 401 **Full Marks - 50**
3L+1T=4
Credit-4

A. Genetically modified foods

a. GM food- concept, Definition, available GM foods in India.
b. Fundamental techniques for GM food preparation
c. Food fortification through genetical modification
d. Steps adopted for acceptability of GM food.

B. Food Fortification:

a. Needs, objectives, principles and rationale, selection and basis of fortificants.
b. Fortifying products:
   Malting and germination of grains – process, characteristics, nutritional benefits and uses Fortifying beverages, candies, snack products.
   Salt, Sugar, Oils and other health foods fortification

C. Food Toxicology

1. Sources of hazardous substances in Food-Mycotoxin, Natural Toxin, Environmental Toxin, Industrial toxin, Agricultural Toxin, Adulterants.
2. 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, ED50 and TD50: In vitro and in vitro studies; Clinical trials.
3. 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; Mycotoxicosis of significance. Determination of toxicants in foods and their management, Sea food toxin- PSP, DSP
4. 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 adulteration and potential toxicity of food adulterants.
5. 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.

Recommended reading

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. Tonu, P. 2007. Principles of Food Toxicology. CRC Press, LLC. Boca Raton, FL.

FOOD STANDARD, QUALITY CONTROL, FOOD LAWS AND ENTREPRENEURSHIP DEVELOPMENT

Code: FSN 402 **Full Marks - 50**
3L+1T=4
Credit-4

FOOD STANDARD AND QUALITY CONTROL

1. Principles of quality control - Raw material process control and Product inspection.
2. Standards for foods - Milk and milk products, Fruits and Vegetables, Beverages and Fleshy foods.
3. Food Laws, Consumerism - Definition, Consumer protection, Consumer Education, Legal modes of protection and Machinery for redressal of consumer grievances.

EVALUATION OF QUALITY OF FOODS

1. Sensory Evaluation of foods - Requirement for conducting sensory tests, Types of test, limitation of sensory evaluation.
2. Objective methods of evaluation of food.
3. Improvised instruments used for Indian recipes.

FOOD LAWS

1. a. Concept and meaning of Food quality and food Safety, food adulteration, food hazards.
   b. Natural toxins.
2. Food laws and regulations – National and international food laws, Governing bodies.
3. Exposure, estimation, toxicological requirements and risk assessment.
4. Safety aspects of water and beverages such as soft drinks, tea, coffee, cocoa.
5. a. Safety assessment of food contaminants and pesticide residues.
   b. Safety evaluation of heat treatments and related processing techniques.

Entrepreneurship Development

a. Definition, Characteristic, Meaning of entrepreneur, Importance of entrepreneur in economic Development
b. Steps, Quality of successful entrepreneur, Contents of training programme
c. Women entrepreneur, Problems measures, taken for the development of women entrepreneur in India.
d. Concepts of small industries, Objectives, Problems, Measures taken for the promotion of SSI
e. Procedures to strat SSI-market survey, raw material collection, food production, packing, labelling and marketing.
f. Project formulation steps involve.

Recommended reading:

1. Gibson, R.S.1990. Principles of Nutritional Assessment. Oxford University Press. New Delhi
2. Gopaldas, T and Seshadri, S. 1987. Nutrition – Monitoring and Assessment. Oxford University Press. New Delhi
3. Jelliffe, D.B. Latest Ed. The Assessment of Nutritional Status of Community WHO/FAO Monograph series No.53, WHO Geneva.
4. Mann, S.K; Sangha, J.K; Mehta, U and Jain, R.1999. Manual on Community Nutrition, College of Home Science, PAU, Ludhiana
5. 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.
6. Ranganna S. 2006. Handbook of Analysis and Quality Control for Fruits and Vegetables Products 2nd Ed. Tata McGraw- Hill Publishing Company Limited. New Delhi.

INTERNSHIP

Code: FSN 493 **Full Marks - 100**
8P
Credit-4

Internship Training in Hospital
Report Preparation
Students are required to perform internship in hospitals / foods service institutions / Clinics and they have to submit a report on the internship training during examination. Evaluation of internship shall be made on the basis of report and viva-voce examination (At least one month).

PROJECT WORK

Code: FSN 494 **Full Marks - 100**
8P
Credit-4
Project work
(An independent research project work undertaken by student under the guidance of a teacher, can either be a survey or Laboratory oriented research. The research should be submitted at the end of session in the form of a dissertation. The project work can be undertaken at University departments, affiliated research institutions, quality control laboratories, food industries or other institutions with prior approval**)**
(The student should appear before examiners board and the dissertation shall be evaluated by means of presentation and viva – voce).

DISTRIBUTION OF PRACTICAL MARKS

COURSE NO	TITLE OF PAPER	TITLE OF TOPIC	MARKS				CREDIT
			EXP	LAB NOTE BOOK	VIVA	TOTAL	
FSN195	NUTRITIONAL BIOCHEMISTRY AND NUTRITIONAL ANTHROPOMETRY	NUTRITIONAL BIOCHEMISTRY	20	5	5	50	2
		NUTRITIONAL ANTHROPOMETRY	20				2
FSN196	EXPERIMENT ON FOOD ITEMS AND ITS CONSTITUENTS	EXPERIMENT ON FOOD ITEMS AND ITS CONSTITUENTS	40	5	5	50	4
FSN295	EXPERIMENT ON FOOD MICROBIOLOGY AND REVIEW WORK	EXPERIMENT ON FOOD MICROBIOLOGY	20	5	5	30	4
		REVIEW WORK	-	20		20	
FSN296	THERAPEUTIC DIET PREPARATION	THERAPEUTIC DIET PREPARATION FOR METABOLIC DISEASE, GASTRO INTESTINAL DISEASE ETC	20	5	5	50	4
			20				
FSN395	EXPERIMENT ON BIOSTATISTICS AND COMPUTER APPLICATION	EXPERIMENT ON BIOSTATISTICS	20	5	5	50	4
		COMPUTER APPLICATION	20				
FSN396	EXPERIMENT ON FOOD PROCESSING AND FOOD INDUSTRY VISIT	EXPERIMENT ON FOOD PROCESSING	20	5	5	50	4
		FOOD INDUSTRY VISIT	10	10			
FSN493	INTERNSHIP	INTERNSHIP	40	40	20	100	8
FSN494	PROJECT WORK	PROJECT WORK	40	40	20	100	8