

PDM UNIVERSITY

Faculty of Life Sciences **Department of Food Science and Nutrition** **M.Sc. Food Science and Nutrition**

TWO YEAR FULL TIME PROGRAMME



PDM UNIVERSITY BAHADURGARH
DELHI- NCR

⌘ *Note: Syllabi applicable for students seeking admission in the M.Sc. Food Science & Nutrition Course from the academic year 2018*

Details of Course: M.Sc. Food Science & Nutrition

Course Structure Credits (Theory + Practical)

Core Courses (14 Papers)	14 x 04 = 56
Core Course Practicals	12 x 02 = 24
Dissertation (Experimental, Presentation and Viva-Voce)	01 x 16 = 16
PPT (Pre Placement Training)	0 x 0 = 00

Total Credits = 96

M.Sc. Food Science & Nutrition
Department of Food Science & Nutrition
Faculty of Life Sciences, PDMU

PROGRAMME STRUCTURE

	Module Code	Module Type	Module Name	Marks			Credits
				Internal	External	Total	
1st Sem	FSNT5101	Core I	Human Nutrition	50	100	150	4
	FSNT5102	Core I (P)	Human Nutrition Lab	25	50	75	2
	FSNT5103	Core II	Nutritional Biochemistry I	50	100	150	4
	FSNT5104	Core II (P)	Nutritional Biochemistry I Lab	25	50	75	2
	FSNT5105	Core III	Principles of Dietetics	50	100	150	4
	FSNT5106	Core III (P)	Principles of Dietetics Lab	25	50	75	2
	FSNT5107	Core IV	Human Physiology	50	100	150	4
	FSNT5108	Core IV (P)	Human Physiology Lab	25	50	75	2
			Total	300	600	900	24
2nd Sem	FSNT5109	Core V	Principles of Foods	50	100	150	4
	FSNT5110	Core V (P)	Principles of Foods Lab	25	50	75	2
	FSNT5111	Core VI	Nutritional Biochemistry II	50	100	150	4
	FSNT5112	Core VI (P)	Nutritional Biochemistry II Lab	25	50	75	2
	FSNT5113	Core VII	Diet Therapy	50	100	150	4
	FSNT5114	Core VII (P)	Diet Therapy Lab	25	50	75	2
	FSNT5115	Core VIII	Research Methodology	50	100	150	4
	FSNT5116	Core VIII (P)	Research Methodology Lab	25	50	75	2
			Total	300	600	900	24
3rd Sem	FSNT6101	Core IX	Community Nutrition	50	100	150	4
	FSNT6102	Core IX (P)	Community Nutrition Lab	25	50	75	2
	FSNT6103	Core X	Food microbiology	50	100	150	4
	FSNT6104	Core X (P)	Food microbiology Lab	25	50	75	2
	FSNT6105	Core XI	Institutional Food Management	50	100	150	4
	FSNT6106	Core XI (P)	Institutional Food Management Lab	25	50	75	2
	FSNT6107	Core XII	Food Product Development & Quality Evaluation	50	100	150	4
	FSNT6108	Core XII (P)	Food Product Development & Quality Evaluation Lab	25	50	75	2
			Total	300	600	900	24
4th Sem	FSNT6109	Core XIII	Advanced Nutrition	50	100	150	4
	FSNT6110	Core XIV	Food Processing & Preservative Technology	50	100	150	4
	FSNT6111	Core XV	*Dissertation (Experimental, Presentation and Viva-Voce)	400	400	800	16
			PPT (Pre Placement Training)	0	0	0	0
			Total	500	600	1100	24
			Grand Total after four semesters	1400	2400	3800	96

* Dissertation shall begin in Semester 3

SEMESTER SYSTEM COURSE DETAILS

M.Sc. Food Science and Nutrition

DEPARTMENT OF FOOD SCIENCE AND NUTRITION

**FACULTY OF LIFE SCIENCES
PDM UNIVERSITY, BAHADURGAR**

FSNT5101
HUMAN NUTRITION
(4 credits Theory + 2 credits Practical = 6 credits)

Objectives:

- To understand the role of adequate nutrition in stages of life cycle.
- To know the nutritional requirement and meal management of athletes.

Unit 1: PRINCIPLES OF NUTRITION

- Energy value of foods
- Estimation of energy value of foods by Bomb Calorimeter and by Benedict's oxy Calorimeter
- Factors affecting energy requirements;
- Factors affecting BMR, SDA, RDA, and derivation of RDA.
- Physical activity, Reference man, Reference woman
- Basic five food groups, Nutritional contribution from each group
- Balanced diet, Food Pyramid
- Basic principles of meal planning
- Steps in meal planning, food cost
- Nutritional requirements of adult man
- Nutritional requirements of adult woman

Unit 2: PREGNANCY, LACTATION AND INFANCY

Pregnancy:

- Physiological changes, Growth of fetus from conception till term
- Maternal weight gain and complications of pregnancy
- Increase in Nutritional requirements during pregnancy

Lactation:

- Development of breast, physiology of lactation
- Nutritional component of colostrum and mature milk
- Increase in Nutritional requirements during lactation, Lactogogues

Infancy:

- Growth and development during infancy
- Immunization Schedule
- Composition of different types of milk – cow, buffalo, goat and camel, formula milk
- Breast feeding Vs bottle feeding, Feeding of Low birth weight and premature infants, Human Milk Banks
- Weaning: Homemade foods Vs commercial foods

Unit 3: PRE SCHOOLERS, SCHOOLGOING CHILDREN AND ADOLESCENTS

Pre-schoolers:

- Milestones and Growth Chart
- Nutritional requirements
- Factors to be considered while planning diet for the preschool children

School going children:

- Nutritional requirements
- Packed lunch
- Factors to be considered while planning diet for school going children
- Influence of television on eating habits of school going children

Adolescents:

- Sequence of developmental changes, Role of hormones on growth, development and maturation
- Nutritional requirements during adolescence
- Challenges in adolescence: weight control, skipping meals, anorexia, fast foods, smoking, alcohol and drug abuse, teenage pregnancy

Unit 4: GERIATRIC AND ATHELETES**Geriatric:**

- Physiological changes in aging
- Nutritional requirements and Dietary modification
- Common diseases affecting geriatric groups
- Common disabilities affecting geriatric groups

Athletes:

- Exercise – Benefits, Types
- Source of energy – Creatinine phosphate, glucose and glycogen, fats, proteins
- Nutritional requirements
- Meal Management – pre, during and post event, supplements
- Water and electrolyte balance
- Ergogenic aids

BOOKS RECOMMENDED

- Modern Nutrition in Health & Diseases – Eds – Maurice E. Shils, James A.Olson, Moshe Shike, 8th edition, Vol I and II, Williams & Wilkins Publication.
- Nutrition and Dietetics – Shubhangini A Joshi, 2nd edition, Tata Mc Graw Hill publication.
- Food, Nutrition and Diet Therapy – Kathleen Mahan & Krause, Sylvia Escott Stump.

SUGGESTED REFERENCES FOR ADDITIONAL READING

- Perspectives in Nutrition – Gordon M. Wardlaw, Margaret Kessel, 5th edition, Mc Graw Hill Publication.
- Nutrition and Metabolism – Nutrition Society Textbook, Eds – Michael J. Gibrey, Ian A Macdonald and Helen, Blackwell publishing.
- Decisions in Nutrition – Vincent Hegarty.
- Human Nutrition – Geissler & Powers, 11th edition, Elsevier Publications.
- Dietetics – B Srilakshmi, 5th edition, New Age International Publishers

FSNT5102
HUMAN NUTRITION
PRACTICALS

Objectives:

- **To familiarise students with the raw and cooked quantities of food and plan diet for various age groups.**

I. To standardize raw and cooked foods.

1. Cereal and Pulse- Rice, Upma , Phulka, Chapathi, Kichidi, Idli, Dosa, Dhal with Green Leafy Vegetable
2. Beverages and Desserts - Tea, Soup, Juices, Milk Shakes, Porridges, Plain Custard
3. Vegetable and fruits- Vegetable curries and salads

II. Plan, Calculate Nutritive value, cost and Prepare a Day's diet for the following

4. Adult man/ woman
5. Pregnant woman/ Lactating woman
6. Children- Preschooler/ School going
7. Adolescent Girl/ Boy
8. Geriatric Woman / Man

FSNT5103
NUTRITIONAL BIOCHEMISTRY- I
(4 credits Theory + 2 credits Practical = 6 credits)

Objectives:

- To enable students to understand the role of nutrients in the body.
- To know the classification, functions and metabolism of carbohydrates, amino acids, proteins and nucleic acids.

Unit 1: CARBOHYDRATES AND THEIR METABOLISM

- Classification, sources, functions and requirements
- Digestion and absorption
- Transport, utilization and storage
- Glycolysis
- TCA cycle
- Pentose phosphate pathway
- Glycogenesis, glycogenolysis, gluconeogenesis
- Electron transport chain
- Fermentation, alcohol metabolism
- Inborn errors of Carbohydrate Metabolism- Glycogen storage diseases, Lactose intolerance, Galactosemia, Fructose intolerance

Unit 2: AMINO ACIDS, PROTEINS AND NUCLEIC ACIDS

Amino Acids:

- Classification, Functions
- Utilization of amino acids
- Urinary excretion

Proteins:

- **Classification, sources and functions**
- **Digestion and absorption**
- **Transport and storage**

Nucleic acids:

- Types (DNA , RNA) and Functions
- Components of Nucleic acids
- Structure of DNA (Double Helix)
- Structure of RNA
- Types of RNA

Unit 3: AMINO ACID METABOLISM

- Deamination, transamination
- Decarboxylation, deamidation
- Metabolism of tyrosine, tryptophan, phenylalanine
- Metabolism of methionine, leucine and arginine
- Urea cycle
- Amino acids: balance, imbalance and toxicity
- Inborn errors of amino acid metabolism:

- PKU
- Tyrosinemia, Maple syrup urine disease
- Homocystinuria, Alkaptonuria

Unit 4: PROTEIN AND NUCLEIC ACID METABOLISM

- Synthesis of purines and pyrimidines (flow chart)
- Degradation of purines and pyrimidines
- Gout
- Protein synthesis
 - Components required
 - Initiation of Translation
 - Elongation of Peptide chain
 - Termination of peptide Chain
 - Inhibitors of protein synthesis,
 - Chaperones and protein folding
 - Post transcriptional changes
 - Hypoalbuminemia

BOOKS RECOMMENDED

- Nutritional Science – B. Srilakshmi, New Age International Publishers, 2nd edition.
- Textbook of Medical Biochemistry – MN Chatterjee, Rana Shinde, 7th edition, Jaypee Brothers.
- A textbook of Biochemistry – A V S S Rama Rao, 9th edition, UBS Publisher's Distribution Pvt. Ltd.

SUGGESTED REFERENCES FOR ADDITIONAL READING

- Nutritional Biochemistry – Tom Brody, 2nd edition, Academic Press.
- Text Book of Human Nutrition – Mahtab S. Bamji, N Prahlad Rao, Vinodini Reddy, 2nd edition, Oxford & IBH Publishing Co. Pvt. Ltd.
- Textbook of Medical Biochemistry – S Ramakrishnan, K G Prasannan, R Rajan, 3rd edition, Orient Longman, Harper's Illustrated Biochemistry – Robert K. Murray, Daryl K. Granner, Peter A. Mayes, Victor W. Rodwell, 26th edition, McGraw Hills.
- Experimental Biochemistry – A Student Companion – B Sashidhar Rao, Vijay Deshpande, IK International Pvt. Ltd.
- Biochemistry – U Satyanarayana, U Chakrapani, Books & Allied (P) Ltd.
- Clinical Biochemistry – Nagini
- Principles of Biochemistry – Lehninger A L, CBS Publishers and Distributors.
- Textbook of Biochemistry (for Medical students) – DM Vasudevan and S Sreekumari, 4th edition, Jaypee Brothers Medical Publishers (P) Ltd., New Delhi.

FSNT5104
NUTRITIONAL BIOCHEMISTRY- I
PRACTICALS

Objectives:

- **To acquaint the students with principles, techniques and application of different methods of food analysis**
 - Qualitative analysis of carbohydrates
 - Qualitative analysis of protein
 - Separation of fatty acid by paper chromatography
 - Separation of Amino Acid by paper chromatography
 - Estimation of Total sugar by phenol sulphuric acid method
 - Estimation of bile pigments in urine
 - Estimation of blood glucose by oxidase method

FSNT5105
PRINCIPLES OF DIETETICS
(4 credits Theory + 2 credits Practical = 6 credits)

Objectives:

- To impart in depth knowledge regarding prevalence, etiology, diagnosis, diet and life style management in different diseases.
- To gain knowledge on the methods of assessment of nutritional status among individuals and interaction of drugs and nutrients.

Unit 1: INTRODUCTION TO DIETETICS

- Role and responsibilities of Dietitian – Administrative, Community, Hospital
- Interpersonal relationship with patient
- Nutritional counselling
- Nutritional Assessment:
- Anthropometry – Height, Weight, BMI.
- Clinical methods- SGA, MNA, MUST
- Biochemical method: Serum Albumin, Serum Transferrin, Albumin/ Globulin Ratio.
- Diet planning, implementation and follow up
- Dietetics – meaning, need for diet modification
- Modification of normal diets
- Types of hospital diets – clear fluid, full fluid, soft diet

Unit 2: NUTRITION IN CRITICAL CARE

Enteral Nutrition:

- Types – Short term feeding methods : Nasogastric, Nasoduodenal, Nasojejunal
- Long term feeding methods: Gastrostomy, Percutaneous Endoscopic Gastrostomy,
- Percutaneous Endoscopic Jejunostomy
- Methods of delivery – Bolus, gravity, pump, Formula feeds
- Advantages, Disadvantages and complications of enteral nutrition
- Parenteral Nutrition:
- Types – Total Parenteral Nutrition, Peripheral Parenteral Nutrition
- Advantages, Disadvantages and Complications of parenteral nutrition, Composition of
- parenteral nutrition solutions

Surgery:

- Physiological response, endocrine and metabolic changes
- Nutritional care in pre and post-operative conditions

Burns:

- Severity of burns, Metabolic changes in burns
- Nutritional support in burns

Unit 3: ENERGY IMBALANCE AND G.I. DISORDERS

Obesity:

- Definition, types, etiology, assessment and complication
- Management of obesity – exercise, diet, behavior modification, pharmacotherapy and surgery

Leanness:

- Etiology, complications
- Dietary management

Gastrointestinal Disorders: Etiology, symptoms, diagnosis, treatment and dietary management of

- Gastritis
- Peptic ulcer
- Diarrhea
- Constipation
- Malabsorption syndrome: ulcerative colitis, Crohn's disease, irritable bowel disease,
- lactose intolerance and celiac disease
- Diverticular diseases

Unit 4: FEBRILE CONDITIONS, DRUG AND NUTRIENT INTERACTION

- Metabolic changes during fever
- Febrile conditions:
- Short duration – Typhoid, Influenza
- Intermittent duration – Malaria
- Long duration – Tuberculosis
- Dietary Management
- Drug and Nutrient Interaction:
- Types of drugs – Antibiotics, Analgesics, NSAIDs, Antipyretics, Antihistamines
- Pharmacokinetics of drugs
- Effect of drugs on Pharmacokinetics
- Effect of drugs on food intake, absorption, metabolism and excretion
- Effect of food on drug therapy

BOOKS RECOMMENDED

- Clinical Nutrition – Ed Michael J Gibney, Marinos Elia, Olle Ljungqvist and Julie Dowsett.
- Text Book of Human Nutrition – Mahtab S Bamji, N Prahlad Rao, Vinodini Reddy, 2nd edition, Oxford & IBH Publishing Co. Pvt. Ltd.
- Food, Nutrition and Diet Therapy – Kathleen Mahan & Krause, Sylvia Escott Stump.
- Normal and Therapeutic Nutrition - Robinson & Lawler, 17th edition, Mac Millan Publishers.

SUGGESTED REFERENCES FOR ADDITIONAL READING

- Foods – Nutrition and Health – Dr. Vijaya Khader, Kalyani Publishers.
- Nutrition in Health and Diseases – Anderson, 17th edition.
- Modern Nutrition in Health & Disease – Eds – Maurice E. Shils, James A. Olson,
- Moshe Shike, 8th edition, Vol I and II, Williams & Wilkins Publication.
- Nutrition in clinical Practice – David L. Katz, Lippincott, Williams & Wilkins.
- Clinical Dietetics and Nutrition – F P Antia and Philip Abraham.
- Biochemistry – U Satyanarayana, U Chakrapani, Books & Allied (P) Ltd.
- Perspectives in Nutrition – Wardlaw Kessel, Mc Graw Hills.

FSNT5106
PRINCIPLES OF DIETETICS
PRACTICALS

Objectives:

- **To familiarize the students with newer concepts in dietary management of Various disorders and diseases.**
- **Plan, Calculate Nutritive value, cost and Prepare a Day's diet for the following**
 1. Burns
 2. Obesity
 3. Leanness
 4. Peptic Ulcer
 5. Diarrhoea
 6. Constipation
 7. Ulcerative colitis
 8. Short duration fever- Typhoid
 9. Long duration- Tuberculosis

FSNT5107
HUMAN PHYSIOLOGY
(4 credits Theory + 2 credits Practical = 6 credits)

Objectives:

- To enable the students to understand the functions of various systems in the body.
- To acquaint the students with abnormalities of endocrine system.

Unit 1: DIGESTIVE AND EXCRETORY SYSTEM

- Structure and functions of gastrointestinal tract
- Structure and functions of liver
- Functions of gastrointestinal secretions
- Role of enzymes in digestion
- Gut flora, role of prebiotics and probiotics in the maintenance of health of digestive system
- Structure and functions of kidney
- Urine formation
- Organic constituents of urine
- Inorganic constituents of urine
- Water and electrolyte balance

Unit 2: RESPIRATORY AND NERVOUS SYSTEM

- Structure and functions of nose and nasal cavity, pharynx, larynx, trachea, bronchi and lungs
- Mechanism of respiration, Oxygen transport, Carbondioxide transport
- Respiratory rate, Air volume in lung in different situations
- Respiratory abnormalities; Hypoxia, Hypercapnia, carbon monoxide poisoning, Asphyxia, Cyanosis, High altitude sickness
- Emphysema, Asthma, COPD
- Structure of nerve cell, nerve impulses
- Classification of nervous system, Structure and functions of brain, spinal cord
- Peripheral nervous system
- Cerebrospinal fluid, Blood Brain Barrier, Neurotransmitters
- Alzheimer's disease, Parkinson's disease

Unit 3: BLOOD AND CIRCULATORY SYSTEM

- Structure and functions of heart and blood vessels
- Pulmonary, Systemic and Portal circulation
- Blood pressure, Heart rate, Factors affecting BP and heart rate
- Regulation of Cardiac output
- Composition of blood
- Plasma proteins; Functions, role in fluid balance
- Organic and Inorganic compounds in plasma
- Blood Lipids – Chylomicrons, VLDL, LDL, HDL, Cholesterol, Triglycerides
- Enzymes in blood
- Blood coagulation

Unit 4: ENDOCRINE SYSTEM

- Endocrine glands, Formation and secretion of hormones
- Control of hormone secretion, mechanism of hormone action
- Pituitary gland: Hormones secreted and their functions, abnormalities
- Thyroid gland: Structure of thyroid gland, formation of thyroid hormones, functions of thyroid hormones, hypothyroidism, hyperthyroidism
- Adrenal gland: Structure of adrenal gland, secretions of adrenal cortex and their functions, hypoadrenalism, hyperadrenalism
- Secretions of adrenal medulla and their functions
- Parathyroid gland: Structure of parathyroid gland, functions of parathormone, hypo and hyper secretion of parathormone
- Islets of Langerhans: Structure of islets of Langerhans, functions of Insulin, deficiency of insulin, functions of glucagon
- Testes: Structure of testes, functions of testosterone, deficiency of testosterone
- Ovaries: Structure of ovaries, functions of estrogens and progesterone

BOOKS RECOMMENDED

- Textbook of Medical Physiology – Guyton, 8th edition, HBJ International Edition, WB Sanders.
- Essentials of Medical Physiology – Anil Baran Singha Mahapatra, 2nd edition, Current Books International.

SUGGESTED REFERENCES FOR ADDITIONAL READING

- Human Physiology – An Integrated Approach – DU Silverthorne, Prentice Hall.
- Human Physiology – from cells to system – L Sherwood, 6th edition.
- Textbook of Biochemistry (for Medical Students) – DM Vasudevan and S Sree Kumari, 4th edition, Jaypee Brothers Medical Publishers (P) Ltd., New Delhi

FSNT5108
HUMAN PHYSIOLOGY
PRACTICALS

Objectives:

- **To acquaint the students with principles, techniques and application of different methods of analysis for various components in blood.**

I. Microscopic Examination of various tissues and blood vessels

a. Epithelial b. Muscular c. Connective d. Bone e. Artery f. Vein (Specimens)

II. Estimation of blood sample for

1. Enumeration of RBC Count

2. Enumeration of WBC count

3. Determination of blood group and Rh factor

4. PCV - determination

5. Blood glucose by glucometer method

6. Blood Hemoglobin by Cyanmethhaemoglobin method.

III. Estimation of Urine sample for

7. Sugar (Benedicts test)

8. Albumin

FSNT5109
PRINCIPLES OF FOODS
(4 credits Theory + 2 credits Practical = 6 credits)

Objectives:

- To provide an understanding of composition of various food stuffs.
- To familiarize students with changes occurring in various food stuffs as a result of processing and cooking.

Unit 1: CEREALS AND PULSES

Cereals

- Starch: functions and properties
- Gelatinization, factors affecting gelatinization
- Changes in cooked starches – gel formation, retrogradation, syneresis
- Cereal protein – gluten, factors affecting gluten formation
- Nutrient changes during different treatment methods of cereal grains
- Role of natural leavening agents
- Role of yeast

Pulses

- Decortication
- Soaking and germination of pulses
- Fermentation of pulses
- Roasting and Puffing
- Effect of cooking treatments on the nutrient composition, quality and quantity of legumes

Unit 2: ANIMAL FOODS

Milk:

- Composition and Nutritive Value of Milk
- Types of milk
- Properties of milk proteins – effect of heat, acid and phenolic compounds on milk

Egg:

- Composition and Nutritive Value of egg
- Egg as a binding, foaming and emulsifying agent
- Quality and Grading of Eggs

Meat:

- Post mortem changes in meat – rigor mortis, curing, ageing and tenderization
- Changes during cooking of meat

Poultry:

- Advantages of white meat

Fish:

- Classification, Characteristics of fresh fish, Spoilage, Nutritional importance of fish

Unit 3: FATS AND OILS, SUGARS

- Properties of fats and oils
- Emulsions, Fat as emulsifying agent
- Fat as leavening and shortening agent
- Rancidity – types, mechanism and prevention

- Factors affecting amount of fat absorbed during cooking
- Fat replacers
- Types of sugar
- Sugar crystallization and caramalization
- Factors affecting crystallization
- Stages of sugar cookery, preparation of candies – crystalline and non crystalline

Unit 4: VEGETABLES, FRUITS AND SENSORY EVALUATION

Plant pigments:

- Water insoluble and Water soluble pigments
- Factors affecting plant pigments on cooking: acid, alkali, metals, heat
- Flavour compounds: terpenoids, flavonoids, Sulphur compounds and other volatile flavor compounds
- Enzymatic Browning and its prevention
- Physio – Chemical changes in Fruits and Vegetables- Ripening, Respiration and Textural changes

Sensory Evaluation:

Subjective evaluation techniques:

- Difference tests: paired comparison test, duo-trio test, triangle test
- Rating tests – Ranking, single sample, Two sample and
- Multiple sample difference Tests, Hedonic scaling, Numerical scoring, Composite scoring
- Sensitivity tests and Descriptive tests

Objective tests to assess sensory properties of foods:

- Measurement of colour, viscosity, consistency and texture

BOOK RECOMMENDED

- Food Science – Norman N Potter, Joseph H. Hotchkiss, 5th edition, CBS Publishers & Distributors, New Delhi.
- Food Facts and Principles – Shakuntala Manay, New Age International Publishers.
- Food Science – B Sri Lakshmi, New Age International Publishers.

SUGGESTED REFERENCES FOR ADDITIONAL READING

- Fruit and Vegetable Preservation – Principles & Practices – R P Srivastava, Sanjeev Kumar. 3rd edition, international Book Distributing Co., Lucknow.
- Food Science, Chemistry and Experimental Foods – Dr.M.Swaminathan, The Bangalore Printing & Publishing Co. Ltd., Mysore

FSNT5110
PRINCIPLES OF FOODS
PRACTICALS

Objectives:

- **To familiarize students with changes occurring in various food stuffs as a result of processing and cooking.**
1. Gelatinization and factors affecting gelatinization
 2. Estimation of alkaline phosphates in milk
 3. Egg– Preparation of stable emulsion- Mayonnaise
 4. Stages of Sugar cookery – Any two Preparations
 5. Test for checking Rancidity of oils
 6. Testing pectin strength in fruits and vegetable extracts.

Sensory Evaluation:

1. Threshold test for salt/ sugar
2. Triangle Test
3. Paired Comparison Test
4. Hedonic Rating Test

FSNT5111
NUTRITIONAL BIOCHEMISTRY – II
(4 credits Theory + 2 credits Practical = 6 credits)

Objectives:

- To enable students to understand the role of nutrients in the body.
- To know the classification, functions and metabolism of lipids, vitamins, and minerals.

Unit 1: LIPIDS AND THEIR METABOLISM

- Classification, sources and functions
- Digestion and absorption, Deposition and storage
- Role of essential fatty acids and Lipoproteins
- Role of Triglycerides and Cholesterol
- Oxidation of fatty acids
- Synthesis of fatty acids
- Biosynthesis of triglycerides and phosphatides
- Cholesterol metabolism
- Bile pigments, Ketosis
- Lipotropic factors, Fatty Liver

Unit 2: IMBALANCES OF LIPIDS AND FAT SOLUBLE VITAMINS

Imbalances of Lipids

- Obesity, Cachexia
- Inborn errors of Lipid Metabolism- Gaucher's disease, Niemann's picks disease, Tay-sach's, Fabry's disease
- Hyperlipoproteinemia
- Interrelationship between carbohydrate, fat and protein metabolism
- Metabolic Changes during starvation

Fat Soluble Vitamins

Physiological action, transport, utilization, storage, sources, functions and deficiency of:

- Vitamin A
- Vitamin D
- Vitamin E
- Vitamin K

Unit 3: WATER AND WATER SOLUBLE VITAMINS

Water

- Functions, Distribution, Requirements
- Disturbances in Fluid Balance- Dehydration and Oedema
- Role of solutes (Sodium and Potassium) in maintaining the volume of the fluid compartments

Water Soluble Vitamins

Physiological action, transport, utilization, storage, sources, functions and deficiency of:

- Thiamin
- Riboflavin
- Vitamin B12, Pantothenic acid
- Folic Acid

- Pyridoxine
- Niacin
- Ascorbic acid

Unit 4: MINERALS AND TRACE ELEMENTS

- Calcium – absorption, utilization, sources, functions and deficiency
- Phosphorous – absorption, utilization, sources, functions and deficiency
- Factors affecting calcium absorption
- Role of calcium in ossification and bone growth
- Inter-relationship between parathormone and vitamin D in the regulation of calcium and phosphorous metabolism
- Iron: Functions, sources, absorption, transport, utilization and storage of iron. Role of iron in prevention of anemia
- Iodine: Physiology and source of iodine, Role of iodine in human nutrition
- Physiology, sources, functions and deficiency of Fluorine and Zinc
- Physiology, sources, functions and deficiency of Copper, Manganese, Selenium and Chromium

BOOKS RECOMMENDED

- A Textbook of Biochemistry – A V S S Rama Rao, 9th edition, UBS Publisher's Distribution Pvt. Ltd.
- Nutritional Biochemistry – Tom Brody, 2nd edition, Academic Press
- Biochemistry – U Satyanarayana, U Chakrapani, Books & Allied (P) Ltd.
- Textbook of Biochemistry (for Medical Students) – DM Vasudevan and S SreeKumari, 4th edition, Jaypee Brothers Medical Publishers (P) Ltd., New Delhi.

SUGGESTED REFERENCES FOR ADDITIONAL READING

- Textbook of Medical Biochemistry – M N Chatterjee, RanaShinde, 7th edition, Jaypee Brothers.
- Textbook of Medical Biochemistry – S Ramakrishnan, K G Prasannan, R Rajan, 3rd edition, Orient Longman.
- Harper's Illustrated Biochemistry – Robert K Murray, Daryl K Granner, Peter A Mayes, Victor W Rodwell, 26th edition, McGraw Hills.
- Experimental Biochemistry – A Student Companion – B SashidharRao, Vijay Deshpande, I K International Pvt. Ltd.
- Clinical Biochemistry – Nagini.
- Principles of Biochemistry – Leihninger A L, CBS Publishers and Distributors.
- Nutritional Science – B. Sri Lakshmi, New Age International Publishers, 2nd edition.
- Text Book of Human Nutrition – Mahtab S Bamji, N PrahladRao, Vinodini Reddy, 2nd edition, Oxford & IBH Publishing Co. Pvt. Ltd

FSNT5112
NUTRITIONAL BIOCHEMISTRY – II
PRACTICALS

Objectives:

- **To familiarize students with changes occurring in various food stuffs as a result of processing and cooking.**
 - Preparation of the sample
 - Estimation of the following
1. Iron
 2. Calcium
 3. Phosphorus
 4. Sugar by DNase method
 5. Vitamin C
 6. Potassium
 7. Magnesium
 8. Chloride

FSNT5113
DIET THERAPY
(4 credits Theory + 2 credits Practical = 6 credits)

Objectives:

- To impart in depth knowledge regarding prevalence, etiology, diagnosis, diet and life style management in acute and chronic diseases.
- To gain knowledge to recommend and provide appropriate nutritional care for prevention or and treatment of various diseases.

Unit 1: DIET FOR HEPATIC DISORDERS

Liver:

- Structure and functions
- Etiology, symptoms, diagnosis/functional test and dietary management of:
- Jaundice – Types – hemolytic, obstructive and infective
- Viral Hepatitis – Types – A, B, C, D, E and G
- Fatty liver
- Cirrhosis
- Alcoholic liver disease
- Hepatic Coma
- Liver Transplant

Gall Bladder:

- Structure, functions and composition of bile
- Etiology, symptoms, diagnosis and dietary management of:
- Cholecystitis
- Cholelithiasis

Unit 2: DIET FOR RENAL DISORDERS

Kidney:

- Structure and functions
- Etiology, symptoms, diagnosis and dietary management of:
- Acute and Chronic Glomerulonephritis
- Nephrosis
- Acute Renal Failure
- Chronic Renal Failure
- Kidney Transplant
- Urinary calculi – Types – Calcium oxalate, uric acid and struvite
- Dialysis
- Hemodialysis - Advantages, disadvantages and Dietary management
- Peritoneal dialysis- Advantages, disadvantages and Dietary management

Unit 3: DIET FOR HORMONAL DISTURBANCES

Disease of Pancreas:

- Etiology, symptoms, diagnosis and dietary management: Acute Pancreatitis, Chronic Pancreatitis

Diabetes Mellitus:

- Types, metabolic changes
- Etiology, symptoms, diagnosis

- Complications
- Treatment – exercise, hypoglycemic drugs, insulin and diet
- Dietary Management – Role of fibre, glycemic index, food exchange list

Diseases of Adrenal Cortex:

- Dietary management in Addison's diseases
- Dietary management in Cushing's syndrome

Diseases of Thyroid Gland:

- Dietary management in Hypothyroidism
- Dietary management in Hyperthyroidism

Unit 4: DIET FOR DEGENERATIVE AND CHRONIC DISORDERS

Disorders of circulatory system

- Dietary management of Hypotension, Hypertension
- Dietary management of Cardio Vascular Diseases
- Ischemic Heart Disease- Arteriosclerosis, Atherosclerosis, Coronary Artery Disease,
- Myocardial Infarction, Angina, Heart Failure
- Non- Ischemic heart disease-Cardiac Myopathy, Congenital Heart Disease

Disorders of Musculo – Skeletal system:

- Rheumatoid Arthritis – Types, etiology, symptoms and dietary management
- Osteoarthritis – Types, etiology, symptoms and dietary management
- Gout – etiology, symptoms and dietary management.

Cancer:

- Types, mechanism
- Etiology, metabolic changes, treatment (drugs, chemotherapy and radio therapy)
- Nutritional management of cancer

AIDS:

- Causes, symptoms, metabolic changes, diagnosis
- Treatment and dietary management

BOOKS RECOMMENDED

- Clinical Dietetics and Nutrition – F P Anita and Philip Abraham.
- Food, Nutrition and Diet Therapy – Kathleen Mahan & Krause, Sylvia Escott Stump.
- Normal and Therapeutic Nutrition – Robinson & Lawler, 17th edition, Mac Millan Publishers.
- Clinical Nutrition – Ed Michael J Gibney, Marinos Elia, Olle Ljungqvist and Julie Dowsett.
- Basics of Clinical Nutrition, 2nd Edition, Joshi, Jaypee Publishers

SUGGESTED REFERENCES FOR ADDITIONAL READING

- Foods – Nutrition and Health – Dr. Vijaya Khader, Kalyani Publishers.
- Nutrition in Clinical Practice – David L. Katz, Lippincott, Williams & Wilkins.
- Text Book of Human Nutrition – Mahtab S Bamji, N Prahlad Rao, Vinodini Reddy, 2nd edition, Oxford & IBH Publishing Co. Pvt. Ltd.
- Nutrition in Health and Diseases – Anderson, 17th edition.
- Modern Nutrition in Health & Disease – Eds – Maurice E. Shils, James A. Olson, Moshe Shike, 8th edition, Vol I and II, Williams & Wilkins Publication.
- Biochemistry – U Satyanarayana, U Chakrapani, Books & Allied (P) Ltd.
- Principles and Applications in Health Promotion – Sinton & Crowley, 2nd edition.
- Perspectives in Nutrition – Wardlaw Kessel, McGraw Hills

FSNT5114
DIET THERAPY
PRACTICALS

Objectives

- **To familiarize the students with newer concepts in dietary management of various disorders and diseases.**

Planning and Preparation of Diets for:

1. Viral Hepatitis
2. Cirrhosis of Liver
3. Nephritis
4. Nephrosis
5. Renal Failure
6. Renal calculi
7. Cancer
8. Diabetes with Hypertension / Nephropathy / Atherosclerosis

FSNT5115
RESEARCH METHODOLOGY
(4 credits Theory + 2 credits Practical = 6 credits)

Objectives:

- **To enable the students to understand the importance of research design**
- **To impart in depth knowledge on collection, compilation and analysis of data.**

Unit 1: METHODS OF RESEARCH

- Definition of research, Characteristics of research, Criteria of good research
- Merits and demerits of scientific research
- Types of research - Historical research, Ex-post facto research, laboratory experiments, Field experiments, survey research, evaluative research Case study research, operational research, participatory research
- Research Strategies in the field of Food And Nutrition- Descriptive studies (Correlation, Case studies, Cross-sectional surveys)
- Analytical studies (Observational, Case-control, Cohort studies –Prospective and Retrospective)
- Experimental studies (Clinical /Intervention trials including Randomized controlled trials) Steps in conducting research
- Hypothesis: Definition, purpose, types
- Reporting: Methods of reporting, Technical reports
- Research Abstract: Definition, guidelines for writing abstract
- Thesis: Definition, parts, steps in writing thesis

Unit 2: SAMPLING DESIGN AND TYPES OF SAMPLING

- Sampling- Definition, Meaning, Aim, Characteristics of good sample
- Sampling- Basis, Advantages, Limitations and Benefits
- Survey- Meaning, Advantages, Disadvantages, Types and Quality
- Census and sample survey
- Steps in sampling design
- Types of sampling: Random Sampling - Simple random sampling, Stratified random sampling, Systematic sampling, Cluster sampling
- Non random sampling methods -Judgment sampling, Convenience sampling, Quota sampling, Volunteer sampling and Snowball sampling
- Sampling and Non sampling errors
- Sample size and its determination
- Sampling distribution and Importance

Unit 3: METHODS OF DATA COLLECTION AND COMPLICATION

- Types of Data- Primary Data and Secondary Data, Advantages and Disadvantages, Difference between Primary Data and Secondary Data
- Methods of collecting primary data: Questionnaire, Interview, Schedule, Observation, Inventories, Checklist
- Drafting of questionnaire, training of interviewers
- Ranking and Rating Scales
- Criteria for evaluation of instruments – reliability and validity
- Sources of secondary data, precautions in the use of secondary data

- Classification of data: types of classification- Geographical, Chronological, Qualitative and Quantitative
- Tabulation of data: parts of a table, general rules of tabulation, types of tables
- Diagrammatic representation of data
- Graphic representation of data

Unit 4: STATISTICAL METHODS

Statistical Methods:

- Measures of central tendency: mean, median and mode, their relative advantages and disadvantages
- Measures of dispersion: Mean deviation, standard deviation
- Coefficient of variation, percentile
- Types of correlation, coefficient of correlation and its interpretation
- Rank correlation
- Regression equations and predictions
- Analysis of variance
- Contingency tables, Chi-square test
- 't' test: student's 't' test, paired 't' test, unpaired 't' test
- 'F' test

BOOKS RECOMMENDED

- Statistical Methods – S P Gupta, Sultan Chand and Sons Publishers, New Delhi.
- Research Methodology – methods and techniques – C R Kothari, Wiley Eastern Limited, Madras.
- Research Methodology (Concepts, Methods, Techniques and SPSS)-Dr.Priri R. Majhi, Dr. Prafull K. Khatua, II Edition, Himalaya Publishing House, Pvt. Ltd. 2015.
- A Handbook of Methodology of Research – Dr. Rajammal P Devadas and Dr. K Kulandaveil, Sri Ramakrishna Mission, Coimbatore.
- Research Methods in Social Science – B H V Sharma, D Ravindra Prasad, P Satyanarayana, Sterling Publications.
- Biostatistics – SundaraRao., 7th edition, Jaypee Brothers medical Publishers
- Methods in Biostatistics- B.K. Mahajan, 2010
- Manual of Biostatistics- JP Baride, AP Kulkarni, RD Mazumdar, Jaypee Publishers
- Methodology of research in Social science – O.R. Krishnaswami and M. Ranganatham, 2nd revised edition, , Himalaya Publishing house ltd, 2015.

FSNT5116
RESEARCH METHODOLOGY
PRACTICALS

Objectives

- To familiarize the students with newer concepts in research.
 - Enable the students to analyze the data for the project work with the Statistical techniques
 - Application of statistical methods related to community nutrition and sensory evaluation techniques
1. Tabulation of Raw Data
 2. Diagrammatic and Graphical representation of Raw Data
 3. Calculation of mean and Standard Deviation
 4. Calculation of t- test and its interpretation
 5. Calculation of F- test and its interpretation
 6. Calculation of ANOVA and its interpretation
 7. Calculation of Chi square test and its interpretation
 8. Calculation of Coefficient of Correlation and its interpretation

FSNT6101
COMMUNITY NUTRITION

(4 credits Theory + 2 credits Practical = 6 credits)

Objectives:

- To understand the causes / determinants and consequences of nutritional problems in community.
- To familiarize students with various approaches to nutrition and health interventions, programmes and policies.

Unit 1: ASSESSMENT OF NUTRITIONAL STATUS

Anthropometry:

- Weight, height, mid arm circumference, head and chest circumference
- Skin fold thickness, BMI – uses and limitations
- Weight / Height, Weight / Age, Height / Age – ICMR, NCHS standards, Gomez and Waterloo's classification, WHO standards

Diet Surveys:

- Individual
- Institutional and National
- Uses and limitations of diet surveys
- Biochemical methods: uses and limitations
- Clinical assessment: uses and limitations
- Biomarkers – Definition, Classification – Genetic and biochemical
- Examples of biomarkers – RBC, folate, calcium, LDL receptors in CVD, vitamin A.

Unit 2: NUTRITION EDUCATION AND HEALTH ADMINISTRATION

- Importance of Nutrition and Health Education

Tools and techniques of health education

- Audio aids
- Visual aids
- Audiovisual aids, advantages and disadvantages
- Types of approaches: personal, group and mass, advantages and disadvantages

Health administration

- Central level
- State level
- Village level
- Primary Health Care

Unit 3: NUTRITION AND HEALTH INTERVENTIONS

- Magnitude of malnutrition in India
- Consequences of malnutrition in India

Nutritional problems in India:

- PEM, Anaemia
- Iodine Deficiency Disorder and Vitamin A Deficiency
- Dental caries, Fluorosis

Measures to combat malnutrition:

- ICDS, IDDCP
- Vitamin A Prophylaxis Programme
- Anemia Prophylaxis Programme

- Nutrition and Health Policies
- Role of National organizations in combating malnutrition: ICMR, ICAR, NIN.
- Role of International organizations in combating malnutrition: CARE, UNICEF, WHO, FAO, ICRISAT.

Unit 4: VITAL STATISTICS AND OCCUPATIONAL HAZARDS

Vital statistics:

- Mortality
- Morbidity

Occupational hazards:

- Physical and chemical
- Biological

Protection of health and nutritional status of workers:

- Women employees in industries and establishments
- Medical measures
- Infrastructure measures and legislation

Management during calamities and emergencies

- Nutritional relief and rehabilitation - assessment of food needs, food distribution strategy, Mass and supplementary feeding, Sanitation and hygiene, Evaluation of feeding programmes
- Public nutrition approach to tackle nutritional problems in emergencies

BOOKS RECOMMENDED

- Public Health Nutrition – Michale J. Gibney, Barrie M. Margetts, John M. Kearney and Lenore Arab (Eds.) – Nutrition Society Textbook Series, Blackwell Publishing.
- Nutritional Science – B. Sri Lakshmi, New Age International Publishers, 2nd edition.
- Text Book of Human Nutrition – Mahtab S Bamji, N Prahlad Rao, Vinodini Reddy, 2nd edition, Oxford & IBH Publishing Co. Pvt. Ltd.
- Social and Preventive Medicine – Part & Park.
- Goyet, Fish. V. Seaman, J and Geijer. U. (1978) The management of Nutrition Emergencies in Large Population, WHO, Geneva.
- The Management of Nutrition in Major emergencies, WHO in collaboration with UNHCR, International Federation of Red Cross and Red Crescent societies and WFP.
- Owen. A. Y. and Frankle, R. T. (1986) Nutrition in the Community. The Art of delivering Services, 2nd ed. Times Mirror/ Mosby.
- WFP/ UNHCR (1998) WFP/ UNHCR Guidelines for Selective Feeding Programmes in Emergency Situations. Rome and Geneva: WFP & UNHCR.
- Goyet, Fish. V. Seaman, J. and Geijer, U. (1978) The Management of Nutritional emergencies in Large Populations, World Health Organization, Geneva

FSNT6102
COMMUNITY NUTRITION
PRACTICALS

Objectives:

- To give an insight into the various low cost ingredients available in market and develop low cost nutritious recipes for vulnerable segments of the community
 - To develop teaching aids for Nutrition and Health Education
1. Development of low cost nutritious recipe
 - Standardization of Recipe
 - Calculation of cost and Nutritive Value
 2. Diet survey – Food frequency questionnaire and 24 hr dietary recall.
 - Data collection and compilation.
 3. Development of Teaching aids for Nutrition and Health Education :
 - Audio, Visual, or Audio Visual aids.
 4. Market survey on Labelling of Food Products

FSNT6103
FOOD MICROBIOLOGY
(4 credits Theory + 2 credits Practical = 6 credits)

Objectives:

- To familiarize students with the basics of Food Microbiology.
- To enable students to gain knowledge on preservation techniques and food contamination.

Unit 1: MICROBES AND GROWTH OF MICROBES

- Scope of microbiology
- Importance of microbiology in applied areas – medical, soil, milk, air, food,

Space and industry

Types of microorganisms and their general characteristics

- Fungi (molds and yeast)
- Bacteria
- Protozoa
- Viruses

Intrinsic factors affecting microbial growth:

- Nutrient content, pH,
- Redox potential, water activity

Extrinsic factors affecting microbial growth:

- Humidity, temperature
- Gaseous atmosphere

Unit 2: METHODS OF FOOD PRESERVATION

- Principles of food preservation

Methods of food preservation

- Pasteurization,
- Blanching,
- Canning,
- Slow and quick freezing,
- Freeze drying,
- Irradiation,
- Drying and Dehydration
- Use of preservatives: salt, sugar, vinegar
- Use of chemical preservatives

Unit 3: FOOD CONTAMINATION AND SPOILAGE

- Classification of foods by ease of spoilage
- Causes of spoilage in different types of foods
- Sources of contamination – water, air, soil, animals and humans
- Spoilage of cereals and cereal products – molding, ropiness
- Spoilage of milk and milk products – gas production, proteolysis, ropiness
- Spoilage of meat and meat products – aerobic and anerobic
- Spoilage of fish and other sea foods, poultry and eggs
- Spoilage of fresh fruits and vegetables
- Spoilage of canned products – spoilage by spore forming and non-spore forming bacteria
- Spoilage of sugar products

Unit 4: FERMENTED FOODS

- Definition of fermentation, history of fermented foods
- Benefits of fermentation

Types of fermentation

- Acid fermented foods, Yeast fermented foods
- Solid state fermentation
- Fermented dairy products – yoghurt, cheese fermented milks
- Vegetable fermentation – Sauerkraut, cucumber, olives, and pickles
- Fermented meals, Fermented beverages
- Vinegar
- Oriented Foods – soy sauce, tempeh, miso, natto
- Indigenous products – idli, dosa, dhokla

BOOKS RECOMMENDED:

- Food Hygiene and Sanitation – S Roday, Tata McGraw Hill Publishing Co. Ltd., 3rd reprint.
- Food Poisoning and Food Hygiene – Hobbs B C and R J Gillbert, 4th edition, English Language Book Society and Edward Arnold Publishers Ltd.
- Food Contamination and Safety – Vanisha Nambiar.

SUGGESTED REFERENCES FOR ADDITIONAL READING

- Food Science – B Sri Lakshmi, New Age International Publishers.
- Foods – Nutrition and Health – Dr. Vijaya Khader, Kalyani Publishers.
- Food Science – Norman H Potter, Joseph H. Hotchkiss, 5th edition, CBS Publishers & Distributors, New Delhi.
- Text Book of Human Nutrition – Mahtab S Bamji, N Prahlad Rao, Vinodini Reddy, 2nd edition, Oxford & IBH Publishing Co. Pvt Ltd.
- Food Science – Sumati R. Mudambi, Shalini M. Rao, M V Rajagopal, Revised 2nd edition, New Age International Ltd. Publishers.
- Catering Management – An Integrated Approach – Mohini Sethi, Surjeet Malhan, 2nd edition, New Age International Publishers.

FSNT6104
FOOD MICROBIOLOGY
PRACTICALS

Objective:

- To familiarize students with the sterilization techniques.
 - To develop skill in formulating and standardizing of new recipes
1. Sterilization techniques:
 - a. Dry Heat
 - b. Moist Heat
 2. Methods of media preparation and solution
 - a. Nutrient agar
 - b. Potato Dextrose Agar
 - c. Nutrient Broth
 - d. Preparation of staining solution
 3. Inoculation techniques
 4. Preparation of bacterial staining – simple, gram
 5. Motility of microorganisms by hanging drop technique
 6. Methylene Blue Reduction Test for viable bacterial count in milk.

FSNT6105
INSTITUTIONAL FOOD MANAGEMENT
(4 credits Theory + 2 credits Practical = 6 credits)

Objectives:

- To know the types and variety of foods available in the markets
- To learn to purchase, receive and store different foods.
- To understand the importance of hygiene, sanitation and safety in kitchens

Unit 1: MENU PLANNING AND FOOD SERVICE

- Factors affecting menu planning
- Types of menus, wording of menu and construction of menu card
- Delivery and Service of Foods:
 - Food service systems : Conventional
 - Commissary
 - ready prepared
 - assembly service
- Types of service : Self-service, tray service, waiter-waitress service, portable meals
- Types of food services: Campus food service, Food service in commercial restaurants, Hotel

Food service, Hospital food service, Industrial food service, School food service

- Clearing and winding up after service
- Customer relations

Unit 2: FOOD PURCHASING, SELECTION AND STORAGE

- Food Purchase: Food purchasing procedure
- Purchasing methods
- Selection of foods
- Important points to be observed for various food commodities
- Importance of sanitary procedures while preparing, cooking and holding of foods
- Food Storage: General Guidelines for Storage of food
 - Dry Storage
 - Refrigerated Storage
 - Freezer Storage
 - Importance of pest control

Unit 3: QUANTITY FOOD PRODUCTION

- Construction and selection of recipes for quantity cooking
- Standardization of recipes
- Storage and use of leftover foods
- Quality control of food production, hygiene and safety procedures for prevention of contamination of raw and cooked foods for different areas of food service for personnel working in food service
- Calculation of food costs, portion control, loss and profit made
- Kitchen Management : Cost control, optimal utilization of space, material, manpower

Unit 4: FINANCIAL MANAGEMENT

- Financial Management
- Component of cost, Behaviour of cost
- Concept of contribution and breakeven

Cost control:

- Importance of cost control, Factors affecting losses
- Methods of controlling food cost and labour cost
- Cost concept, Food cost control
- Book keeping
- Books of account

SUGGESTED REFERENCES FOR ADDITIONAL READING

- Sethi M and Mahan S (Revised 2nd edition, 2007)). Catering Management, An Integrated Approach. New Age International (P) Ltd
- Andrews S (2009) Food and beverage service : Training Manual 2nd edition. New Delhi Tata McGraw Hill.
- Bessie Brooks West and Levelle Wood MS (1988). Food Service in Institutions (6th ed.). John MacMillan Publishing Co., New York
- Harris N (1984) Meal management (6th ed.). New York : Mac Millan.
- Wailey BH (1986) Production management handbook. U.K. : Gower Publishing.
- Kotas R (1981). Accounting in hotel and catering industry. publisher- Thomson Learning; 4th Revised edition edition (Jun 1981)
- Fuller J and Thomas S (2006). Modern Restaurant Service, Amazon
- Kotler P and Keller K (2008). Marketing Management (13th ed.). Prentice Hall, USA.

FSNT6106
INSTITUTIONAL FOOD MANAGEMENT
PRACTICALS

Objective:

- Gain knowledge on quantity food production
1. Principles of Menu planning and planning of meals for
 - Banquet s- 7 course meal
 - Outdoor Catering events like Weddings, Birthday parties etc.
 2. Standardization of any 3 Recipes
 3. Determination of standard serving size.
 4. Calculation of Food cost.
 5. Calculate the Recipe conversion factor and Yield for the above standardized recipes. Calculation of nutritive value.
 6. Preparation of inventory list to check personal hygiene of food handlers
 7. Develop a HACCP Plan for an Indian Recipe. Identify Critical control points and corrective measures.
 8. Visit to a food service unit

FSNT6107
FOOD PRODUCT DEVELOPMENT & QUALITY EVALUATION
(4 credits Theory + 2 credits Practical = 6 credits)

OBJECTIVES:

- To make students understand how to innovate recipes and standardize.
- To make students understand how to increase stability of food, packaging methods.
- To make students learn about product commercialization

Unit 1: FOOD NEEDS & CONSUMER PREFERENCE

- Market survey and its importance in; designing a questionnaire to find consumer needs for a product or a concept. Developing a Product to Meet the Requirements. Product life cycle.
- Creating brand value for the Product. The SWOT analysis

Unit 2: DESIGNING NEW PRODUCTS

- New Food Product Development (NPD) process and activities, The Stage-Gate model 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; involvement of consumers, chefs and recipe experts;
- Selection of materials/ingredients for specific purposes; modifications for production on large scale, cost effectiveness and return on investment, nutritional needs or uniqueness; use of novel food ingredients and novel processing technologies.

Unit 3: STANDARDIZATION & LARGE SCALE PRODUCTION

- Process design, equipment needed; establishing process parameters for optimum quality; Sensory Evaluation; Lab requirements; different techniques and tests; statistical analysis; application in product development and comparison of market samples; stages of the integration of market and sensory analysis.

Unit 4: QUALITY, SAFETY & 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 5: PRODUCT COMMERCIALIZATION, LAUNCH, EVALUATION & CASE STUDIES

- Outcomes and activities in product commercialization, Pre-launch trial, Steps in product launch, Evaluation of the Launch, product performance testing
- Developing test market strategies
- Case Studies of some successes and failures
- Food choice models and new product trends.

REFERENCES

- Jacqueline H. Beckley, M. Michele Foley Elizabeth J. Topp & J. C. Huang Witoon Prinyawiwatkul (2007). Accelerating New Food Product Design and Development. Blackwell Publishing Company. IFT Press. USA
- Howard R. Moskowitz, I. Sam Saguy & Tim Straus (2009). An Integrated Approach to New Food Product Development. Taylor and Francis Group, LLC.USA
- Mary Earle and Richard Earle (2008). Case studies in food product development Wood head Publishing Limited and CRC Press LLC.USA
- Creating New Foods. The Product Developer's Guide: Marie D. Earle and Richard L. Earle (2001). Chadwick House Group Ltd. New Zealand.
- David H. Lyon, Mariko A. Francombe, Terry A. Hasdell and Ken Lawson (1992). Guidelines for sensory analysis in food product development and quality control. Chapman & Hall, 2-6 Boundary Row, London.

FSNT6108
FOOD PRODUCT DEVELOPMENT & QUALITY EVALUATION
PRACTICALS

- Survey on types of convenience foods / consumer behaviour / analysis of food labelling
- Group projects to Develop Food Products at Laboratory scale
- Project Identification: Products/Processes
- Review, Project Feasibility, Design and Product Specification
- Project Planning: Identifying Objectives, Identifying Tools/Methods, - Permutation and Combination
- Response Surface Methodology, Use of Information/ Communication Technology Project Execution: Product Trials and Standardization
- Evaluation of product- Analysis of Physical and Chemical Properties
- Sensory Evaluation Project Presentation: Documentation and Report

FSNT6109
ADVANCED NUTRITION
(4 credits Theory)

Objectives:

- To familiarize students with the recent advances in nutrition.
- To impart knowledge on bioavailability of nutrients.

Unit 1: CURRENT TRENDS IN NUTRITION

- Designer foods
- Genetically modified foods
- Novel proteins – leaf protein, single cell protein
- Fortification
- Irradiation of foods
- Application of irradiated foods in armed forces
- Role of leptin and ghrelin in food intake
- Space foods
- Organic foods
- Extruded Foods- Advantages and Disadvantages

Unit 2: BIOAVAILABILITY OF NUTRIENTS

- Animal and human metabolic studies-use in assessment of nutrient bioavailability
- Ethics in conducting human and animal metabolic studies
- Methods of evaluating protein quality – need, Amino acid score
- NPU, BV, Digestibility coefficient
- Methods of determining bioavailability of vitamins and minerals
- Radio-isotopes
- Balance studies
- Growth and specific tissue response
- Repletion-depletion techniques
- Plasma appearance
- Microbial assays
- Invitro studies
- Factors affecting bioavailability of calcium
- Factors affecting bioavailability of iron

Unit 3: NUTRITION ASSOCIATED WITH IMMUNITY AND GENE EXPRESSION

- Active immunity – Humoral, cellular and combination of both
- Passive immunity – Normal human Ig, Specific human Ig, animal antitoxins or antisera
- Immunoglobulins – IgG, IgM, IgA, IgD, IgE
- Role of nutrients on immune function
- Malnutrition and immune function
- Fundamentals of gene structure

Principles of gene expressions

- Transcription mechanism and regulation
- Translation mechanism and regulation
- Effects of nutrients on gene expression

- Thrifty genotype – phenotype hypothesis

Unit 4: PACKAGING AND LABELING OF FOODS

- Food packaging: Importance, Definition, Principles of packaging

Types of packaging material:

- Metal, glass, Paper, plastic,
- edible packaging material, miscellaneous packaging materials

Packages with special features:

- Boil-in-bag package, plastic-shrink package,
- Cryovac film, microwave oven packaging, high barrier plastic bottles
- Aseptic packaging in composite cartons, military food packaging,
- ovenable paper, boards, distribution packaging
- Packaging laws-SWMA
- Nutrition labelling- Principles and Codex guidelines
- Labelling Provisions in existing Food Laws- FSSAI

BOOKS RECOMMENDED

- Nutrition and Metabolism – Michael J. Gibney, Marinos Elia, Olle Ljungqvist,
- Julie Dowsett (Eds.) – Nutrition Society Textbook series, Blackwell Publishers.
- Nutrition Science – B Sri Lakshmi, New Age International Publishers.
- Normal and Therapeutic Nutrition – Robinson & Lawler, 17th edition, Mac Millan Publishers.
- Text Book of Human Nutrition – Mahtab S Bamji, N Prahlad Rao, Vinodini
- Reddy, 2nd edition, Oxford & IBH Publishing Co. Pvt. Ltd.

BOOKS SUGGESTED FOR ADDITIONAL READING

- Social and Preventive Medicine – Park & Park.
- Modern Nutrition in Health & Disease – Eds – Maurice E. Shils, James A.
- Olson, Moshe Shike, 8th edition, Vol I and II, Williams & Wilkins Publication.
- Human Nutrition – Geissler & Powers, 11th edition, Elsevier Publications

FSNT6110
FOOD PROCESSING & PRESERVATIVE TECHNOLOGY
(4 credits Theory)

Objectives:

- To understand food storage, preservation, processing and packaging by various methods.

Unit 1:

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

Unit 2:

- 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 3:

- 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 4:

- 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 5:

- 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.

FSNT6111
DISSERTATION

Dissertation will start in semester 3 and will continue in semester 4. It will be evaluated at the end of 4th semester for 800 marks as follows

Continuous evaluation (IA)	= 200 marks
Experimental work and Dissertation	= 200 marks
Presentation and viva-voce	= 400 marks
Total marks	= 800 marks