

**M.Sc. Home Science (Food and Nutrition)**  
(As per NEP 2020 guidelines)  
Session 2022-23

**I Semester**

Paper No.	Subject	Course Type	Credits	Credits =Theory + Practical
I	Women Right	Theory/Major	4	16 (Theory)
II	Nutritional Biochemistry-I	Theory/Major	4	
III	Maternal and Child Nutrition	Theory/Major	4	
IV	Applied Nutrition- Health and Fitness	Theory/Major	4	
V	Nutritional Biochemistry-I	Practical/Major	4	4(Practical)
VI	Other faculty*	Minor	4	4
VII	Educational Tour(One Week)	(S/US)	4	4
	Total		28	28

**II Semester**

Paper No.	Subject	Course Type	Credits	Credits =Theory + Practical
I	Research Methodology & Statistics	Theory/Major	4	16 (Theory)
II	Nutritional Biochemistry-II	Theory/Major	4	
III	Advanced Food Science	Theory/Major	4	
IV	Public Health Nutrition	Theory/Major	4	
V	Advanced Food Science	Practical/Major	4	4(Practical)
VII	Industrial Training(15 Days)	Project(S/US)	4	4
	Total			
Grand Total:28+24=52				

### III Semester

Paper No.	Subject	Course Type	Credits	Credits =Theory + Practical
I	Techniques & Instrumentation in Nutrition Research-Biochemistry –III	Theory/Major	4	16 (Theory)
II	Institutional Food Management	Theory/Major	4	
III	Advanced Nutrition	Theory/Major	4	
IV	Food Microbiology and Food Safety	Theory/Major	4	
V	Institutional Food Management	Practical/Major	4	4(Practical)
VII	Survey	(S/US)	4	4
	Total		24	24

### IV Semester

Paper No.	Subject	Course Type	Credits	Credits =Theory + Practical
I	Advanced Physiology	Theory/Major	4	16 (Theory)
II	Clinical Nutrition with Compulsory Internship	Theory/Major	4	
III	Food Processing and Preservation	Theory/Major	4	
IV	Naturopathy: Holistic Approach Nutrition	Theory/Major	4	
V	Food Preservation techniques	Practical/Major	4	4(Practical)
VII	Research Project	(S/US)	4	4
	Total		24	24
Grand Total:24+24=48				

S/US = (Satisfactory/Unsatisfactory)

**M.Sc. Home Science**  
**(FOOD & NUTRITION)**  
**(As per NEP-2020 guidelines)**  
**Session- (2022-2023)**

## **M.SC HOME SCIENCE (FOOD AND NUTRITION)**

### **PROGRAMME OUTCOMES (PO)**

The Expected Programme Outcomes on completion of M.SC HOME SCIENCE (FOOD AND NUTRITION

PO1: Provide quality education to make the students technically competent to face the challenges in the field of Food Science, Nutrition and Dietetics.

PO2: Impart knowledge and skills necessary to work in research laboratories, food industries, health sector and at the community level.

PO3: Synergize a new generation with professional competence to face the challenges of the food processing sector.

PO4: Provide advanced knowledge and skills in highly job oriented courses in the areas of Food Processing, Quality Control, Food Safety, and Nutritional Sciences.

PO5: Conduct needs based multidisciplinary research for improving the livelihood of the community and the nation.

PO6: Identify food based strategies for alleviating nutritional problems to achieve nutrition and health security.

PO7: Develop entrepreneurial skills by providing skill development programmes in commercial Food processing

### **PROGRAMME SPECIFIC OUTCOMES**

PSO1: Understand the nature and basic concepts in the field of Food Science and Nutrition.

PSO2: Understand the applications of research for improving the livelihood of the community

PSO3: Analyze the relationship between diet and health and impart knowledge to alleviate nutritional problems and to achieve health security.

**SEMESTER-I**  
**Course Type: Theory Major**  
**Paper – I Women Right**

**Objective:**

- Identifying the status of women in India and legal safeguards for women.
- Critical appraisal of gender issues

**Credits: 4**

S. No.	CONTENTS	PERIODS
UNIT- I	• Women's perspective and its constituent elements in present socio-economic and cultural context	3
	• Women's movement in pre-independent and post independent periods and present trends	3
	• Milestones and obstacles in women's movement in India	
	• Status of women in India, women and human rights	2
UNIT- II	Definition and Evolution of rights:	3
	• Human Rights	3
	• Women Rights	
	• Classification and characteristics:	2
	• Social / Civil	2
• Political	4	
• Economic and Cultural rights		
UNIT-III	Forms of violation of women's rights-	
	• Violation against women in home, workplaces and society, Sexual harassment, rape,	4
	• Health and Nutrition based deprivations	3
	• Crime against women, Political discrimination	3
UNIT- IV	• Gender disparity (infanticide, foeticide, girl child)	3
	• Feminism, its basic types and their relevance to Indian context.	4
	• Facts and myths of feminism.	2
	• Importance of women's participation in economics, educational, social and political development	3

**REFERENCES**

1. Desai N & Krishna M. 1988. Women and Society in India. Ajanta Publ.
2. Krishnaraj M. (Ed.). 1986. Women Studies in India. Popular Prakshan.
3. Patil AK. 1995. Women and Development. Ashish Publ.
4. Poonacha V. 1999. Understanding Women Studies. SNDT Women's University. Mumbai

**SEMESTER-I**  
**Course Type: Theory Major**  
**Paper: II Nutritional Biochemistry I**

Credits: 4

**Objectives:**

- Augment the biochemistry knowledge acquired and understand the significance of Biochemistry in Home Science research.
- Understand the mechanisms adopted by the human body for regulation of metabolic Pathways
- Become proficient for specialization in nutrition. Understand integration of cellular level metabolic events to nutritional disorders and imbalances.

S.No.	CONTENTS	PERIODS
UNIT-I	Definition, objectives, scope and importance of biochemistry and its relation to nutrition	<b>1</b>
	<b>Carbohydrates-</b> <ul style="list-style-type: none"> <li>• definition, classification, and properties of Glycoproteins, Proteoglycans</li> <li>• glycolysis, kreb's cycle, and its significance as amphibolic pathway,</li> <li>• glycogenesis, glycogenolysis, cori cycle and blood sugar regulation.</li> </ul>	<b>10</b>
UNIT-II	Definition, classification of lipids	<b>2</b>
	<b>Metabolism of Lipids-</b> <ul style="list-style-type: none"> <li>• Biosynthesis of fatty acids</li> <li>• Beta oxidation theory with energetic</li> <li>• Ketosis, formation and utilization of ketone bodies.</li> </ul>	<b>6</b>
	<b>Proteins</b> <ul style="list-style-type: none"> <li>• Definition, classification.</li> <li>• Structure and properties of proteins.</li> <li>• Essential and non essential amino acids.</li> </ul>	<b>5</b>
	<b>Metabolism of Proteins –</b> <ul style="list-style-type: none"> <li>• Urea cycle and its regulation.</li> <li>• Lipoproteins- types, composition, role and significance in and its relationship with lipid transport.</li> </ul>	<b>4</b>
Unit-III	<b>Enzymes-</b> <ul style="list-style-type: none"> <li>• Definition, types and classification of enzymes</li> <li>• Coenzymes, specificity of enzymes, isozymes, enzyme kinetics including factors affecting velocity of enzymes catalysed reaction.</li> <li>• Enzyme Inhibition Enzymes in differential diagnosis of diseases and their clinical significance</li> <li>• Allosteric Enzymes</li> </ul>	<b>3</b>
		<b>4</b>
		<b>2</b>
		<b>1</b>
Unit-IV-	<b>Nucleic Acids -</b> <ul style="list-style-type: none"> <li>• Classification, composition, and function of nucleic acids</li> <li>• Structure and properties of nucleosides, nucleotides</li> <li>• DNA, RNA (mRNA, tRNA, rRNA )</li> <li>• Replication, Transcription, Protein biosynthesis</li> <li>• Genetic code.</li> </ul>	<b>2</b>
		<b>2</b>
		<b>3</b>
		<b>6</b>
		<b>1</b>

#### **Reference books-**

1. General biochemistry by Frutton and Simmond.
2. Text book of Biochemistry by West and Todd.
3. Introduction to Modern Biochemistry by Karlson.
4. Principles of Biochemistry by White Handler and Smith.
5. Biochemistry by Kleiner and Orten.
6. Hawk's Physiological Chemistry by Oser.
7. Review of Physiological Chemistry by H.A. Harper.
8. Essentials of food and Nutrition Vol.-I and II by M. Swaminathan.
9. Biochemistry by S.K. Dasgupta. Vol. I, II, III.
10. Essentials of Biochemistry by Dr. M.C. Pant.
11. Biochemistry by Virendra Kumar Shukla.
12. A Text Book of Biochemistry by S.P. Singh.
13. Chemical Analysis- An Instrumental Approach by A.K. Srivastava, P.C. Jain. S. Chand & Company Ltd.
14. Principles of Biochemistry by Leneinger, D.L. Nelson, M.M. Cox.
15. Instrumental methods of chemical analysis by B.K. Sharma.

#### **Sessional Work**

1. Seminar presentation on any topic from syllabus.
2. Academic assessment through short and long questions.
3. Discussions on role of nutrients in biochemistry.

## SEMESTER-I

Course Type: Theory Major

### Paper- III Maternal and Child Nutrition

Credits: 4

#### Objectives:

- To understand nutritional demands during pregnancy and lactation.
- To acquaint the students with different programs running for controlling under nutrition in infants and mothers.
- To understand nutritional needs during infancy, childhood and adolescence.
- To impart efficient methods of teaching nutrition to children and mothers.

S.No.	CONTENTS	PERIODS
UNIT-I	<b>PREGNANCY</b>	
	• Pregnancy: The period of physiological stress	2
	• Physiological changes during pregnancy	1
	• Nutrition during pregnancy – Nutrient, requirement, diet & dietary pattern	4
	• Maternal Nutrition & foetal outcome- pre pregnancy weight and foetal outcome, BMI , Weight gain during pregnancy	4
	• Risk factors during pregnancy	1
UNIT- II	<b>LACTATION</b>	
	• Breast Feeding- Colostrum, composition and importance, initiation of breast feeding and duration, advantages of breastfeeding	3
	• Nutrition needs of lactation	1
	• Diet and Dietary pattern for lactating woman	2
	• Effect of maternal malnutrition on milk output and quality of milk	1
	• Introduction of complementary foods- initiation and management	2
	• Infant milk substitute act, BPNI (Breast feeding promotion Network in India )	1
• Management of pre-term, low birth weight babies and IUGR	1	
UNIT-III	<b>INFANCY, CHILDHOOD AND ADOLESCENCE</b>	2
	• Importance of focussing health & nutrition interventions in first 1000 days of life & improving delivery of key nutrition interventions, its evidence, impact, significance for controlling under nutrition & new government initiatives (IYCF- Infant and young Child feeding practices, IGMSY- Indira Gandhi Matratv Suraksha Yojana, Janani Suraksha Yojana )	
	• Nutritional requirements during infancy, early childhood, childhood and adolescence with special reference to girl child	6
	• Diet for preschool child, nutritional deficiency diseases and corrective measures	4
	• Dietary management of common childhood diseases	2



<b>UNIT-IV</b>	<b>GOVERNMENT PROGRAMMES AND NUTRITION COMMUNICATION</b>	
	• Problems in improving micronutrient deficiencies in children, Pregnant / Lactating women and adolescent girls: issues, weaknesses and newer initiatives of government (Kishorishakti, SABLA), way forward	4
	• School health programs in India: Current status, bottlenecks	2
	• School lunch programmes	2
	• Efficient methods of teaching principles of nutrition to children & mothers	2

**References:**

1. UNICEF Publications (State of World's Children, tracking maternal & child health, countdown 2015 etc.)
2. Global Strategy for Infant & Young child feeding by WHO & UNICEF, 2003.
3. National IYCF Recommendations, 2006, Ministry of Women & Child Development, GOI, New Delhi.
4. Mapping India's Children (2004), UNICEF in Action.
5. Nita Dalmiya, Ian Darnton Hill, Werner Schultsuld (2009); Multiple micronutrient supplementation during pregnancy in developing country settings. Food & Nutrition Bulletin supplement 30(4).2009
6. Wallace, H.M., Giri, K. (1990). Healthcare of women and children in developing countries, 3<sup>rd</sup> party publishing co. Oakland.
7. Michel Dibble and Vpulsenaratu (2010). Special section on IYCF practices in 4 countries in South Asia: S.Asia infant feeding network FN Bulletin 31(2) 291-375, June 2010.
8. Indian council of Medical Research. Nutrient requirements & recommended dietary allowances for Indians (2009).
9. Indira Gandhi National Open University. School of Continuing Education (2012). Childhood Nutrition: Basic Concepts and Physiological requirements- Course 1.

<b>SESSIONAL WORK</b>	
1.	Plan diet for pregnant and lactating women
2.	Plan and prepare nutrient dense, complementary foods for 6-12 month old infants
3.	Plan and prepare diet for an infant
4	Plan low cost recipe for Balwadi and Aanganwadi and school lunch programmes
5	Plan diet for deficiency diseases and common childhood illnesses
6	Plan diet for different age groups of children & adolescents

**SEMESTER-I**  
**Course Type: Theory Major**  
**Paper- IV Applied Nutrition - Health and Fitness**

Credits: 4

**Objectives:**

- To promote the students understanding about the functional benefits of foods for health and fitness.
- To enable the students to understand the role of nutrition in the dietary management of geriatrics
- To enable the students to understand the physiological demands during different sports activities.

S.No.	CONTENTS	PERIODS
<b>UNIT –I</b>	<b>ANTIOXIDANTS IN HEALTH &amp; DISEASE</b> <ul style="list-style-type: none"> <li>• Effect of oxidants on Macromolecules- Carbohydrates, proteins, lipids , nucleic acids.</li> <li>• .Nutrient antioxidants with potent health effects</li> <li>• Non- Nutritive food components with potential effects (Flavonoids- polyphenols and tannins, phytoestrogens, cyanogenic compounds)</li> <li>• Pre and Probiotics</li> <li>• Foetal origin of Non-communicable disease</li> <li>• Nutrigenomics- the future of Nutrition care for health management, treatment and prevention of diseases.</li> </ul>	 3 2 2  2 1 2
<b>UNIT-II</b>	<b>GERIATRIC NUTRITION- MULTIFACETED ASPECT OF AGEING</b> <ul style="list-style-type: none"> <li>• Ageing process- changing demographic trends, theories of ageing</li> <li>• The ageing process- physiological, biochemical and body composition changes</li> <li>• Health and Nutritional problems of the elderly</li> <li>• Nutritional requirements and dietary guidelines</li> <li>• Community geriatrics- Dimensions, issues and solutions.</li> </ul>	 3 3 2 2 2
<b>UNIT-III</b>	<b>NUTRITIONAL MANAGEMENT- HEALTH &amp; FITNESS</b> <ul style="list-style-type: none"> <li>• .Definitions, components and assessment criteria of- <ul style="list-style-type: none"> <li>- Specific fitness</li> <li>- Health status</li> </ul> </li> <li>• Holistic approach to management of fitness and health <ul style="list-style-type: none"> <li>- energy input and output</li> <li>- diet and exercise</li> <li>- effect of specific nutrients on work performance and physical fitness</li> <li>- nutrition, exercise, physical fitness and health inter-relationships</li> </ul> </li> </ul>	 2  2 2 3 3
<b>UNIT- IV</b>	<b>NUTRITION IN SPORTS</b> <ul style="list-style-type: none"> <li>• Physiological aspects- Metabolic changes during sports activity</li> <li>• Energy systems for endurance and power activity</li> <li>• Fuels for muscle contraction, Nutritional requirements for sports: Pre game, during and post game meal ( Short-duration, endurance)</li> <li>• Water &amp; Electrolyte balance and replenishments</li> <li>• Erogogenic aids, sports drink, uses and abuse of dietary supplements</li> </ul>	 2 2 4 2 2

**References:**

1. Shils ME, Olson JA and Shike N (1994). Modern Nutrition in Health & Disease. 8<sup>th</sup> Edition, Vol I and II, Philadelphia Lea and Febiger.
2. Bagchi K and Puri S (1999). Diet and Ageing: Exploring some facts. Society of Gerontological research and HelpageIndia, New Delhi.
3. Parizkova J (1997). Nutrition, physical activity and health in early life. Ed. Wolinsky, I, CRC press.
4. McArdle W, Katch F, Katch V (1996). Exercise physiology, exercise energy, nutrition and human performance. 4<sup>th</sup> Edition. Williams and Wilkins, Philadelphia.
5. Indian Council of Medical Research (2000). Nutrient Requirements and Recommended Dietary Allowances for Indians: A report of the expert group of the ICMR, New Delhi.
6. Hickson JH (2000). Nutrition for exercise & sport. CRC Press. 2<sup>nd</sup> Edition.
7. Mahan, L.K and Escott Stump .S. (2008). Krause's Food & Nutrition Therapy. 12<sup>th</sup> Ed. Saunders-Elsevier.
8. Ira Wolinsky (Ed.). Nutrition in Exercise & Sports. 3<sup>rd</sup> Edition.

SESSIONAL WORK	
1.	Market Survey for commercial nutritional products for physical fitness & sports performance available in India
2.	Yoga and Pranayam
3.	Vegetarian , Vegan and traditional Diets
4.	Diet for different sports activities- Endurance & power

**SEMESTER-I**  
**Course Type: Practical Major**  
**Paper-V Nutritional Biochemistry I**

Credits: 4

**Objectives:**

- Augment the biochemistry knowledge acquired and understand the significance of Biochemistry in Home Science research.
- Understand the mechanisms adopted by the human body for regulation of metabolic Pathways
- Become proficient for specialization in nutrition. Understand integration of cellular level metabolic events to nutritional disorders and imbalances.

**Practical: - Interactive periods /week.**

1. Qualitative test for reducing and non-reducing sugars, fat and proteins
2. Separation of water and non-water soluble protein from soybean and Bengal gram flour.
3. Estimation of cholesterol.
4. Determination of acid value of an oil/ fat.
5. Quantitative estimation of sugars.
6. Estimation of soluble protein by Biuret method.
7. Simple test of sterol.

**Course Type: Minor**  
**Paper VI (From Other Faculty)**

Credits: 4

\*Faculty of Linguistic, Faculty of computer, Faculty of Management, Faculty of Basic Science

**SEMESTER-I**  
**Course Type: Major**

**Paper- VII Educational Tour (One Week)**

Credits: 4

**Semester-II**  
**Course Type: Theory Major**  
**Paper –I Research Methodology & Statistics**

Credits: 4

**Objectives:**

- To understand the role of Statistics in Research.
- To apply Statistical Techniques to Research Data for analyzing and interpreting data meaningfully.
- To understand the use of Statistical Software in the analysis of data.

S.No.	CONTENTS	PERIODS
UNIT- I	<b>Introduction to Statistics</b> <ul style="list-style-type: none"> <li>• Meaning of Statistics and its scope in Home Science and other field of inquiry</li> <li>• Processing of Data: Editing, Classification and Coding of Data</li> <li>• Tabulation of Data</li> <li>• Diagrammatical and Graphical representation of data: Significance of difference between Diagram and Graph, Types of Diagram and Graph (Bar Diagrams, Histogram, Polygon, Ogives)</li> </ul>	2
		3
		2
		5
UNIT- II	<b>Statistical Measures</b> <ul style="list-style-type: none"> <li>• Measures of Central Tendency (Mean, Median, Mode, Quartiles, Deciles, Percentiles)</li> <li>• Measures of Dispersion/Variation (Range, Mean and Quartile Deviation, Standard Deviation, Coefficient of Variation)</li> </ul>	6
		6
UNIT- III	<b>Correlation, Regression and Association of Data</b> <ul style="list-style-type: none"> <li>• Simple Correlation for Grouped and Ungrouped Data (Karl Pearson's , Spearman Rank Correlation), Basic concepts of Partial and Multiple Correlation</li> <li>• Simple Linear Regression for Grouped and Ungrouped Data</li> <li>• Measures of Association</li> </ul>	5
		5
		2
UNIT- IV	<b>Test of Significance</b> <ul style="list-style-type: none"> <li>• Hypothesis, its type and error, Level of Significance, Critical Region, One Tailed and Two Tailed Test</li> <li>• Large Sample Test: One sample and two sample test or population Mean and Proportion</li> <li>• Small Sample Test: Applications of t- test (for one sample and two problems)</li> <li>• Chi Square Test and its applications</li> <li>• F- Test and its applications</li> </ul>	2
		2
		3
		2
		3
		3
	<b>Computer Applications in data Analysis</b> <ul style="list-style-type: none"> <li>• Use of Statistical Software in data analysis</li> </ul>	3

UNIT V	Parts of dissertation/research report/ article : Introduction <ul style="list-style-type: none"> <li>• Review of literature</li> <li>• methods</li> <li>• Results and discussion</li> <li>• Summary</li> <li>• abstract, Bibliographies and References</li> </ul>	<b>5</b>
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**References:**

1. Hellan M. Walker.: Elementary Statistical Methods
2. Sharma. Choudhary & Gupta.: Descriptive Statistics
3. Elhance. D.N.: Elementary Statistics
4. S. P. Gupta : Statistical Methods
5. Shukla and Sahai: Principles of Statistics

**Sessional Work**

- Summarization and Presentation of data using tables and graphs.
- Applications of Statistical Techniques to data analysis and interpretation of data.
- Applications of z, t F and Chi-Square test in hypothesis testing.
- All the above will be done using Statistical Softwares



**SEMESTER-II**  
**Course Type: Theory Major**  
**Paper-II: Nutritional Biochemistry II**

Credits: 4

**Objectives**

- Understand integration of cellular level metabolic events to nutritional disorders
- To familiarize with the applications of the analytical techniques.
- Comprehend better the principles involved in different methods of investigation.
- Become proficient for specialization in nutrition.

S.No.	CONTENT	PERIODS
UNIT-I	• <b>Water</b> , electrolyte and acid –base balance	3
	• <b>Vitamins</b> : Structure and biochemical properties of water soluble and fat soluble vitamins and their coenzyme activity	4
	• <b>Minerals</b> – Biochemical role of inorganic elements –calcium,phosphorous,iron	3
	• <b>Hormones</b> - Modes of Hormones action and biological role of hormones of pituitary, adrenal cortex and medulla, thyroid, parathyroid, pancreas.	6
UNIT-II	<b>Concepts of energy expenditure and their application-</b>	
	• Units of energy measurement of energy expenditure by direct and indirect calorimetry	2
	• Calculation of non protein respiratory quotient and its conversion to quantity of carbohydrate and fat (in grams) metabolised.	2
	• Determination of amount of protein metabolised and calculation of total heat production of the diet, basal metabolism, BMR and its measurement	2
	• Determination of amount of protein metabolised and calculation of total heat production of the diet, basal metabolism, BMR and its measurement	2
• SDA of food and its interpretation, calculation of energy expenditure of an average reference man and woman, regulation of energy balance	2	
UNIT-III	<b>Inborn errors of metabolism-</b>	
	• Disorders of amino acid metabolism- Albinism, Alkaptonuria, Maple syrup urine diseases, Tyrosinemia, Phenylketonuria.	4
	• Disorders of carbohydrate metabolism- Pentosuria, Fructosuria, Hyperglycinemia, Galactosaemia, hereditary disaccharide (sucrose and maltose) tolerance	4
	• Disorders of lipid metabolism –Gaucher’s disease, Niemann pick disease, Fabry’s disease.	3
	<b>Bioenergetics:</b> Electron Transport Chain, oxidative Phosphorylation and synthesis of ATP	3
UNIT-IV	• <b>Applied instrumentation in biochemistry</b> -physiochemical principles and methodology- colorimetry, photometry, flourimetry, flame photometry and atomic absorption meter	6
	• <b>Introduction to functional biochemistry of liver</b> - A brief description of liver function tests	3
	• <b>Introduction to functional biochemistry of Kidney</b> - A brief description of Kidney function tests	3

**Sessional work:**

1. Estimation of Ascorbic Acid.
2. Estimation of moisture, fat, ash calcium, phosphorous and iron.
3. Buffers- preparation of buffers. Determination of pH of unknown solution.
4. Estimation of protein by Lowry's method.
5. Estimation of protein by Microkjeldahl method.
6. Estimation of blood sugar.
7. Estimation of lipid profile (total cholesterol, triglyceride, HDL, LDL, VLDL Cholesterol).

**Reference books-**

1. General biochemistry by Frutton and Simmond.
2. Text book of Biochemistry by West and Todd.
3. Introduction to Modern Biochemistry by Karlson.
4. Principles of Biochemistry by White Handler and Smith.
5. Biochemistry by Kleiner and Orten.
6. Hawk's Physiological Chemistry by Oser.
7. Review of Physiological Chemistry by H.A. Harper.
8. Essentials of Food and Nutrition Vol. I and II by M. Swaminathan.
9. Biochemistry by S.K. Dasgupta. Vol. I, II, III.
10. Essentials of Biochemistry by Dr. M.C. Pant.
11. Biochemistry by Virendra Kumar Shukla.
12. A Text Book of Biochemistry by S.P. Singh.
13. Chemical Analysis- An Instrumental Approach by A.K. Srivastava, P.C. Jain. S. Chand & Company Ltd.
14. Principles of Biochemistry by Leneinger, D.L. Nelson, M.M. Cox.
15. Instrumental Methods of Chemical Analysis by B.K. Sharma.
16. Nutrition and diet therapy- Sheel Sharma, Pee,pee, publishers, New Delhi-2013
17. Experimental and techniques in Biochemistry 2007, galgotia Publishers, New Delhi.

**SEMESTER-II**

**Course Type: Theory Major**

**Paper-III Advanced Food Science**

Credits: 4

**Objectives :**

- Enabling students to comprehend the changes that occur in the physiochemical properties of food stuffs during food preparation.
- Enabling the students to understand and apply the various techniques in the quality evaluation of foods.
- Imparting awareness on the concept of 'food product development'

S.No.	CONTENTES	PERIODS
UNIT-I	<b>Colloids and Carbohydrates in Food</b> <ul style="list-style-type: none"> <li>• Introduction to food science.</li> <li>• Physical &amp; Chemical properties of foods-Changes occurring on cooking and storages.</li> <li>• Colloids – Properties denaturation of proteins, gelatinisation, gel formation, emulsions, foams, browning reactions enzymatic and non-enzymatic.</li> <li>• Sugar Cookery:                             <ul style="list-style-type: none"> <li>○ Stages of cookery, fondants, fudges, caramels and brittles, crystallisation of sugar.</li> </ul> </li> <li>• Starch Cookery:                             <ul style="list-style-type: none"> <li>○ Gelation, factors affecting gelation, starch as thickener, different sources of starch and their properties cereals and millets-their milling and parboiling.</li> </ul> </li> </ul>	1
		2
		4
		2
		3
UNIT-II	<b>Proteins and Fats in Food</b> Protein Cookery <ul style="list-style-type: none"> <li>• Properties of milk protein, other milk products- curds, evaporated, spray dried and condensed milk, Cheese, Khoya, Their use in food preparations.</li> <li>• Cereals, grams and dals-Effect of soaking, germination &amp; fermentation on cereals and pulses, properties of gluten, gluten formation and the factors affecting it.</li> <li>• Eggs-Properties of egg-proteins &amp; uses in egg preparations, egg as binding, foaming and emulsifying agent mayonnaise preparation.</li> <li>• Meat-Postmortem changes, changes on cooking, fish types, changes during heat treatment.</li> </ul>	3
		3
		3
		2
	2. Fats & Oils: <ul style="list-style-type: none"> <li>• Properties, smoking points, melting point, hydrogenation,</li> <li>• shortening effect. Changes an Storage, rancidity, oxidative and hydrolytic, whipped cream as double emulsion,</li> <li>• different commercial products and their uses.</li> </ul>	3
UNIT-III	<b>Vegetables &amp; Fruits, Sensory Evaluation</b> 1. Vegetables & Fruits: <ul style="list-style-type: none"> <li>• Structure of vegetable tissues, starch, sugars, pectic substances, celluloses and their effect on texture and palatability. Plant pigments, plant enzymes, enzymatic browning, use of plant enzymes for textural changes in foods eg.</li> </ul>	4

	Effect on meat.	
	2. Sensory evaluation <ul style="list-style-type: none"> <li>• Selection of panel of judges</li> <li>• Types of tests</li> <li>• Judging</li> </ul>	2
	Objective methods of measurement of: <ul style="list-style-type: none"> <li>• Colour</li> <li>• Texture</li> </ul>	2
UNIT-IV	<b>New Product Development</b> <ul style="list-style-type: none"> <li>• Food Additives: Definition, importance, classification &amp; uses</li> <li>• Leavening agents : Importance, classification, nature &amp; use</li> <li>• Food product development: Definition, factors affecting product development and health concerns.</li> </ul>	2 2 3

**References:**

1. Charley, H. (1982): Food Science (2<sup>nd</sup> Edition), John Wiley and Sons, New York.
2. Potter, N. and Hotchkins, J.H. (1996): Food Science, 5<sup>th</sup> Edition, CBS Publishers and Distributors, New Delhi
3. Belitz, H.D and Geosch , W (1999): Food Chemistry, 2<sup>nd</sup> Edition, Springer, New York
4. Manay, N.S and ShadarsSharaswamy , M .1987. Food ,Facts and Principles. Wiley Eastern Ltd, New Delhi.
5. Srilakshmi , B.2001. Food Science. New Age International Pvt Ltd. 2<sup>nd</sup> Edition.
6. Meyer ,L.H.Food Chemistry, Reinhold Book Corporation, New York.

**Sessional Work**

1. Seminar presentation on any topic from syllabus.
2. Academic assessment through short and long questions.
3. Discussions on role of nutrients in food science.

**SEMESTER-II**  
**Course Type: Theory Major**  
**Paper-IV Public Health Nutrition**

Credits: 4

Objective:

- To understand the concept of public health nutrition.
- To be familiar with national health care delivery system
- To understand the concept of food and nutrition security
- To gain knowledge regarding national/ public sector policies and programs for improving food and nutrition security.
- To be able to plan, implement and evaluate behavior change communication for promotion of nutrition and health among the vulnerable groups.

S.No.	CONTENTS	PERIODS
UNIT – I	<b>PUBLIC HEALTH NUTRITION &amp; HEALTH CARE SYSTEM</b>	
	• Aim, scope and content of public health nutrition	2
	• Current concerns in public health nutrition: An overview	2
	• Role of Public health nutritionists in National Development	2
	• <b>Health-</b> definition, dimensions, determinants, indicators	2
	• Community health care	2
	• National Health care delivery system	2
UNIT- II	<b>PUBLIC HEALTH ASPECT OF UNDER NUTRITION</b>	6
	• Aetiology, public health implications, prevention and community based management of PEM, Severe acute malnutrition	6
	• Micronutrient deficiencies of public health significance	
UNIT-III	<b>FOOD AND NUTRITION SECURITY</b>	
	• Concepts and definitions of food and nutrition security at National, regional , household and individual levels.	4
	• Public sector programmes for improving food and nutrition security	6
	• National Plan of Action on Nutrition	2
UNIT-IV	<b>BEHAVIOUR CHANGE COMMUNICATION FOR NUTRITION AND HEALTH PROMOTION</b>	
	• Planning of communication strategies for behaviour change programme.	2
	• Stakeholders in nutrition promotion.	2
	• Developing nutrition education plan	2
	• Identifying communication strategies and approaches for health promotion (e.g social marketing)	2
	• Designing nutrition and health messages, selecting communication channels, developing and field testing of communication materials	4
	• Ethics in Nutrition and Health Communication	2

**References:**

- Achaya, K.T. (Ed) (1984). Interface between Agriculture, Nutrition and Food Science. The United National University.
- Beaton, G.H and Bengoa, J.M (Eds) (1996) . Nutrition in Preventive Medicine, WHO.
- Gibney M.J., Margetts, B.M., Kearney, J.M. Arab, I., (Eds) (2004). Public health Nutrition, NS Blackwell publishing.
- National consensus workshop on Management of SAM children through Medical Nutrition Therapy (2009)- Compendium of scientific publications Volume I & ii. Jointly organised by AIIMS, SitaramBhartia Institute of Science and Research, IAP ( subspeciality chapter on Nutrition, New Delhi. Sponsored by DBT.
- Park, K. (2009). Parks Textbook of Preventive and Social Medicine, 20<sup>th</sup> Edition, Jabalpur. M/S Banarsidas
- Gopalan, C and Kaur, S. (Eds) (1993). Towards better Nutrition , problems and policies. Nutrition Foundation of india.
- National Nutrition Policy, GOI, 1993.
- National Plan of Action on Nutrition, GOI, 1995.
- Public Health Communication: Evidence for Behaviour change by Robert C. Hornik (2002) by Lawrence Erlbaum Associates, Inc.
- Communication and Health : Systems and Applications. Edited by Eileen Berlin Ray and Lewis Donohew (1990) by Lawrence Erlbaum Associates, Inc.
- Designing health messages: Approaches for communication Theory and Public Health Practice ;Editors : Edward Maibach and Roxanne Louiselle Parrott (1995) by Sage Publications, Inc.

<b>Sessional work</b>	
1.	Planning and preparation of diet/dishes for PEM, VAD and IDA.
2.	Field Visit to ongoing national nutrition programmes
3.	Assessment of Nutritional problem in an identified community and their determinants in different population groups through analysis of secondary data (such as NSSO, NFHS data etc)
4.	Planning of a communication strategy for a nutrition education programme in the community; field testing of messages, materials, and methods

**SEMESTER-II**  
**Course Type: Practical Major**  
**Paper –V Advanced Food Science**

Credits: 4

**Objectives :**

- Enabling students to comprehend the changes that occur in the physiochemical properties of food stuffs during food preparation.
- Enabling the students to understand and apply the various techniques in the quality evaluation of foods.
- Imparting awareness on the concept of 'food product development'

<b>PRACTICALS</b>	
1.	Experience in training for taste perception & thresh holds, hedonic scale for attributes of foods & developing score cards. Triangular tests, duo & trio tests & others.
2.	Standardisation of recipes & methods or reporting recipes.
3.	Experiments on crystallization of sugar & effects of temperature, concentration, acids and other preparation & evaluation of any three preparations. Laddoo, Halwa&GulabJamun.
4.	Experiment on starch gelatinization, viscosity, measurement of starch pastes- comparison of different sources of starch.
5.	Experiment with eggs to study the properties of coagulation foaming, emulsifying, colouring, effect of quality of eggs on these properties. Preparation of cakes, Mayonnaise evaluation.
6.	Milk cookery preparation & evaluation of soup(cream of tomato), cheese, curd, ice-cream.
7.	Meat- Methods of cooking, factors affecting texture of meat.
8.	Pulses- Method of cooking pulses, effect of soaking, alkali, salts, germination.
9.	Vegetable & Fruit cooking- Factors affecting colour, texture, flavours, browning reactions & preventive methods.
10.	Fats & Oils – smoking point, absorptions, tests, shortening - effect in food preparations

**SEMESTER-II**  
**Course Type: Major**  
**Paper –VI Industrial Training (15 Days)**

Credits: 4



**Semester-III**

**Course Type: Theory Major**

**Paper -I Techniques and Instrumentation in Nutrition Research: Nutritional Biochemistry -III**

Credits: 4

**OBJECTIVES:**

1. To understand the principles of various analytical techniques available for nutrition research.
2. Become efficient in the use of some of the most commonly used techniques and instruments in High quality research.
3. To understand the principles and use of instruments used for protein, DNA and radioactive isotopes.

S.No.	CONTENTS	PERIODS
<b>Unit I</b>	<ul style="list-style-type: none"> <li>• <b>Radioactive</b> and heavy isotopes, their characteristics, detection, measurement and application in nutrition research.</li> </ul>	3
	<ul style="list-style-type: none"> <li>• <b>Immunological Methods:</b> Principle and brief description of Radio immune assay (RIA) and Enzyme linked immune sorbent assay (ELISA).</li> </ul>	3
<b>Unit II</b>	<ul style="list-style-type: none"> <li>• <b>Chromatography-</b> Principles and application in paper (Circular, ascending and descending), ion exchange, column, thin layer, gas liquid and high performance, liquid chromatographic techniques.</li> </ul>	3
	<ul style="list-style-type: none"> <li>• <b>Electrophoresis-</b> Principles and application in paper and gel electrophoresis</li> </ul>	3
	<ul style="list-style-type: none"> <li>• <b>Automation-</b> Clinical biochemistry: Principle and application of auto analyser</li> </ul>	3
<b>Unit III</b>	<ul style="list-style-type: none"> <li>• Principle ,brief description and application of Nuclear magnetic resonance (NMR) and Dual energy x-ray absorptiometry (DEXA).</li> </ul>	3
	<ul style="list-style-type: none"> <li>• Overview of principles and applications of microbiological assays.</li> </ul>	4
	<b>Assessment of Nutritional status-</b> <ul style="list-style-type: none"> <li>• <u>Anthropometry</u></li> <li>• <u>Biochemical assessment</u></li> <li>• <u>Clinical assessment</u></li> <li>• <u>Dietary assessment</u></li> </ul>	5
<b>Unit IV</b>	<ul style="list-style-type: none"> <li>• <b>Methods in animal experimentation-</b> Selection of animals, importance of limiting the extraneous stress to experimental animals, preparation of diets for lab animals (natural, purified and chemically defined diets), feeding lab animals (ad-libitum, pair feeding, restricted feeding), taking samples from Animals( blood sampling, anaesthesia euthanasia), ethical norms of animal experimentation</li> </ul>	3
	<ul style="list-style-type: none"> <li>• <b>Human intervention trials on Nutrition experimentation:</b> Details and ethical norms.</li> </ul>	2

**Sessional work:**

1. Estimation of total, free and conjugated bilirubin in blood serum.
2. Estimation of total and lipoprotein cholesterol in blood serum. Assay of alkaline phosphatase activity in serum.
3. Assay of activity of transaminases (SGOT, SGPT) in serum.
4. Standardisation of colorimetric and spectrophotometric method.
5. To study the working of an atomic absorptiometer.
6. Separation of the various components of a mixture using chromatographic method.
7. Assessment of nutritional status-
  - Anthropometric tools and measurement of height, weight, MUAC and skin fold thickness.
  - Diet survey and diet calculations

**Reference:**

1. Sharma S(1993). Practical Biochemistry. Classic Publishers, Jaipur(India)
2. Raghuramulu et al(1983). A manual of laboratory techniques. National Institute of Nutrition, Hyderabad (India).
3. Oser BC (1965) 14<sup>th</sup> ed. Hawk's physiological chemistry. Tata Mc graw Hill publishing co ltd.
4. Sharma B.K(1999) 8<sup>th</sup> ed. Instrumental methods of chemical analysis, Get publishing house.
5. Sharma S (2007). Experiments and Techniques in Biochemistry. Galgotia Publication Pvt Ltd.
6. AOAC Official Methods of Analysis- Volume 1(19<sup>th</sup> Edition)-2012,AOAC International.

**SEMESTER-III**  
**Course Type: Theory Major**  
**Paper- II Institutional Food Management**

Credits: 4

**Objectives :**

- To develop a knowledge base about the different types of food service units and its evolution.
- To impart necessary expertise to function as a food service manager.
- To provide practical experience in managing food material for food service management.
- To equip individuals to understand human resources.

S.No.	CONTENTS	PERIODS
<b>UNIT-I</b>	<b>FOOD SERVICE MANAGEMENT &amp; ORGANIZATION</b>	
	<ul style="list-style-type: none"> <li>• Definition, principles and functions</li> </ul>	2
	<ul style="list-style-type: none"> <li>• Types of catering establishments (Conventional, commissary, ready prepared, assembly / serve)</li> </ul>	1
	<ul style="list-style-type: none"> <li>• Management Theories (Classical, scientific, behavioural systems approach, contingency approach, MBO, JIT , TQM)</li> </ul>	2
	<ul style="list-style-type: none"> <li>• Managerial operations</li> </ul>	1
	<ul style="list-style-type: none"> <li>• Functions of Manager</li> </ul>	2
	<ul style="list-style-type: none"> <li>• Principles of Management</li> </ul>	1
	<ul style="list-style-type: none"> <li>• Definition of organisation&amp; steps in organising</li> </ul>	
	<ul style="list-style-type: none"> <li>• Tools of Management</li> </ul>	2
	<ul style="list-style-type: none"> <li>• Tangible Tools- organisation chart, job description, job specification, job analysis: pathway chart, process chart, work schedule, production schedule, staff and service analysis, budget.</li> </ul>	2
	<ul style="list-style-type: none"> <li>• Intangible tools – Communication, Leadership, decision making</li> </ul>	1
<b>UNIT-II</b>	<b>MATERIAL MANAGEMENT</b>	
	<ul style="list-style-type: none"> <li>• Menu planning : Functions, factors affecting menu planning, menu construction, types of menu, menu card, Characteristics of cuisines- Indian, Chinese, Continental, French, Thai and Mexican</li> </ul>	2
	<ul style="list-style-type: none"> <li>• Purchase: Market, buyer, vendor, methods of purchase: Formal and informal purchasing procedure</li> </ul>	2
	<ul style="list-style-type: none"> <li>• Storage: Types of storage, store room requirement, appropriate temperature for storing different foods, storeroom records</li> </ul>	2
	<ul style="list-style-type: none"> <li>• Food Production: Production planning and control: importance of planning, production forecast, estimating quantities to buy quantity preparation techniques, production schedule, product evaluation, standardization of recipes, recipe adjustments and portion control</li> </ul>	4
	<ul style="list-style-type: none"> <li>• Food delivery and service: Centralised and decentralised, factors affecting selection, styles of service , delivery and service equipment.</li> </ul>	2
<b>UNIT-III</b>	<b>ORGANIZATION OF SPACES, EQUIPMENT , SANITATION &amp; SAFETY</b>	

	<ul style="list-style-type: none"> <li>• Kitchen spaces: Types of kitchen, designing kitchens</li> <li>• Planning service areas</li> <li>• Architectural considerations for a food service establishment</li> <li>• Feasibility assessment in terms of layout design and costs</li> <li>• Classification and selection of equipment</li> <li>• Care and maintenance of equipment</li> <li>• Importance of hygiene and sanitation in food service units</li> <li>• Sanitation measures for food, personnel and unit hygiene, training techniques for food service personnel in sanitation.</li> <li>• Safety- Causes of accidents, types, safety techniques, 3Es of safety</li> <li>• Food laws/ Food bill</li> <li>• - FPO, ISI, Agmark, PFA, New Food Bill 2006.</li> <li>• Quality Standards- HACCP, ISO</li> </ul>	1 1 1 1 1 1 1 2 1
<b>UNIT- IV</b>	<b>FINANCIAL MANAGEMENT</b> <ul style="list-style-type: none"> <li>• Importance of Financial management in food based enterprise</li> <li>• Budgets and Budgeting process</li> <li>• Menu, purchase, store, production, sales, personnel utilities</li> <li>• Basic concepts n Business transactions: Cash memo, receipt, pay-in slip, cheques, vouchers</li> <li>• Books of Account: Journal, sales, return book, purchase return book, sales book, purchase book, cash book, ledger</li> <li>• Pricing and its methods, costing, concepts and controlling techniques, cost effective procedures, concept of break even point (BEP)</li> <li>• Cost analysis: concept of trial balance, profit and loss account.</li> </ul>	1 1 1 1 2 4 2

**References:**

1. West B.Bessie& Wood Levelle (1988). Food service in Institutions. 6<sup>Th</sup> Edition. Revised by Hargar FV, Shuggart SG &Palgne Palacio June, Macmillian Publishing Company, New York.
2. SethiMohini (2005). Institutional Food Management. New Age International Publishers.
3. Kotler Philip . Marketing Management (2001). Millennium edition. Prentice Hall of India.
4. Kinght JB &Kotschevar LH (2000). Quantity Food Production, planning & Management. 3<sup>rd</sup> Edition, John Wiley & sons.
5. Koontz Hand Dannel, C.Keiser J and Kaillo E. Controlling and Analysis of Cost in Food Service operation. Wiley &Sons . New York.

**SEMESTER-III**  
**Course Type: Theory Major**  
**Paper- III Advanced Nutrition**

Credits: 4

**Objectives :**

- To understand the historical perspectives of nutrient requirements.
- To learn to critically evaluate the methodology and derivation of requirements for specific macronutrients.
- To learn the importance of nutrition in emergency conditions.
- To appreciate the importance of nutrition immunity interactions and their implications.
- To learn various measures for enhancing nutritional quality of diets
- To stay updated with emerging nutrition concepts.

S.No.	CONTENTS	Periods
UNIT- I	<b>Human Nutrient Requirements – Macro &amp; Micronutrients</b> <ul style="list-style-type: none"> <li>• Historical perspectives of Nutrient requirements</li> <li>• Methods of assessment of nutrient needs- a critical review</li> <li>• Critical evaluation of sensitive methods and derivations of requirements and recommended dietary allowances of macro &amp; micronutrients for all age groups:-               <ul style="list-style-type: none"> <li>• Energy</li> <li>• Carbohydrates &amp; Dietary fiber</li> <li>• Proteins &amp; amino acids</li> <li>• Lipids</li> <li>• Water</li> <li>• Vitamins</li> <li>• Minerals &amp; trace elements</li> </ul> </li> </ul>	 2 2  8
UNIT – II	<b>Nutrition in Emergency &amp; Special Conditions</b> <ul style="list-style-type: none"> <li>• Famine, draught, floods, earthquakes, cyclones, war , civil and political emergencies and its impact on nutrition- health</li> <li>• Major deficiency diseases in emergencies and natural calamities, PEM and other nutritional deficiencies</li> <li>• Assessment &amp; surveillance of nutritional status in emergency affected populations.</li> <li>• Communicable diseases- control &amp; treatment in emergency, role of immunization and sanitation</li> <li>• Disaster management cell functions and convergence</li> <li>• Extreme temperatures- low &amp; high</li> <li>• High altitude</li> <li>• Space Nutrition- Physiological changes in space travel, packaging for space travel, nutritional considerations</li> </ul>	 3  1 1 2  1 1 1 2
UNIT-III	<b>Epidemiology, immunity &amp; infection</b> <ul style="list-style-type: none"> <li>• Definition, aims, basic measurements and applications</li> <li>• Study designs- methods applied in conducting nutrition research</li> <li>• Measuring exposure (diet) outcome (disease) relationship and their interpretation</li> <li>• Host defense mechanisms and nutrients essential in the development of immune system</li> <li>• Effect of infections on the nutritional status of an individual</li> <li>• Nutrient deficiencies and excesses affecting the immune-competence and susceptibility to infections</li> </ul>	 2 2 2 2 2  2

<b>UNIT-IV</b>	<b>Improving Nutritional Quality of Diets</b>	
	• Assessment of protein quality	3
	• Dietary diversification	2
	• Bioavailability of Nutrients	2
	• Nutrient losses during cooking and processing	3
	• Nutrigenomics, nutraceuticals and bioactive compounds	2

### **Sessional Work**

1. Seminar presentation on any topic from syllabus.
2. Academic assessment through short and long questions.
3. Discussions on any specific topic from entire syllabus.

### **References:**

- Bamji M.S., Rao N.P., Reddy V. Eds (2009). Textbook of Human Nutrition. 3<sup>rd</sup> Edition. Oxford and IBH Publishing Co.Pvt. Ltd.
- ICMR (2010). Nutrient requirements and recommended dietary allowances for Indians.
- FAO/WHO (2004). Vitamin and mineral requirements in Human Nutrition. Report of a joint expert consultation group.
- Goyet, Fish. V. Seaman, J. and Geijer, U. (1978). The management of Nutritional emergencies in Large populations, World Health Organization, Geneva.
- WFP/ UNHCR (1998). Guidelines for selective feeding programmes in Emergency situations. Rome and Geneva: WEP/UNHCR
- Bonita R, Beaglehole R, Kjellstrom (2006). Basic epidemiology. Second edition. WHO
- Frank G.C. (2008). Community Nutrition- Applying epidemiology to contemporary practice. Second edition. Jones and Bartlett publishers.
- Park, K. (2009). Parks textbook of preventive and social medicine, 20<sup>th</sup> Edition, Jabalpur.M/S Banarsidas

**SEMESTER-III**  
**Course Type: Theory Major**  
**Paper- IV Food Microbiology and Food Safety**

Credits: 4

**Objectives:**

- Making the students understand the basis of microbial growth in various foodstuffs and its beneficial and harmful effects.
- Making the students learn the ways and means to prevent microbial contamination during and after food processing to contain spoilage and poisoning.
- Helping the students understand the role of microorganisms in food product development.

S.No.	CONTENTS	PERIODS	
<b>UNIT -I</b>	<b>INTRODUCTION TO MICROBIOLGY</b>		
	<ul style="list-style-type: none"> <li>• Definition, scope of Food Microbiology</li> </ul>	2	
	<ul style="list-style-type: none"> <li>• An Introduction to microbial world: Bacteria, Fungi , Yeast, Viruses.</li> <li>• Bacterial groups based on their morphology: Gram positive , gram negative, motile/ non-motile bacteria, sporulating / non sporulating bacteria.</li> </ul>	3	
	<ul style="list-style-type: none"> <li>• Bacterial groups based on their physiological growth factors: Temperature, pH, water activity, availability of oxygen. Intrinsic and extrinsic parameters that affect microbial growth and their relevance to food spoilage and preservation.</li> </ul>	3	
	<ul style="list-style-type: none"> <li>• Fungi and Yeast : General features and their importance in food microbiology</li> <li>• Viruses and Bacteriophages: Definition, their general characteristics and multiplication</li> </ul>	2 2	
<b>UNIT-II</b>	<b>FOOD SPOILAGE AND DESTRUCTION OF MICROBES</b>		
	<ul style="list-style-type: none"> <li>• Food Spoilage :Definition, microorganisms involved in spoilage of various foods: Milk, bread, canned food, vegetables and fruits, fruit juices, meat, eggs and fish.</li> <li>• Physical and chemical means used in destruction of microbes: Definition of sterilisation and disinfection. Role of heat, filtration and radiation in sterilization, use of chemical agents- alcohol halogens and detergents</li> </ul>	6 6	
<b>UNIT-III</b>	<b>CONTAMINATION- INTOXICATION &amp; INFECTION</b>		
	<ul style="list-style-type: none"> <li>• Sources of food contamination, food poisoning Symptoms &amp; control .</li> </ul>	3	
	<ul style="list-style-type: none"> <li>• Food Borne Intoxication: Botulism and Staphylococcal intoxication</li> </ul>	4	
<b>UNIT- IV</b>	<ul style="list-style-type: none"> <li>• Food borne infections- Salmonellosis, Clostridium perfringens, bacillus cereus gastroenteritis</li> </ul>	4	
		<b>MICRORGANISMS IN FOOD</b>	
		1. Microorganisms in food enzyme and technology:	
		<ul style="list-style-type: none"> <li>• Food Fermentation</li> <li>• Enzymes and food production</li> <li>• Microorganisms as food</li> <li>• Probiotics and Single cell proteins</li> </ul>	2 2 2 2
	2. HACCP system and food safety used in controlling microbiological hazards	2	

**References:**

1. Text Book of Zoology P.S Dhami, Pardeep Publication.
2. Food Microbiology Frazier, willian C and West off Dannis C, Tata McGraw Will Publish Company Ltd.
3. Pelczar, M.L. and Reid, R.D. Microbiology. Mc Graw Hill Book Company, New York.
4. Jay, J.M: Food Microbiology; 6<sup>th</sup> Edition, Aspen publishers, Inc., Maryland.
5. Adams, M.R. and Moss M.G: Food Microbiology, 1<sup>ST</sup> Edition, New age International (P) Ltd.

SESSIONAL WORK	
1.	Identification of microbes
2.	Preparation of chart and models (same as theory)
3.	Identification of slides of microbes.
4.	Sterilization
5.	Techniques of culturing from liquid and solid media
6.	Staining of bacteria: Gram staining and spore staining
7.	Determination of plate count
8.	Bacteriological analysis of water and milk



**SEMESTER-III**  
**Course Type: Theory Major (Practical)**  
**Paper- V Institutional Food Management**

Credits: 4

<b>Practical</b>	
1.	Market Survey: <ul style="list-style-type: none"> <li>• To assess products and commodities in the market , to formulate price list, to list and categorise food production and service equipments</li> </ul>
2.	Planning Menus (for any 3) <ul style="list-style-type: none"> <li>• Institutions that cater to children</li> <li>• Food service units in hostels</li> <li>• Canteen</li> <li>• Conferences</li> </ul>
3.	Standardising recipes for 6,25 and 50 portions Any two of the following: <ul style="list-style-type: none"> <li>• Snacks</li> <li>• Cakes</li> <li>• Cereal preparation</li> <li>• Curry preparation</li> </ul>
4.	<ul style="list-style-type: none"> <li>• Canteen project</li> </ul>
5.	Product development: <ul style="list-style-type: none"> <li>• Healthy food</li> <li>• Party food</li> </ul>
6.	<ul style="list-style-type: none"> <li>• Regional/ International cuisine</li> <li>• Preparation of recipes from Regional,Chinese, Continental and American cuisines</li> </ul>
7.	Cost Analysis of Menus
8.	Visit to different types of Food service Institutions to study the following: <ul style="list-style-type: none"> <li>• Organization</li> <li>• Physical plan and layout</li> <li>• Food service equipment</li> <li>• Sanitation and hygiene</li> </ul>

**SEMESTER-III**  
**Course Type: Theory Major**

**Paper- VI Survey**

**Credits: 4**

## SEMESTER-IV

Course Type: Theory Major

Paper- I Advanced Physiology

Credits: 4

Objective:

1. Understand the current state of knowledge about the functional organization of the human body.
2. Describe and explain the normal function of the cells, tissues, organs and organ systems of the human body
3. Comprehend the pathophysiology of commonly occurring diseases.
4. Correlate physiology with various disorders and their pathogenesis

S.No.	CONTENTS	PERIODS
UNIT -I	<b>INTRODUCTION TO LYMPHATIC &amp; CIRCULATORY SYSTEM</b> <ul style="list-style-type: none"><li>• Lymphatic system and its and functions.</li><li>• Circulatory System: blood – composition, blood cells - development and function of blood cells, blood clotting, blood grouping and haemoglobin</li><li>• Heart and its anatomy. Circulation of blood, cardiac cycle, blood pressure and factors affecting blood pressure.</li></ul>	2
		5
		4
UNIT-II	<b>RESPIRATORY AND DIGESTIVE SYSTEM</b> <ul style="list-style-type: none"><li>• Respiratory system: anatomy, physiology and mechanism of respiration, regulation of respiration.</li><li>• Digestive system: anatomy of gastrointestinal tract and accessory organs. Digestion and absorption of food.</li></ul>	5
		6
UNIT-III	<b>EXCRETORY AND ENDOCRINE SYSTEM</b> <ul style="list-style-type: none"><li>• Excretory system: anatomy and functions of kidney, formation, composition and excretion of urine.</li><li>• Endocrine glands, mode of action of hormones</li></ul>	5
		5
UNIT- IV	<b>REPRODUCTIVE AND NERVOUS SYSTEM</b> <ul style="list-style-type: none"><li>• Reproductive system: structure and functions of male and female reproductive organs.</li><li>• Nervous system: anatomy and functions.</li></ul>	5
		5

### Reference Books:

1. Best CH & Taylor NB. 1989. The Human Body. ASI Publ. House. (Source: National Book Depot, Bombay).
2. Chatterjee CC. 1992. Human Physiology. Vols. I, II. Medical Allied Agency.
3. Guyton AC. 1991. Text Book of Medical Physiology. WB Saunders.
4. Wilson KJW & Ross JS.1987. Ross and Wilson Anatomy and Physiology in Health and Illness. 6th Ed. Churchill Livingstone.

	<b>SESSIONAL WORK</b>	<b>Periods</b>
1.	Microscopic examination of prepared slides of different human organs	2
2.	Estimation of haemoglobin	2
3.	Identification of blood groups	2
4.	Preparation of blood smear.	1
5.	Measurement of blood pressure.	2
6.	Estimation of blood glucose	2
7.	Preparation of TEC and TLC	2
8.	Preparation of blood Haem-crystals	1
9.	Demonstration and study of models of human body system.	2

## SEMESTER-IV

Course Type: Theory Major

### Paper-II Clinical Nutrition with Compulsory Internship

Credits: 4

#### Objectives:

- To understand causative factors and metabolic changes in various diseases/ disorders.
- To gain knowledge of the principles of diet therapy.
- To learn principles of dietary counselling
- To understand the rationale of prevention of various diseased / disorders

S.No.	CONTENTS	PERIODS
UNIT-I	<b>NUTRITIONAL ASSESSMENT &amp; CARE OF PATIENTS</b>	
	• Nutrition care process	2
	• Nutritional screening and assessment of patients- outpatient & hospitalised	2
	• Nutritional interpretation of routine medical and laboratory data	2
	• Nutrition care plan and implementation	1
	• Monitoring & follow up	1
	• Diet counselling	2
	• Diet, Nutrition and drug interaction	2
• Nutrition support : Enteral & Parenteral Nutrition	2	
UNIT-II	<b>WEIGHT MANAGEMENT, DIABETES &amp; HEART DISEASE</b>	
	Pathophysiology, metabolic & clinical aberrations, diagnosis, complications, treatment, MNT, dietary counselling and recent advances in –	
	• Weight imbalance disorders- Overweight and Underweight	3
	• Diabetes Mellitus – Type 1, Type 2 & Gestational Diabetes	4
• Cardiovascular disease- Hypertension, hyperlipidaemia, metabolic syndrome, myocardial infarction, congestive heart failure, coronary bypass surgery.	5	
UNIT-III	<b>GASTROINTESTINAL TRACT, LIVER &amp; KIDNEY DISORDERS</b>	
	Pathophysiology, metabolic & clinical aberrations, diagnosis, complications, treatment, MNT, Dietary counselling and recent advances in:	
	• Gastrointestinal tract disorders – GERD, Peptic ulcer, diarrhoea, lactose intolerance, celiac disease, diverticular disease, Crohn's disease and ulcerative colitis	5
	• Liver, Gallbladder & Pancreatic disorders- Cirrhosis, Encephalopathy, liver transplant, cholecystitis, cholecystectomy, Pancreatitis.	5
• Kidney Disorders – Nephrotic syndrome, glomerulonephritis, acute renal failure, chronic kidney disease, dialysis, transplant, renal stones.	5	

<b>UNIT-IV</b>	<b>METABOLIC STRESS AND CANCER</b> Metabolic & Clinical aberrations, diagnosis, complications, treatment, MNT and dietary counselling in :	5
	<ul style="list-style-type: none"> <li>• Metabolic stress – Surgery, Burns, sepsis and trauma</li> <li>• Cancer- Role of diet in aetiology and management , effect of cancer therapy on MNT</li> </ul>	4

**References:**

1. Lee RD & Neiman DC (2009). Nutritional Assessment. 5<sup>th</sup> Edition. Brown & Benchmark.
2. Mahan , L.K. and Escott Stump. S(2008). Krause's Food & Nutrition Therapy.12<sup>th</sup> Edition. Saunders-Elsevier.
3. Shils, M.E., Shike ,M, Ross, A.C., Caballero B and Cousins RJ (2005). Modern Nutrition in Health & Disease. 10<sup>th</sup> .Lipincott, William and Wilkins.
4. Gibney MJ, Elia M, Ljungquist&Dowsett J. (2005).Clinical Nutrition. The Nutrition society textbook series. Blackwell publishing company.

<b>SESSIONAL WORK</b>	
1.	Assessment of patient needs- Nutritional assessment & screening
2.	Market survey of commercial nutritional supplements <ul style="list-style-type: none"> <li>• Collection of information on commercial food formula available in the market</li> <li>• Intravenous nutrition supplement – TPN, Cost , Composition, dosage , indications.</li> </ul>
3.	Planning & preparation of diets using exchange lists for <ul style="list-style-type: none"> <li>• Overweight &amp; underweight</li> <li>• Diabetes mellitus</li> <li>• Peptic ulcer</li> <li>• Diarrhoea</li> <li>• Ulcerative colitis</li> <li>• Cirrhosis</li> <li>• Cholelithiasis</li> <li>• Hypertension</li> <li>• Hyperlipidaemia</li> <li>• Glomerulonephritis</li> <li>• Nephritic syndrome</li> <li>• Acute &amp; chronic renal failure</li> <li>• Dialysis</li> <li>• Burns</li> </ul>

**INTERNSHIP**

**Duration :** 3 Months

**Training :** 3 months internship in any hospitals & Dietetics Department.

**Evaluation:**

1. The students will have to prepare a report and submit.
2. A presentation has to be made in seminar on their work experience.

## SEMESTER-IV

Course Type: Theory Major

### PAPER-III- NATUROPATHY: HOLISTIC APPROACH NUTRITION

Credits: 4

#### Objectives :

1. Connected with Ayurveda and Naturopathy of our culture.
2. The importance of Ayurveda and Naturopathy in present scenario.
3. Knowledge on traditional and alternate methods to manage disorders.
4. Adaptation of vernacular material.

Content

S.No.	CONTENTS	PERIODS
UNIT-I	Nature cure and Natural methods of Treatment	
	• Nutritional screening and nutritional status assessment	2
	• Principles and practice of nature care	3
	• Fasting – The Master remedy	2
	• Exercise in health and disease	3
	• Diet related ethical issues in the terminally ill	2
UNIT-II	Type of Different Therapy	
	• Yoga Therapy	3
	• Aroma Therapy	3
	• Chromo Therapy	3
	• Sunbath Therapy	3
UNIT- III	Health and wellness through nutrition	
	• Optimum Nutrition for Vigour and Vitality	2
	• Vitamin and Their Importance in Health and Disease	3
	• Mineral and Their Importance in Nutrition	2
	• Amazing Power of Amino-Acids	3
	• Role of Enzyme in Nutrition	2
UNIT-IV	• Remedies in Different Disease	2
	• Infectious Disease(Cough and cold, fever, Diphtheria, Diarrhoea &Dehydration)	1
		2
	• Hair(Hair fall, dandruff, splitting)	1
	• Eye problem(Eye sight weakness & Dark circle)	2
	• Acne &Pimple	1
	• Stone(Gall bladder &Kidney)	
	• Sleeping Disorder	3
	• Uses of Natural Beverages:	
	• Vinegar,Wheat Grass Juice,Alovera and other herbal juice(Noni juice, Beal juice, cane juice etc)	

**References:**

1. Dr.Om prakash Saxena, A complete book of Naturopathy;Hindi seva sadan,Mathura
2. Pdt.Manas Rajrishi&Harshil Agrawal,Basic Naturopathy and Ayurveda

	<b>SESSIONAL WORK</b>
1.	Nutritional Screening of patient
2.	Collection of information on commercial food formula available in the market and their evaluation
3.	Preparation of Natural Beverages
4.	Ayurveda Cooking



**SEMESTER-IV**

**Course Type: Theory Major  
Paper-IV Food Processing and Preservation**

Credits: 4

**Objectives :**

- Enabling students to understand the principles and processes involved in food processing
- Familiarizing the students with the technological innovations for various food stuffs.
- Making students aware of the role packaging plays in the delivery of food stuffs.

S.No.	CONTENTS	PERIODS
UNIT- I	<b>FOOD PRESERVATION</b>	
	• Principles underlying food preservation operations :-	2
	• Thermal	2
	• Refrigeration and freezing	1
	• Dehydration	1
	• Radiation	
	• Use of chemical additives, ionizing radiations, pickling and curing in preservation.	4
UNIT -II	<b>PROCESSING TECHNOLOGY OF FOODS</b>	
	• Cereals: Wheat milling process, baking technology, production of bread, barley malting. Rice processing, fractionation, parboiled rice.	4
	• Fruits & Vegetables: Changes during ripening	2
	• Canning process of fruits & vegetables	2
	• Milk and Milk products: Milk processing, separation, standardization, pasteurization, homogenization, ultrahigh sterile milk.	4
	• Meat & Fish processing : Rigor mortis, ageing, tenderizing, curing, salting, pickling.	2
UNIT-III	<b>FORTIFICATION AND EXTRUSION TECHNOLOGY</b>	2
	• Fortification Technology	
	• Objectives	
	• Nutritional significance	
	• Selection of Vehicle	
	• Fortification of salt, cereal products & dairy products	
	1. Extruded Food: An introduction to extrusion technology	2
UNIT-IV	<b>PACKAGING TECHNOLOGY, FOOD LABELLING &amp; FOOD LAWS</b>	2
	• An Introduction to packaging technology	2
	• Objectives	
	• Basic packaging materials and their protective qualities	
	• Effect of packaging on the nutritive value of foods	
	1. FPO and other food laws governing Indian Food Industry	

**References:**

- Dey S: Outlines of Dairy Technology, Oxford University Press, Delhi.
- Desrosier NW: Elements of Food Technology, Connecticut, USA: AVI publishing co.
- Mat : Cereal Technology, Connecticut, USA: AVI publishing co.
- Siddapa, GS (1986), Preservation of Fruits & Vegetables, ICAR Publication.
- National Dairy development board, Amul, Milk and Milk products processing
- Gould GW. New Methods of Food Preservation. Blacklie. Academic & Professional, London.

**Sessional Work**

1. Seminar presentation on any topic from syllabus.
2. Academic assessment through short and long questions.
3. Discussions on any topic from entire syllabus.

**SEMESTER-IV**

**Course Type: Practical Major**

**Paper-V Food Preservation Techniques**

Credits: 4

**Objectives :**

- Enabling students to understand the principles and processes involved in food processing
- Familiarizing the students with the technological innovations for various food stuffs.
- Making students aware of the role packaging plays in the delivery of food stuffs.

<b>Practical work</b>	
1.	Dehydration of fruits and vegetables and shelf life studies: is effect on colour, texture and flavour.
2.	Preservation of fruits and vegetables using low temperature
3.	Preservation of fruits and vegetables using heat, salt and sugar
4.	Processing of tomato products
5.	Processing of Jams, jellies and marmalades
6.	Processing of pickles and brines.
7.	Prepare simple extruded foods

**SEMESTER-IV**

**Course Type -Major**

**Paper-VI Research Project**

Credits: 4

**Course Content:**

Report writing of Research project