Avinashilingam Institute for Home Science and Higher Education for Women
(Deemed to be University Estd. u/s 3 of UGC Act 1956, Category A by MHRD)
Re-accredited with A++ Grade by NAAC. CGPA 3.65/4, Category I by UGC
Coimbatore - 641 043, Tamil Nadu, India

Department of Food Science and Nutrition
B.Sc. Food Science and Nutrition

Programme Outcomes

1. Attain and apply fundamental knowledge in basic concepts of Science
2. Gain Competence to communicate effectively
3. Develop critical thinking for innovations
4. Identify problems and suggest appropriate scientific and technological solution
5. Function individually or as a team in work environment
6. Acquire research skills to inquire, synthesize and articulate solution for community
7. Access and apply ICT tools for learning
8. Exhibit professional ethics and norms for social development
9. Implement acquired knowledge in basic sciences for lifelong learning
10. Promote Individual entrepreneurial skills

Programme Specific Outcomes:

1. Enable students to access higher education and research in national and international institutions.
2. Acquire knowledge and comprehend significance of Food Science and Nutrition for community upliftment.
3. Foundation for career opportunities and promotion of entrepreneurs in the areas of personal and public health nutrition and food industry.

Scheme of Instruction & Examinations
(for students admitted from 2023-2024& onwards)

Part	Subject Code	Name of paper / Component	Hours of instruction/ week (T+P)	Scheme Examination					
				Duration of exam	CIA	CE	Total	Credit	
	First Semester								
I	23BLT001/ 23BLH001/ 23BLF001	பொதுத்தமிழ்தாள்I- இக்காலஇலக்கியம்/ Prose and Non-Detailed Texts/ French I	2	3	50	50	100	2	
II	23BAEEC1	**Ability Enhancement Compulsory Course - I** English for Communication	4	3	50	50	100	4	
	Generic Elective								
		Generic Elective - I	4+4	3	50	50	100	6	
III	**Discipline Specific Core Courses**								
	23BFNC01	Food Science	4	3	50	50	100	4	6
	23BFNC01P	Food Science Practical I	4	3	50	50	100	2	
	23BFNC02	Food Chemistry	4 + 4	3	50	50	100	6	
IV	23BVBNC1/ 23BVBNS1/ 23BVBSP1	**Skill Enhancement Course Value Based Course Elective I** – NCC / NSS / Sports	3/2	2	60	40	100	4/1/1	
	23BFNPD1	**Professional Development Course –** Professional Aspects of Food Safety	1	-	100	-	100	Remarks	
		Games – Practical	1		-	-	-		
							Total	**28/25**	

	Second Semester								
I	23BLT002/ 23BLH002/ 23BLF002	பொதுத்தமிழ்தாள்II-அறஇலக்கியம்/ Grammar, Translation and General Essay / French II	2	3	50	50	100	2	
II	23BAEES1	**Ability Enhancement Compulsory Course - II** Environmental Studies	4	3	50	50	100	4	
	Generic Electives								
	23BENGE2A/ 23BENGE2B/ 23BENGE2C/ 23BENGE2D	**Generic Elective - II Introduction to Literature / British Literature / Modern Indian Literature / New Literatures in English**	5+1	3	50	50	100	6	
III	**Discipline Specific Core Courses**								
	23BFNC03	Fundamentals of Human Physiology	5+1	3	50	50	100	6	
	23BFNC04	Food Microbiology	4	3	50	50	100	4	6
	23BFNC04P	Food Microbiology Practical II	4	3	50	50	100	2	
IV	23BVBNC2/ 23BVBNS2/ 23BVBSP2	**Skill Enhancement Course Value Based Course Elective I** – NCC / NSS / Sports	3/2	2	60	40	100	4/1/1	
	23BFNPD2	**Professional Development Course** Food Adulteration	3	-	100	-	100	Remarks	
		Games – Practical	1		-	-	-		
							Total	**28/25**	
	Third Semester								
I	23BLT003/ 23BLH003/ 23BLF003	பொதுத்தமிழ்தாள்IIIசமயஇலக்கியம் /Ancient and Modern Poetry / French III	2	3	50	50	100	2	
II	**Generic Elective**								
		Generic Elective III	5+1/4+4	3	50	50	100	6	
III	**Discipline Specific Core Courses**								
	23BFNC05	Bakery and Confectionery	4	3	50	50	100	4	6
	23BFNC05P	Bakery and Confectionery Practical III	4	3	50	50	100	2	
	23BFNC06	Techniques of Food Evaluation	4	3	50	50	100	4	6
	23BFNC06P	Techniques of Food Evaluation Practical IV	4	3	50	50	100	2	
IV	**Skill Enhancement Courses**								
	23BSBCS1	**Skill Based Compulsory Course I** Communication Skill	4P	3	50	50	100	2	
		Skill Based Elective Course - II	4P	3	50	50	100	2	
	23BVBNC3/ 23BVBNS3/ 23BVBSP3	**Value Based Course Elective I** – NCC / NSS / Sports	3/2	2	60	40	100	4/1/1	
		Value Based Course Elective II	2	-	100	-	100	2	
							Total	**30/27**	
	Fourth Semester								
I	23BLT004/ 23BLH004/ 23BLF004	பொதுத்தமிழ்தாள்IV-சங்கஇலக்கியம்/Introduction to Functional Hindi and Journalism / French IV	2	3	50	50	100	2	
II	**Generic Elective**								
		Generic Elective IV	5+1/4+4	3	50	50	100	6	
III	**Discipline Specific Core courses**								
	23BFNC07	Principles of Nutrition	4	3	50	50	100	4	6
	23BFNC07P	Principles of Nutrition Practical V	4	3	50	50	100	2	
	23BFNC08	Family Meal Management	4	3	50	50	100	4	6

	23BFNC08P	Family Meal Management Practical VI	4	3	50	50	100	2	
IV	**Skill Enhancement Courses**								
	23BSBSS1	**Skill Based Compulsory Course III** Soft Skill	4P	3	50	50	100	2	
		Skill Based Elective Course - IV	4P	3	50	50	100	2	
	23BVBNC4/ 23BVBNS4/ 23BVBSP4	**Value Based Course Elective I** – NCC / NSS / Sports	3/2	2	60	40	100	4/1/1	
		Value Based Course Elective III	2	-	100	-	100	2	
							Total	**30/27**	
	Fifth Semester - Internship during Summer Vacation for 15 days								
III	**Discipline Specific Core Courses**								
	23BFNC09	Nutrition in Diseases	4	3	50	50	100	4	6
	23BFNC09P	Nutrition in Diseases Practical VII	4	3	50	50	100	2	
	23BFNC10	Food Preservation and Processing	4	3	50	50	100	4	6
	23BFNC10P	Food Preservation and Processing Practical VIII	4	3	50	50	100	2	
	Discipline Specific Elective Courses								
	23BFNDE1	**DSE – I Project / Internship**	2	-	100	-	100	6	
	23BFNDE2-4	**DSE – II** Theory + Practical / Theory + Tutorial	4+4/5+1	3	50	50	100	6	
IV	**Skill Enhancement Courses**								
	23BVBNC5/ 23BVBNS5/ 23BVBSP5	**Value Based Course Elective I** – NCC / NSS / Sports	3/2	2	60	40	100	4/1/1	
	23BFNPD3	**Professional Development Course** Entrepreneurial Skills	6	-	100	-	100	Remarks	
							Total	**28/25**	
	Sixth Semester								
III	**Discipline Specific Core Courses**								
	23BFNC11	Product Development and Marketing	4	3	50	50	100	4	6
	23BFNC11P	Product Development and Marketing Practical IX	4	3	50	50	100	2	
	23BFNC12	Assessment of Nutritional Status	4+4	3	50	50	100	6	
	Discipline Specific Elective Courses								
	23BFNDE5-7	**DSE - III** Theory + Practical / Theory + Tutorial	4+4/5+1	3	50	50	100	6	
	Discipline Specific Elective Courses								
	23BFNDE5-7	**DSE - IV** Theory + Practical / Theory + Tutorial	4+4/5+1	3	50	50	100	6	
IV	**Skill Enhancement Courses**								
	23BVBNC6/ 23BVBNS6/ 23BVBSP6	**Value Based Course Elective I** – NCC / NSS / Sports	3/2	2	60	40	100	4/1/1	
							Total	**28/25**	
							Over all total	**172/154**	

- **Ability Enhancement Compulsory Courses**
  - 23BAEEC1 - English for Communication
  - 23BAEES1 - Environmental Studies

- **Skill Enhancement Courses**, are Skill Based and / or Value Based which are aimed at providing hands on training, competencies, skills etc. and may be opted by the students from the electives offered by the departments or from SWAYAM MOOCs / NPTEL.

Skill Based courses

- **Skill Based Compulsory Course I – 23BSBCS1 – Communication Skill** during 3rd semester
- **Skill Based Compulsory Course III - 23BSBSS1 – Soft Skill** during 4th semester

Skill Based courses offered by the **Department of Food Science and Nutrition**

S.No.	Skill Based Elective Courses (II / IV)	Semester	Hours of Instruction	Credit/Course
1.	23BFNSE1 Baking and Icings	3	4P	2
2.	23BFNSE2 Functional Beverages	3	4P	2
3.	23BFNSE3 Millet Based Recipes	3	4P	2
4.	23BFNSE4 Soups and Salads	4	4P	2
5.	23BFNSE5 Chocolate Making	4	4P	2
6.	23BFNSE6 Quality Evaluation of Foods	4	4P	2
7.	SWAYAM MOOCs / NPTEL			

- **Value Based Courses - Elective I**

Value Based Courses Elective I	Subject Code	Semester	No. of Credits
NCC/	23BVBNC1-6/	1-6	24 Credits
NSS/	23BVBNS1-6/		6 Credits
Sports	23BVBSP1-6		6 Credits

- **Value Based Courses - Elective II / III offered by theDepartment of Food Science and Nutrition**

Value Based Course Electives II / III	Subject Code	Semester	Hours of Instruction	Credit / Course
Holistic Wellness	23BFNVB1	3	2	2
Foods for Stress Management	23BFNVB2	4	2	2

- **Discipline Specific Elective Courses** should be related to their own core which may be from SWAYAM MOOCs /NPTEL also
  - All the courses have 6 credits with 4 hours of theory and 4hours of practical's or 5 hours of theory and 1 hour of Tutorials.

S.No.	DSE Courses	Semester	Hours of Instruction	Credits
			Theory + Practical / Theory + Tutorial	
1	23BFNDE1 Project / Internship	5	2	6
2	23BFNDE2 Food Quality Control and Management	5	5+1	6
3	23BFNDE3 Nutrition for Health and Fitness	5	5+1	6
4	23BFNDE4 Food Biotechnology	5	5+1	6
5	23BFNDE5 Food Sanitation and Hygiene	6	5+1	6
6	23BFNDE6Nutraceuticals and Nutrigenomics	6	5+1	6
7	23BFNDE7 Food Packaging	6	5+1	6
8	SWAYAM MOOCs / NPTEL			

- **Generic Elective Courses** offered for other disciplines / departments
  - A Core Course offered in a Discipline / Subject may be offered as a Generic Elective for other departments.

S.No.	Generic Elective Courses	Semester	Hours of Instruction Theory + Practical/ Theory + Tutorial	Credits
1	23BFNGE1 Perspectives of Home Science	1	4+4	6
2	23BFNGE2 Preservation of Fruits and Vegetables	3	4+4	6
3	23BFNGE3 Functional Foods and Nutraceuticals	3	5+1	6
4	23BFNGE4 Fundamentals of Food Science	3	5+1	6
5	23BFNGE5 Principles of Nutrition	4	4+4	6
6	23BFNGE6 Community Nutrition	4	5+1	6
7	23BFNGE7 Nutrition in Health and Diseases	4	4+4	6
8	SWAYAM MOOCs / NPTEL			

Total credits to earn the degree

1. Part I components - 8 Credits (Languages)
2. Part II components – 32Credits (Ability Enhancement Compulsory Courses – 8 Credits and Generic Elective Courses – 24 Credits)
3. Part III components - 96 Credits (DisciplineSpecific Core Courses – 72 Credits and Discipline Specific Elective Courses - 24 Credits)
4. Part IV components – 36 / 18 [Skill Enhancement Courses – Skill Based Courses – 8 Credits; Value Based Courses Elective I (NCC / NSS / Sports) – 24 / 6/ 6; Value Based Elective Courses II & III – 4 Credits]
5. Minimum One Course should be from SWAYAM MOOCs/ NPTEL

One to 4 Courses may be from SWAYAM MOOCs/NPTEL for Credit Transfer in DSE, Generic Elective & / or Skill Enhancement Courses.

Food Science

Semester I **Hrs of Instruction /Week:4**

23BFNC01 **No. of Credits:4**

Course Objectives:

1. To obtain knowledge of basic five food groups and nutritional composition
2. To understand the advantages and disadvantages of cooking methods on the stability of nutrients
3. To analyze the effect of processing and storage on nutritional composition of foods.
4. To learn the factors influencing the cooking quality of different foods.

Unit 1: Introduction of Food Groups, Food Pyramid And Cooking Methods **12**

Definition of Food and Food Science, Classification of Foods based on Functions, Food groups and Food pyramid, Need for Grouping Foods Different Methods of Cooking Moist Heat, Dry Heat and Fat as Medium of Cooking-Definition, Merits And Demerits of Different Methods of Cooking. Microwave Cooking -Merits / Demerits of Various Methods of Cooking. Recent Methods of Cooking-Ohmic Cooking,

Unit 2: Cereals, Pulses, Nuts and Oil Seeds, Fats and Oils **12**

Structure, Composition and Nutritive Value, Changes in Nutritive Value during Cooking, Processing and storage, cooking quality Cereals- cereal cookery concepts – Gluten formation, Cereal starch – moist heat effect – Gelatinizatin, Gel formation, Retrogradation & Syneresis; Dry heat effect - Dextrinization , Pulses- wet milling and dry milling, germination, soaking and fermentation. Nuts and oil seeds- role of nuts and oil seeds in cookery, toxins in nuts and oil seeds Fats and oil seeds- types of oils, functions, effect of heat on oil absorption, rancidity

Unit 3: Vegetables and Fruits **12**

Classification, Composition and Nutritive Value, pigments, Changes in Nutritive Value and pigments of Vegetables during Cooking , Ripening of Fruits, Storage of vegetables and Fruits Milk - Composition,

Unit 4: Milk and Milk Products and Eggs **12**

Nutritive Value, Problems Encountered in Cooking, Kinds of Milk, Types of Milk Products- Fermented and Non- fermented products. Egg- Structure, Composition and Nutritive Value, Methods of cooking, Factors affecting coagulation and foam formation, Testing freshness in Egg. Uses of Egg in Food Preparation and Storage of Eggs

Unit:5 Meat, Poultry and Fish **12**

Structure, Composition, Nutritive Value, Selection, Methods of cooking and its effects on changes in nutritive value of Meat, Fish and Poultry. Factors Affecting Tenderness of Meat Storage of Meat, Fish and Poultry

Total Hours **60**

Text Books:

1. Potter, N. and Hotchkiss, J.H. Food Science, 5 th Ed., CBS Publications and Distributors, Daryaganji, New Delhi, 1998.
2. Shakuntala Manay, Shadaksharaswamy. M (2000) Foods, Facts and Principles, New Age International Pvt Ltd Publishers, Sixth Edition, 2015.

3. Usha Chandrasekhar, Food Science and Application in Indian Cookery, Phoenix Publishing House P. Ltd., New Delhi, 2002.

Reference Books:

1. Brow, A., Understanding Food, Thomson Learning Publications, Wadsworth, 2000.
2. Mehas, K.Y. and Rodgers, S.L. Food Science and You, McMillan McGraw Company, New York, 2000.
3. Parker, R. Introduction to food Science, Delmer, Thomson Learning Co., Delma, 2000

Course Outcomes:

1. Knowledge on food groups, food pyramid and understand cooking methods with the application in balanced menu planning.
2. Knowledge on nutritive value, understand the cookery concepts and gain skills to process and store cereals, pulses, nuts and oilseeds.
3. Knowledge on nutritional classification, understand the changes in pigments and acquire skills in preserving nutrients and pigments in the processing and storage of vegetables and fruits.
4. Knowledge on nutritive value, understand the cooking quality factors and develop skills in the preparation and storage of milk and egg products.
5. Knowledge on the structure and nutritive value, understand the processing factors and acquire skills in processing and storage of flesh foods.

CO/ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PS O1	PS O2	PS O3
CO1	M	L	H	M	M	M	-	-	M	H	M	M	H
CO2	M	-	M	M	M	M	-	-	M	M	M	M	M
CO3	L	-	L	L	M	L	-	L	M	L	M	M	H
CO4	M	-	L	M	M	L	-	-	M	L	M	L	H
CO5	M	-	L	M	M	L	-	-	M	L	M	M	H

Food Science Practical I

Semester I **Hrs of Instruction /Week:4**
23BFNC01P **No. of Credits:2**

Course Objectives:

1. Understand the measuring techniques and learn recipes based on food groups.
2. Understand the changes taking place in cooking of different food items
3. Minimize or prevent nutrient losses during cooking

1	Good Laboratory Practices Food groups: Grouping of foods and discussion on nutritive value	**2**
2	Measuring ingredients: Methods of measuring different types of foods –Course and refined flours, solids and liquid food items.	**6**
3	Edible portion: Determination of edible portion percentage	**4**
4	Cooking methods: Moist heat methods – boiling, simmering, steaming and pressure cooking. Dry heat methods – baking, roasting , solar cooking	**4**
5	Fat as a medium for cooking-shallow and deep fat frying.	**4**
6	Cereals: Methods of cooking fine and coarse cereals. Examination of starch. Common preparations with cereals	**4**
7	Pulses : Cooking of soaked and un soaked pulses. Common preparation with pulses	**4**
8	Vegetables: Experimental cookery using vegetables of different colours. Preparation of soups and salads. Common preparations with vegetables.	**4**
9	Fruits: Prevention of darkening in fruits and vegetables. Mixed fruits salad.	**4**
10	Milk and milk products: Factors encountered in milk cookery Experimental cookery – cream of tomato soup, cheese curry. Common preparation with milk, paneer, cheese and curd.	**4**
11	Fleshy foods - preparation with fish, meat and poultry	**4**
12	Egg: Experimental cookery- boiled egg, poached egg. Common preparations with egg.	**4**
13	Beverages: Preparation of hot beverages- coffee, tea. Preparation of cold beverages- fruit drinks and milk shake.	**4**
14	Evaluation of the formulated score card.	**4**
15	Developing value added food products, Selection and Compliance of Raw Materials as per the Food Regulations.	**4**
	Total Hours	**60**

References :

Text Book(s)

1. Srilakshmi, B. (2020) Food Science, 10 th edition, New Age Publisher.
2. Many, S and Shadaksharaswami, M. (2015) Food: Facts and Principles, 3rd edition, New Age Publishers.

Reference Books

1. Swaminathan, M. (2012) Food science, Chemistry and Experimental Foods Bangalore printing and publishing company.
2. Potter, N.N. and Hotchkiss, J.H. (1998) Food Science 5th edition, CBS Publications and Distributors, Daryaganji, New Delhi.

Course Outcomes:

1. Apply the scientific principles in food preparations.
2. Demonstrate the different methods of cooking
3. Understand the desirable and undesirable changes taking place during cooking of foods
4. Evaluate the basic methods and principles involved in cooking of different foods.
5. Evaluate the changes of pigments in vegetables during cooking.

CO/ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO 7	PO 8	PO 9	PO 10	PS O1	PS O2	PS O3
CO1	M	-	H	M	M	M	-	L	M	M	M	M	H
CO2	M	-	M	M	M	M	-	L	L	M	M	M	M
CO3	L	-	L	L	M	L	-	L	L	M	M	M	M
CO4	M	-	L	M	M	L	-	L	L	M	M	L	H
CO5	M	-	L	M	M	L	-	L	L	M	L	M	M

Food Chemistry

Semester I **Hrs of Instruction /Week:4+4**
23BFNC02 **No. of Credits:6**

Course Objectives:

1. To enable the students, study the physico-chemical changes that occur in foods during cooking.
2. Gain knowledge about the chemistry underlying the properties and reactions of various food components.
3. Understand the various properties exhibited by starch and sugars, proteins, fats and oils, pectic substances and spices and condiments
4. Know the role of food components towards food quality
5. Scientifically provide inference on food chemistry experiments

Unit 1: Physico-chemical properties of foods **12**

Moisture in foods, hydrogen bonding, bound water, water activity in foods, determination of moisture content in foods, true solutions, dispersions, sols, gels, foams, colloids and emulsions, Interference of bio molecules during physical and chemical processing of foods, intra cellular and extra cellular matrix of plant and animal foods

Practical **12**

Determination of moisture content of foods – oven method, moisture analyser
Determination of pH in foods using pH meter and pH paper

Unit 2: Chemistry of Starch and Sugars **12**

Starch – components, swelling of starch granules, gel formation, retrogradation, syneresis, effect of sugar, acid, alkali and other agents
Sugars – stages and factors affecting sugar cookery, crystal formation and factors affecting it, types of candies
Milk sugar – action of acid, alkali and enzymes, non-enzymatic browning

Practical **12**

Starch - gelatinization of starch, microscopic examination of uncooked and gelatinized starch, retrogradation and syneresis
Sugars - stages of sugar cookery, preparation of fondant, fudge, caramel and toffee,
Milk - scum formation, boiling over, scorching of milk, coagulation and precipitation of milk proteins

Unit 3: Chemistry of Proteins **12**

Wheat proteins – components, structure, gluten formation
Pulse proteins – soaking, fermentation and germination
Egg proteins – components, properties, effect of heat, acid, alkali and other agents
Milk protein – components, changes in milk, egg and meat proteins during heating
egg proteins – components, properties, effect of heat, acid, alkali and other agents
Animal proteins – components, properties, effect of heat, acid, alkali and other agents

Practical **12**

Wheat proteins - gluten formation
Pulse - effect of soaking, germination and fermentation of batter
Egg - coagulation of egg white and egg yolk, boiled egg, poached egg, omlettes, cake and mayonnaise
Animal proteins - changes observed in cooking meat, fish and poultry, testing the tenderness of meat

Unit 4: Chemistry of Fats and Oils **12**

Physical and chemical properties, rancidity, hydrogenation, winterization, decomposition of triglycerides, shortening power of fats, changes in fats and oils during heating, factors affecting fat absorption in foods

Practical **12**

Fats and oils - smoking temperature of different fats, factors affecting absorption of fats, observation of invisible fats from foods

Unit:5 Pectic Substances, Plant Pigments, Spices and condiments **12**

Pectins, phenolic components – chemistry and properties

Enzymatic browning in fruits and vegetables, volatile compounds from cooked vegetables

Plant pigments - water- and fat-soluble pigments

Spices and condiments – properties and active principle, role in Indian cookery

Practical **12**

Vegetables - effect of acids, alkali and heat on water soluble and fat soluble pigments, enzymatic browning and methods of prevention

Fruits – evaluation of pectin quality, preparation of jam and jelly

Total Hours 120

References:

1. Manay, S N. and Shadaksharaswamy (2017) Foods: Facts and Principles, Third Revised Edition, New Age International (P) Publishers, New Delhi
2. Chandrasekhar, U. Food Science and applications in Indian Cookery (2002) Phoenix Publishing House, New Delhi
3. Swaminathan, M. Food Science, (2015) Chemistry and Experimental Foods,Bappco Publishers, Bangalore.
4. Meyer, L.H, Food Chemistry, (2004) CBS Publishers and Distributors, 4th edition
5. Chopra H.K, Panesar, P.S, Food Chemistry (2010) Narosa Publishing House, New Delhi

Course Outcomes:

1. Demonstrate proficiency in understanding physiochemical changes occurring foods during cooking
2. Explain the properties and reactions of the various food components
3. Describe the basic principles and properties of starch proteins, fats and oils, pectic substances and spices and condiments
4. Develop products with minimum nutritional loss based on the knowledge of food chemistry
5. Practical understanding of the chemical analyses used in identifying and quantifying food components.

CO/ PO	P O1	P O2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2	PSO 3
CO1	H	-	H	H	-	H	-	-	M	H	H	L	H
CO2	H	-	H	M	-	H	-	-	M	M	H	L	H
CO3	H	-	H	H	-	H	-	-	M	H	H	L	H
CO4	H	-	H	M	-	H	-	-	M	H	H	L	H
CO5	H	-	H	H	-	H	-	-	M	H	H	L	H

Fundamentals of Human Physiology

Semester II **Hrs of Instruction /Week:5+1**

23BFNC03 **No. of Credits:6**

Course Objectives:

1. Understand the Composition and Functions of Blood, Haemostasis, Homeostasis, Blood Coagulation, Anemia, Blood Transfusion and Blood Groups
2. Comprehend the structure and functions of Cardiovascular and Respiratory Systems
3. Understand the Anatomy and Physiology of the Digestive and Urinary System
4. Comprehend the Structure and Functions of the Endocrine Glands
5. Understand the Anatomy and Physiology of Male and Female Reproductive Systems

Unit 1:	Composition and Functions, Plasma Proteins, Haemostasis, Coagulation, Red Blood Corpuscles, White Blood Corpuscles, Platelets, Anaemia, Blood Transfusion and Blood Groups	**15**
Unit 2:	Structure of heart and blood vessels, Properties of Cardiac Muscle, Special Junctional Tissues, Cardiac Cycle, Heart Rate, Cardiac Output, Blood Pressure, Radial Pulse Respiratory System Physiological Anatomy of Respiratory Tract, Gaseous Exchange in Lungs and tissues.	**15**
Unit 3:	Anatomical Consideration of the Digestive Tract including Liver and Pancreas, Digestion and Absorption of Carbohydrate, Protein and Fat, Structure of Excretory System. Kidney, Nephrons, Urine Formation Composition of Urine, Micturition	**15**
Unit 4:	Introduction to Endocrinology, Hormones, Pituitary Gland, Thyroid Gland and Parathyroid Gland, Adrenal Gland and Endocrine Functions of Pancreas.	**15**
Unit 5:	Anatomy of Male and Female Reproductive Organs, Physiology of Menstruation, Pregnancy and Associated Changes, Placenta, mammary Gland and Lactation	**15**
	Total Hours	**75**

Practicals

Related Experience **15**

Microscope and its use

1. Histology of epithelial, connective, muscular and nervous tissue
2. Determination of bleeding time
3. Determination of coagulation time
4. Estimation of Haemoglobin
5. Preparation of blood – smear and DLC
6. RBC Count
7. WBC Count
8. Blood grouping
9. Recording of blood pressure and pulse rate before and after exercise

Total Hours **90**

References:

Text Books

1. Chatterjee C.C (2016), Human Physiology 11th Edition, Medical Allied Agency, Kolkata
2. Sembulingam, K. (2012) Essentials of Medical Physiology, 6th Edition, Jaypee Brothers Medical Publishers (P) Ltd., New Delhi.

Reference Books:

1. Best and Taylor, (2011) 13th Edition The Physiological Basis of Medical Practice, Saunders Company.
2. Chaudhri, K. (2016)7th Edition Concise Medical Physiology, New Central Book Agency Ltd., Calcutta

Course Outcomes:

1. Understand the Structure and Functions of the various organ systems of the body
2. Relate the Structure with Functions of the tissues and organs
3. Comprehend the Mechanism of Action of Organs
4. Relate the Physiology of the human body with Food and Nutritional requirements
5. Recognize the Clinical Symptoms of Nutritional Deficiencies based on anatomical consideration

CO/ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PS O1	PS O2	PS O3
CO1	H			M		M			M		M	M	H
CO2	H			M		L			M		H	H	H
CO3	H			M		L			M		H	H	H
CO4	H			M		L			M		H	H	H
CO5	H			H		L			M		H	H	H

Food Microbiology

Semester II **Hrs of Instruction /Week:4**
23BFNC04 **No. of Credits:4**

Course Objectives:

1. To obtain knowledge on morphology of microorganisms and types of microscopy
2. To understand the factors influencing the growth of microorganisms
3. To apply the preservation principles and methods to preserve the foods from microbial contamination
4. To explore the beneficial effects of microorganisms in the development of fermented foods.

Unit 1: Introduction to Microbiology, Morphology and Growth factors of Microorganisms **13**

Definition and History
Microscopy, Light and electron Microscopy, Listing other Types
General Morphology of Microorganisms Bacteria, Fungi, Algae, Yeast and Virus-Bacteriophage
Microbial Biomass, Growth Curve, Definition of Batch and Continuous culture, Factors Affecting Growth - Intrinsic Factors, Nutrient Content, pH, Redox Potential, Antimicrobial Barrier and Water Activity.
Extrinsic Factors: Relative Humidity, Temperature and Gaseous Atmosphere

Unit 2: Microbiology of Plant based Foods **14**

Outline of Contamination, Spoilage and Preservation of Vegetables and Fruits, Cereals and Cereal Products, Pulses, Nuts and oilseeds, Sugar and Sugar Products

Unit 3: Microbiology of Animal based Foods **12**

Outline of Contamination, Spoilage and Preservation of Milk and Milk Products, Canned Foods, Meat and Meat Products, Egg and Poultry

Unit 4: Beneficial Effects of Microorganisms **10**

Fermented Foods – Curd, Cheese, Sauerkraut, Meat, Soy Based Foods, Alcoholic Beverages and Vinegar

Unit:5 Food Intoxication and Food Infection **11**

Food Borne Diseases – Classification- Intoxication – Botulism and Staphylococcal intoxication- Infection – Salmonellosis, Clostridium Perfringens illness, Bacillus cereus, Ecoli, Shigellosis, Yearsinia and Streptococcus faecalis, Listeria monocytogenes – Foods involved, Diseases outbreak, Preventive and control measures.

Total Hours 60

References:

Text Books:

1. Ramesh, K.V (2012) Food Microbiology, MJP Publishers, Chennai
2. Tamine, A (2015) Probiotic Dairy Products, Blackwell Publishing, USA.
3. William C. Frazier (2014) Food Microbiology, Tata McGraw Hills Publishing Company Limited, Chennai.

Reference Books:

1. Adams, MR and Moss, MO (2015) Food Microbiology, New Age International (P) Ltd., New Delhi.
2. Cappuccino G.J and Sherman, N (2008) Microbiology – A Laboratory Manual, Pearson Education Publishers, USA,

3. Jay M.J (2015) Modern Food Microbiology, Fourth Edition, CBS Publishers and Distributors, New Delhi**.**

Course Outcomes:

1. Know the different types and morphology of microorganisms and magnification capacity of different types of microscopes.
2. Understand the factors affecting the growth in controlling the growth curve of microorganisms.
3. Able to preserve the perishable foods from different types of microbial spoilage
4. Able to preserve the non-perishable foods from microbial contamination and spoilage.
5. Explore the beneficial effects of microorganisms in the processing and development of fermented foods.

CO/ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2	PSO 3
CO1	H			M	M				M	L	H		H
CO2	H								M		M		
CO3			M	H	M	M			M	M	M		H
CO4			M	H	M	M			M	M	M		H
CO5	H		L		L	M			M		M	M	M

Food Microbiology Practical II

Semester II **Hrs of Instruction /Week:4**

23BFNC04P **No. of Credits:2**

Course Objectives:

1. To learn laboratory protocols for microbial quality in foods
2. To enable students to enumerate microorganisms in foods

1.	Basic lab techniques for food microbiology	6
2.	Bright field light microscopy Hanging Drop Method – Motility of Bacteria Staining of Bacteria – Simple Staining, Gram Staining	6
3.	Sterilization techniques	6
4.	Preparation of common laboratory media, broth and slant	6
5.	Serial dilution and plating techniques – pour plate, streak plate	6
6.	Enumeration of cell counts – colony forming units. Total colony count, Aerobic Colony Count, Coliform count	6
7.	Most probable number test	6
8.	Microbial analysis of water	6
9.	Microbial analysis of liquid foods – Milk and Fruit juice	6
10.	Microbial analysis of solid foods	6
	Total Hours	**60**

Text Books:

1. Official Methods of Analysis of AOAC International (1995). 16th Edition. Edited by Patricia Cuniff. Published by AOAC International. Virginia. USA. Test No. 17.2.02.
2. Compendium of Methods for the Microbiological Examination of Foods. (1992) Carl Vanderzant and Don F. Splittstoesser Eds. Washington D.C. p. 75-87
3. Microbiology of food and animal feeding stuffs – General requirements and guidance for microbiological examinations - ISO 7218:2013.

Course Outcomes:

1. Understand the basic techniques required in food microbiology laboratory.
2. Develop the skill in the enumeration of microbial cell counts in foods
3. Analyse the microbial quality of food samples.

CO/ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2	PSO 3
CO1	H		H		H	M	M		M		H		H
CO2	H		H		H	H			M		H	L	H
CO3	H		H	L	H	H			M	L	H		H

Bakery and Confectionery

Semester III **Hrs of Instruction /Week:4**

23BFNC05 **No. of Credits:4**

Course Objectives:

1. Knowledge of the evolution of baking and emerging trends in baking
2. Understand the principles involved in baking various products and confectionery and Organoleptic evaluation
3. Knowledge to set up a bakery unit and handling of the equipments
4. Develop entrepreneurial skills and responsibility for setting up bakery and confectionery units

Unit 1: Wheat Processing **12**

History of baking, Structure and Composition of the Wheat Kernel,
Steps in Wheat Milling, By products of wheat, Types of Flour, Enrichment of Flour and Bread. Evaluation of Quality aspects of flour and dough

Unit 2: Baking **12**

Principles of Baking, Classification of Baked Foods, Role of Ingredients – Water, Yeast, Sugar, Shortening, Milk, Egg, Butter, Salt, Leavening Agents, Spices, Flavorings, Fruits and Nuts, Food Colors, Setting Materials, Cocoa and Chocolate ,emulsifiers, flour improvers, recipe balance, storage of baked products, selection of packaging materials.

Unit 3: Factors for Setting up a Bakery Unit **12**

Factors to be considered for Setting up a Bakery Unit
Types of Ovens – Construction and Working of Conventional and Modern Ovens, Study and Maintenance of Major and Minor Equipments
Bread Making – Steps and Methods, Role of Ingredients
Variety Breads, Qualities of a Good Loaf, Bread Faults, bread diseases.

Unit 4: Preparation and Decoration of Baked Foods **12**

Cake Making – Functions of Ingredients
Cake Mixing Methods, Types of Cakes, Cake Judging, Cake Faults and remedies Biscuit, Cookie and Pastry Making, Types and techniques of Icing, Frosting and fillings. Sensory evaluation of baked products- objective and subjective methods

Unit:5 Confectionery **12**

Processing of Raw Materials - Cocoa and Chocolate. Making of Toffee, Chocolates, Fruit Drops, Hard Boiled Candies(clear, hard, pulled, grained, filled), Soft candies (fondant, modified fondants like toffee, fudge, marshmallows, gums, jellies, chocolates)Bars, Chewing Gums, Special Confectionery Foods- tablets, Lozenges.

Total Hours 60

Text Books:

1. Dubey, S.C. (2012), ***Basic Baking*** IV Edition, The Society of Indian Bakers, New Delhi.
2. ***Bakers Handbook on Practical Baking*** (2008) Compiled and Published by US Wheat Associates, New Delhi.
3. ***NIR Board, The Complete Technology Book on Bakery Products***, National Institute of Industrial Research, New Delhi(2010)
4. ***Yogambal Ashokkumar Textbook of Bakery and confectionery*** second edition PHI learning private limited NewDelhi.2012

Reference Books:

1. ***Fellows, J.P. (1998), Food Processing Technology*** – Principles and Practice, Ellis Horword Limited, London.
2. ***Avantina Sharma, (2006), Text Book of Food Science and Technology***, International Book Distributing Co., Chaman Studio Building, Charbagh, Lucknow, UP.

Course Outcomes:

1. An understanding about ingredients used for baking and how their characteristics are used to design , formulate and prepare bakery products as well as their nutritional qualities.
2. Gain knowledge about the appropriate preparation, mixing, make-up, baking, decorating and presenting of baked products
3. Describe and apply appropriate sanitation, health and safety practices in baking
4. Demonstrate the safe operation, cleaning, maintenance and storage of baking equipment and utensils
5. Describe and plan to set up a bakery unit

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PS O1	PS O2	PS O3
CO 1	M		L			H		H		H	M	M	H
CO 2	M					H		M	M	H	M	H	H
CO 3	L	L	L			M		H	M	H	H	M	H
CO 4	L	L	M			M		M	M	H	H	M	H
CO 5	M					H		M	M	H	M	M	H

Bakery and Confectionery Practical III

Semester III **Hours of Instruction /Week:4**

23BFNC05P **No. of Credits:2**

Course Objectives:

1. Emphasis on hands on activities – covering a wide spectrum of baking – including cookies, cakes, quick breads, yeast based dough products, pies and pastries
2. Pursue a career in baking and pastry arts. Emphasis on preparation of chocolate, marzipan and sugar decoration
3. Demonstrate on the safe use and care of bakery utensils and equipment
4. Demonstrate the knowledge of ingredients used in baked recipes /formulations

1	Wheat Processing – Visit to a Milling Unit	6
2	Evaluation of Gluten Content of Flour, Baking of Biscuits and Cookies and Evaluation	12
3	Preparation of Cakes with Egg and Eggless and Different Types Of Icings	12
4	Preparation of Pastries and variety breads	9
5	Visit to a Bakery and Confectionery Unit	6
6	Preparation of Confectioneries like Fudge, Fondant, Candies, Marshmallows, Marzipan, Hard Boiled Candies, Soft and Hard Toffees, Chewing gums	9
7	Mini project	6
	Total Hours	**60**

Text Books:

1. Dubey, S.C. (2012), ***Basic Baking*** IV Edition, The Society of Indian Bakers, New Delhi.
2. ***Bakers Handbook on Practical Baking*** (2008) Compiled and Published by US Wheat Associates, New Delhi.
3. ***NIR Board, The Complete Technology Book on Bakery Products***, National Institute of Industrial Research, New Delhi(2010)
4. ***Yogambal Ashokkumar, Textbook of Bakery and confectionery*** second edition PHI learning private limited NewDelhi.2012

Reference Books:

1. ***Fellows, J.P. (1998), Food Processing Technology*** – Principles and Practice, Ellis Horword Limited, London.
2. ***Avantina Sharma, (2006), Text Book of Food Science and Technology***, International Book Distributing Co., Chaman Studio Building, Charbagh, Lucknow, UP.

Course Outcomes:

1. An understanding about ingredients used for baking and how their characteristics are used to design , formulate and prepare bakery products and their nutritional qualities.
2. Gain knowledge about the appropriate preparation, mixing, make-up, baking, decorating and presenting of baked products
3. Describe and apply appropriate sanitation, health and safety practices in baking
4. Demonstrate the safe operation, cleaning, maintenance and storage of baking equipment and utensils
5. Plan to set up a bakery unit

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2	PSO 3
CO 1	M		L	L		H		H	M	H	M	M	H
CO 2	M	L	H	L	L	H	L	M	M	H	M	H	H
CO 3	L	L	L	L	L	M		H	M	H	H	M	H
CO 4	L		M	M	M	M	L	M	M	H	H	M	H
CO 5	M		H	M	H	H	M	M	M	H	M	M	H

Techniques of Food Evaluation

Semester III **Hrs of Instruction /Week:4**

23BFNC06 **No. of Credits:4**

Course Objectives:

1. Gain knowledge on basic aspects of evaluation of food quality.
2. Understand the techniques and tests for evaluation of food quality.
3. Learn basic statistics in the evaluation of sensory quality of foods.
4. Acquire skills to conduct tests for evaluating the quality of foods.

Unit 1: Introduction to Food Evaluation Quality **10**

Definition, Objectives and Need for Evaluation of Food Quality
Psychological and Physiological factors affecting the evaluation of food quality

Unit 2: Methods of Evaluation of Food Quality–Subjective Methods **14**

Sensory Characteristics of Food-Appearance, Colour, Flavour, Taste, Texture and Consistency, Conducting Sensory Tests – Training Panel Members, Testing Laboratory –Preparation of Samples, Techniques of Smelling and Tasting, Testing time, Design of Experiment, Reasons for Testing Food Quality

Unit 3: Sensory Tests used for Food Evaluation **12**

Types of Tests, Difference Tests, Rating Tests, Sensitivity Tests, Descriptive Tests, Interpretation of scores, Application of softwares in interpreting scores

Unit 4: Methods of Evaluation of Food Quality–Objective Methods **12**

Basic Guidelines, Advantages and Disadvantages Types of tests – Destructive and Non-destructive methods - Physical, Chemical and Physico-chemical methods- Basic principles, and applications of equipments involved in chemical testing , Instruments used for Texture Evaluation

Unit:5 Evaluation of Microbial Quality of Foods **12**

Methods, Assays used to assess the Microbial Loads of different foods, Permitted levels of Microbial Load in different foods, Microbes responsible for Food Quality

Total Hours **60**

Textbooks:

1. Srilakshmi, B. Second Edition, Food Science, New Age International (P) Limited Publishers, New Delhi. 2016
2. Harry T .Lawless, Hildegarde, Sensory Evaluation of Food Principles and Practices, Second Edition, Springer Science,2010.
3. Joshi, V.K Sensory Science : Principles and Applications in Food Evaluation, 2016.

Referencebooks:

1. Hutenwigs,B.J. Food Color and Appearance, Published by Blackie Academic and Professional ,London, 2010.
2. Howard R. Beckley, Jacquiline, H. Sensory and Consumer Research in Food Product Design and Development,2016
3. Bi, Jian, Sensory Discrimination Tests and Measurements: Statistical Principles, Procedures and Tables, 2016.

Course Outcomes:

1. Gain knowledge on the basics of food quality
2. Identify the different quality characteristics of foods
3. Categorize various methods for evaluating food quality
4. Interpret the evaluation techniques and tests used in analyzing food quality
5. As certain the role of microorganisms in food quality

CO/ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PS O1	PS O2	PS O3
CO1	H			M	H		M			M	H		M
CO2			L	M	H	M	M	M	L	L	M		H
CO3	M		L	M	M	L	M	M		L	M		H
CO4		L			H	M	M				M		M
CO5	M	L		M	H	L	M	L		L	M		M

Techniques of Food Evaluation Practical IV

Semester III **Hrs of Instruction /Week:4**

23BFNC06P **No. of Credits:2**

Course Objectives:

1. To learn laboratory techniques and tests for evaluation of food quality
2. To enable students to evaluate quality of foods with appropriate tests and techniques

1.	Basic lab techniques for evaluation of food quality	6
2.	Types of sensory tests – Discriminating, Descriptive and Rating tests, Sensory threshold tests with basic statistical tests.	12
3.	Determination of moisture content by hot air oven method Determination of total solids in liquid foods	6
4.	Analysis of pH and titrable acidity of foods	6
5.	Evaluation of food color by Colorimeter	6
6.	Texture evaluation of foods	6
7.	Analysis of viscosity by Rheometer	6
8.	Serial dilution and plating techniques – pour plate, streak plate	6
9.	Enumeration of cell counts – colony forming units. Total colony count, Aerobic Colony Count	6
	Total Hours	**60**

Text Books:

1. Official Methods of Analysis of AOAC International (1995). 22nd Edition. Edited by Patricia Cuniff. Published by AOAC International. Virginia. USA. Test No. 17.2.02.
2. Srilakshmi,B. Second Edition, Food Science, New Age International(P) LimitedPublishers,NewDelhi.2016
3. Microbiology of food and animal feeding stuffs – General requirements and guidance for microbiological examinations - ISO 7218:2013.

Course Outcomes:

1. Understand the basic techniques required in the evaluation of food quality.
2. Develop the skill in the analysis of quality of foods.
3. Able to employ basic statistics in sensory evaluation of foods.

CO/ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2	PSO 3
CO1	H	L	M	L	M	M					M		M
CO2	H		M	M	H	H	M	L		L	M		M
CO3	M		L		M	M	L				M		M

Principles of Nutrition

Semester IV **Hrs of Instruction /Week:4**
23BFNC07 **No. of Credits:4**

Course Objectives:

1. Acquire an understanding of nutrition science for health promotion and disease prevention
2. Gain knowledge on functions, explore the dietary sources, metabolism, requirements and effects of deficiency of different nutrients of nutritionally important.
3. Gain scientific knowledge about the vital link between nutrition and health of individuals.
4. Understand the interrelationship of the various nutrients
5. Present current evidence for the role of key nutrients in the prevention of chronic diseases

Unit 1: **Energy**- Definition of Energy, **12**
Units of Energy- Calorie and Joule
Measurement of Calorific Value of Foods using Bomb Calorimeter, physiological fuel values of foods, relationship between oxygen used and calorific values.
Determination of energy requirements-direct and indirect calorimetry, relation between Respiratory quotient and energy output, specific dynamic action of foods (Diet Induced Thermo genesis),
Basal Metabolism- definition, determination of basal metabolism -Benedicts Roth Apparatus, Factors Affecting BMR, determination of energy metabolism during work-Energy requirements for various age groups.

Unit 2: **Carbohydrates and proteins** **12**
Carbohydrates - Composition, classification, digestion, absorption and metabolism, Functions, Sources and Requirements of Carbohydrates. Dietary fiber –definition, sources, Role of Fibre in Human Nutrition
Proteins - Composition, classification, functions, digestion, absorption and metabolism, Requirements and Sources, Evaluation of protein quality-PER,BV and Chemical score

Unit 3: **Lipids and Water** **12**
Lipids - Classification, functions, digestion, absorption and metabolism, Functions, Sources and Requirements
Water – Importance, distribution in the body, functions of water and sources, water intake and loss

Unit 4: **Macro, Micro and Trace Minerals** **12**
Classification, Distribution in the body, Functions, Sources and requirement and Effects of Deficiency of Calcium, Phosphorus , Magnesium, Sodium, Potassium, Selenium, Iron, Zinc, Iodine and Fluorine.

Unit:5 **Vitamins** **12**
Fat soluble Vitamins Chemistry, Functions, Sources, Requirements, Deficiency and Hypervitaminosis of Vitamin A, D, E and K
Water Soluble Vitamins - Chemistry, Functions, Sources, Requirements and Deficiency of B-Complex Vitamins- Thiamine, Riboflavin, Niacin, Pyridoxine, Folic Acid, Pantothenic Acid Cyanocobalamin and Vitamin C

Total Hours **60**

Text Books:

1. Srilakshmi, B., Nutrition Science, New Age International (P) Ltd., New Delhi, 2017.
2. Mahtab, S, Bamji, Kamala Krishnasamy, G.N.V. Brahmam, Text Book of Human Nutrition, Third Edition, Oxford and IBH Publishing Co. P. Ltd., New Delhi, 2015
3. Swaminathan, M., Advanced Textbook on Food and Nutrition, Vol. 1, Second Edition, Bangalore Printing and Publishing Co. Ltd., Bangalore, 2012.

Reference Books:

1. Dietary Guidelines for Indians, ICMR, National Institute of Nutrition, Hyderabad,2013.
2. Gordon M. Wardlaw, Paul M.Insel, Perspectives in nutrition third edition, Mosby-year Book,Inc.St.Louis,Missouri,2015
3. Krause, M.V. and Hunesher, M.A., Food, Nutrition and Diet Therapy, 14th Edition, W.B. Saunders Company, Philadelphia, London, 2013

Course Outcomes:

1. Application of the science of nutrients in normal and disease conditions.
2. Able to conceptualize, implement and evaluate the functions, metabolism, requirements and effects of deficiency of nutrients
3. Understand the role of food and nutrients in health and disease prevention.
4. Gain basic knowledge and apply the principles of nutrition to ensure good health for the individual and community
5. Evaluate nutrition information based on scientific reasoning for clinical and community application.

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2	PSO 3
CO 1	H	M	H	H	M	M	H	M	H	M	H	H	M
CO 2	H	M	H	H	M	H	M	H	M	H	H	M	M
CO 3	H	M	H	M	M	M	M	M	H	H	H	H	M
CO 4	H	M	H	M	M	M	M	M	H	H	H	H	M
CO 5	H	M	H	M	M	M	M	M	H	H	H	H	M
CO 6	H	M	H	M	M	M	M	M	H	H	H	H	M

Principles of Nutrition Practical V

Semester IV **Hrs of Instruction /Week:4**

23BFNC07P **No. of Credits:2**

Course Objectives:

1. To learn the qualitative and quantitative analytical tests in foods.
2. To understand the principles of reaction in the identification of nutritional constituents of foods.
3. To acquire the skills to analyze nutritional components of foods.
4. To demonstrate the analysis of nutritional constituents in foods.
5. Gain Knowledge on the energy value of foods and the energy requirements of Individual

S.No.	Practical / Related Experience	
1.	Qualitative tests for sugars – Glucose, Fructose, Lactose, Maltose, Sucrose	**12**
2.	Quantitative estimation of glucose	**3**
3.	Qualitative tests for protein	**3**
4.	Demonstration of estimation of nitrogen	**9**
5	Qualitative Tests for Minerals	**6**
6	Quantitative Estimation of Iron	**6**
7	Quantitative Estimation of Calcium	**6**
8	Quantitative Estimation of Phosphorus	**3**
9	Quantitative Estimation of Ascorbic Acid	**3**
10	Demonstration of fibre and total fat estimation	**9**
	Total Hours	**60**

Text Books:

1. Varley, H., Gowenlak, A.H. and Hill, M. Practical Clinical Biochemistry, William Itinmaon Medical Books, London, 2010.
2. Oser, B.L., Harke's Physiological Chemistry XIV Edition Tata McGraw Hill Publishing Company Ltd., Bombay, 2011

Reference Books:

1. Sadasivam, S. and Manickam, A. Biochemical Method, Second Edition, New AgeInternational P. Ltd., Publishers, New Delhi, 2013.
2. Raghuramulu, N., Madhavannair, K. and KalyanaSundaram, National Institute of Nutrition, 2013, A Manual of Laboratory Techniques, Hyderabad, 500007

Course Outcomes:

1. Develop skills in qualitative analysis and quantitative estimation of nutrients
2. Understand the identification of different types of sugars, proteins and minerals
3. Acquire the skills to quantify organic and inorganic components of foods.
4. Able to identify and analyse constituents in foods in a logical sequence of steps of analysis.
5. Estimate the quantity of macro nutrients in food

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PS O 1	PS O 2	PS O 3
CO 1	H	M	H	M	M	M	M	M	H	M	H	H	M
CO 2	H	M	H	M	M	M	M	M	H	M	H	H	M
CO 3	H	M	H	M	M	M	M	M	H	M	H	H	M
CO 4	H	M	H	M	M	M	M	M	H	M	H	H	M
CO 5	H	M	H	M	M	M	M	M	H	M	H	H	M

Family Meal Management

Semester IV **Hrs of Instruction /Week:4**

23BFNC08 **No. of Credits:4**

Course Objectives:

1. Understanding the basics of RDA in planning a diet for adults
2. Study the nutritional needs for special physiological conditions
3. Develop skills in planning adequate diet for all age groups by understanding their growth and development, requirements and nutritional problems

Unit 1: Introduction to RDA and Balanced Diet **12**

Basics for Recommending the Dietary Allowances, Acceptable Dietary Intake, Purposes of RDA, Factors Affecting Recommended Dietary Allowances, Requirements and Recommended Dietary Allowances, Uses of ICMR RDA in planning balanced diet, Consumption Units.

Unit 2: Nutrition in Pregnancy and Lactation **12**

Nutrition in Pregnancy and Lactation- Physiological Changes Occurring during Pregnancy, Importance of Food and Nutritional Care and Requirement, Dietary Modification, General Dietary Problems and Complications, Involvement of Hormones in Lactation, Factors Affecting the Volume and Composition of Breast Milk, Nutritional Requirements

Unit 3: Nutrition in Infancy **12**

Growth and Development of Infants, Food and Nutritional Requirements, Composition of Human Milk, Human Milk Substitute, Bottle Feeding and related Problems, Weaning and Supplementary Feeding Foods, Feeding Problems and Complication, Commercial fortified infant formula vs natural weaning and supplementary instant foods.

Unit 4: Nutrition in Childhood and Adolescence **14**

Growth and Development, Food and Nutritional Requirements for Pre School, School Going Children and Adolescence. Factors to be considered while Planning Diet for Children and Adolescents, Growth Spurt, Food Habits, Dietary Guidelines, Food and Nutritional Requirements, Nutritional and Behavioral Problems and Eating Disorders.

Unit:5 Nutrition for Adult and Elderly **10**

Food and Nutritional Requirements of Elders, Processes of Aging, Nutrition Related Problems of Old Age, Reference Man and Woman, Food and Nutritional Requirements for Adults doing Different Activities, Dietary Guidelines and diet Modifications

Total Hours 60

References:

1. Mahtab, S, Bamji, Kamala Krishnasamy, G.N.V. Brahmam, Text Book of Human Nutrition, Third Edition, Oxford and IBH Publishing Co. P. Ltd., New Delhi,2012.
2. Srilakshmi, B., Dietetics, New Age International (P) Ltd., New Delhi,2013.
3. Swaminathan, M., Advanced Textbook on Food and Nutrition, Vol. 1, Second Edition, Bangalore Printing and Publishing Co. Ltd., Bangalore,2012.

Journals:

1. Dietary Guidelines for Indians, ICMR, National Institute of Nutrition, Hyderabad, 2013.
2. Gopalan, C. Rama Sastri B.V. and Balasubramanian, Nutritive Value of Indian Foods, NIN, ICMR, Hyderabad,2014.
3. Krause,M.V. and Hunscher, M.A., Food, Nutrition and DietTherapy,14thEdition, W.B. Saunders

Course Outcomes:

1. Comprehend the dietary guidelines in meal planning
2. Acquainted with meal planning for all age groups
3. Enable to familiarize with meal management appreciating the physical and physiological changes of individual

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO 1	PSO 2	PSO 3
CO 1	M		**M**	**H**	**L**	**L**	**H**	**M**	**H**	**L**	**M**	**M**	**H**
CO 2	**M**	**L**	**H**	**H**		**M**	**H**	**M**	**H**	**L**	**L**	**M**	**H**
CO 3	H		H	H	M	L	H	M	H	H	M	H	M

Family Meal Management Practical VI

Semester IV **Hrs of Instruction /Week:4**

23BFNC08P **No. of Credits:2**

Course Objectives:

1.Get familiar with weights, measures of both raw ingredients and cooked foods
2.Enable students to understand the basics of planning menu and prepare food items for different age and income groups
3.Understand the role of a dietitian, home maker in planning and preparing a menu

1	Planning, Preparing and Evaluating Diet for Pregnant Mother	8
2	Planning, Preparing and Evaluating Diet for Lactating Mothers	8
3	Planning, Preparing and Evaluating Menu for Infants (Supplementary Foods)	7
4	Planning, Preparing and Evaluating Diet for Preschoolers	8
5	Planning, Preparing and Evaluating Diet for School Going Children	8
6	Planning, Preparing and Evaluating Diet for Adolescents	7
7	Planning, Preparing and Evaluating Diet for Adults	**7**
8	Planning, Preparing and Evaluating Diet for Elderly	**7**
	Total Hours	**60**

Reference books:

1. ***Dietary Guidelines for Indians, ICMR, National Institute of Nutrition***, Hyderabad,2013.
2. **Gopalan,C.Rama Sastri B.V.and Balasubramanian, Nutritive Value of Indian Foods,** NIN, ICMR, Hyderabad, 2014.
3. ***Srilakshmi, B., Dietetics,*** New Age International (P) Ltd., New Delhi,2013.
4. ***Swaminathan, M., Advanced Textbook on Food and Nutrition***, Vol. 1, Second Edition, Bangalore Printing and Publishing Co. Ltd., Bangalore,2012.

Course Outcomes:

1. Develop skills in preparation of various food items using five food groups for a day
2. Apply the knowledge in preparing variety items with various nutrients
3. Developing competence in the management of time, fuel and resources by adopting different cooking methods
4. Understand the basic concept of meal management, meal planning for all age groups

CO / PO	PO1	PO 2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO 1	M	M	**H**	**H**	**H**	**M**	**H**	**M**	**M**		**H**	**M**	**H**
CO 2	**M**	**M**	**H**	**H**	**M**	**M**	**H**	**M**	**M**		**M**	**L**	**H**
CO 3	**M**	**L**	**L**	**L**	**L**	**H**	**H**		**M**		**M**	**L**	**H**
CO 4	**M**		**M**	**M**	**L**	**L**	**H**		**M**		**M**	**L**	**H**

Nutrition in Diseases

Semester V **Hrs. of Instruction/Week: 4**
23BFNC09 **No. of Credits: 4**

Course Objectives:

1. Learn about the growth and scope of dietetics and concepts of diet therapy
2. Learn about the causes, symptoms and treatment of various disease conditions
3. Gain knowledge about the role of nutrition in disease conditions.
4. Develop skills and techniques in the planning and preparation of therapeutic diets for various disease conditions.

Unit1: Concepts of diet therapy and diet for Fever, Obesity and Underweight **12**

Growth and Scope of Dietetics, Role of Dietitians.
Principles and classification of Therapeutic Diets.
Fever - Causes, Types, Metabolic Changes, Diet Modifications for Typhoid, Tuberculosis, Malaria, Pneumonia, Influenza, SARS
Obesity – Etiology, Assessment, Complications, Diet modifications.
Importance of Exercise.
Underweight: Etiology, Diet Modifications.

Unit2: Diseases of the Cardio Vascular System and Diabetes Mellitus **12**

Cardiovascular Diseases – Atherosclerosis, Coronary Heart Disease,
Congestive Heart Failure: Etiology, Complications, Diet Modifications.
Hypertension – Etiology, Sodium Restricted Diets, Fat Controlled Diets.
Diabetes Mellitus - Etiology, Types, Clinical and Biochemical Changes, GTT, HbA1c, Diet Modifications, Use of Food Exchange Lists.
Insulin-Types, Glycemic Index, Acute and Chronic Complications of Diabetes.

Unit3: Diseases of liver and Gastro Intestinal Tract **12**

Functions of Liver Damages Caused, Clinical Symptoms of Fatty Liver Jaundice, Hepatitis Cirrhosis, Hepatic Coma Diet Modifications.
Diseases of Gastrointestinal Tract – Gastritis, Peptic Ulcer: Etiology, Clinical symptoms, Diagnosis, Treatment by Drugs and Diet Modifications.
Diarrhea, Dysentery, Constipation - Etiology and Diet Modifications.

Unit4: Disease of Kidney **12**

Functions of Kidney, Diseases of Renal System, Damages Caused,
Clinical Symptoms, Nephritis, Diet Modifications.
Nephrosis, Nephrosclerosis, Acute and Chronic Renal Failure.
Dialysis – Principles and Types.
Kidney Stones – Etiology, Types, Diet Modifications, Uremia.

Unit:5 Nutrition in Cancer and HIV **12**

Etiology of Cancer, Types of Cancer, Goals of Nutritional Care, Dietary Recommendation for Cancer Survivors.
Nutritional therapy for Cancer, HIV prevention and treatment, Definition-HIV and AIDS, Causes, Stages of HIV infection, Opportunistic Infections in HIV/AIDS, Treatment, Relationship between Nutrition and AIDS, Nutritional Management in HIV/AIDS.

Total Hours **60**

Text Books:

1. Srilakshmi, V. Dietetics New Age International P. Ltd., New Delhi,2016.
2. Dietary Guidelines of Indians–A Manual, National Institute of Nutrition, Hyderabad, 2015.
3. Garg, M. Diet, Nutrition and Health, ABD Publishers, 2016.

Reference Books:

1. ***Krause, M.V. and Mahan, L.K. Food, Nutrition and Diet Therapy***, 9th Ed., W.B. Saunders Company, Philadelphia,2009.
2. ***Maimun Nisha, Diet Planning for Diseases***, Kalpaz Publishers,2016.

Course Outcomes:

1. Understand the principles of diet therapy and role of dietitians and gain knowledge on the etiological factors, complications and dietary modifications in Fever, obesity and underweight
2. Enumerate on the etiology, complications and dietary modifications of various cardiovascular diseases and causes, types, biochemical changes, glycemic index, complications and dietary management of diabetes mellitus.
3. Understand the functions, clinical symptoms and damages caused in various liver diseases and gastrointestinal diseases.
4. Enumerate on functions of kidney and the damages, clinical symptoms and dietary modifications of various kidney diseases
5. Gain knowledge on causes, nutritional care, treatment of cancer and HIV.

CO/ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PS O1	PS O2	PS O3
CO1	M	-	H	H	L	M	L	L	H	-	M	M	M
CO2	L	-	L	M	-	M	-	L	H	-	M	M	M
CO3	L	-	L	M	-	M	-	L	H	-	M	M	M
CO4	M	-	M	L	L	M	-	L	H	-	M	M	M
CO5	M	-	M	L	L	M	-	L	H	-	M	M	M

Nutrition in Diseases Practical VII

Semester V **Hours of Instruction / week –4**

23BFNC09P **No. of Credits – 2**

Course Objectives: To enable the students to

1. Understand the basic principles in diet planning
2. Develop skills and techniques in planning and preparation of therapeutic diets for various disease conditions
3. Gain experience in planning diet for different disease conditions

Unit	Topic	Hours
1	Preparation of Hospital Diets- Modification of diet with respect to texture, consistency and nutrients	**3**
2	Diets for Febrile Conditions – TB, Typhoid	**3**
3	Modification of Diets in Obesity	**3**
4	Modification of Diets in Underweight	**3**
5	Modification of Diets in Diabetes Mellitus	**6**
6	Diets for Cardiovascular diseases – Sodium Restricted, Fat Controlled	**9**
7	Modification of Diets in Peptic Ulcer	**6**
8	Diets for Constipation and Diarrhea	**3**
9	Diets for Nephritis, Renal Calculi and Protein Restricted Diets	**9**
10	Modifications of Diets in Liver Diseases – Jaundice, Hepatitis and Cirrhosis	**9**
11	Nutrient dense recipes Cancer Patients and HIV Infected Person	**6**
	Total Hours	**60**

Text Books:

1. ***Srilakshmi, V. Dietetics*** New Age International P. Ltd., New Delhi,2011.
2. ***Dietary Guidelines of Indians – A Manual,*** National Institute of Nutrition, Hyderabad, 2011.
3. ***Garg, M. Diet, Nutrition and Health***, ABD Publishers, 2006.

Reference books:

1. ***Krause, M.V. and Mahan, L.K. Food, Nutrition and Diet Therapy***, 9th Ed., W.B. Saunders Company, Philadelphia, 2009.
2. ***Maimun Nisha, Diet Planning for Diseases***, Kalpaz Publishers, 2006.

Course Outcomes:

1. Understand the basic principles involved in planning diets for different disease conditions.
2. Plan and prepare diets to meet out the quality and quantity requirements for specific disease conditions
3. Acquire practical knowledge of therapeutic diet to meet their requirement
4. Gain knowledge in planning and preparing diets for CVD, diabetes, hypertension, peptic ulcer, cancer and the like
5. Understand the calculations of nutritive value for the planned and prepare diet

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO 1	PSO 2	PSO 3
CO 1	**M**		**M**	**M**	**M**	**M**	**M**	**L**	**H**		**H**	**H**	**H**
CO 2	**M**		**M**	**M**	**L**	**M**	**M**	**L**	**M**		**H**	**H**	**H**
CO 3	**M**		**M**	**M**	**L**	**M**	**M**	**L**	**H**		**M**	**H**	**H**
CO 4	**M**		**M**	**M**	**L**	**M**	**M**	**L**	**M**		**H**	**M**	**H**
CO 5	**M**		**M**	**M**	**L**	**M**	**M**	**L**	**M**		**M**	**L**	**H**

Food Preservation and Processing

Semester V **Hrs of Instruction/Week: 4**
23BFNC10 **No. of Credits: 4**

Course Objectives:

1. Understand the importance of food preservation and processing
2. Gain knowledge on the types of food spoilage
3. Comprehend the use of different temperatures in food processing
4. Understand processing of various foods using sugar,chemicals and salt
5. Understand the principles and concept of food fermentation

Unit 1: Introduction to Food Preservation **10**

Importance of Food Preservation, Types of Food Preservation, Types of Spoilage, Basic Principles of Food Preservation.

Unit 2: Preservation by Using Sugar **12**

Sugar Concentrates – Principles of Gel Formation,
Preparation of Jam, Jelly, Marmalades
Preserves, Candied, Glazed, Crystallized Fruits
Preparation and Preservation of Fruit Juices, RTS, Squash

Unit 3: Preservation by the Use of Low Temperature **12**

Refrigeration and Freezing Advantages, Factors to be Considered, Difference Between Refrigeration and Freezing, Methods of Freezing, Freeze drying and Dehydro Freezing, freeze concentration, Steps Involved in Freezing Common Foods, Common spoilages, Storage.

Unit 4: Preservation by the Use of High Temperature -Drying, Dehydration **11**

Sun Drying, Solar Drying and Dehydration, Method of Drying, Mechanical Dehydration, Merits and demerits, Factors Affecting Drying, Preparation of foods for Drying, Mechanism and Advantages, Spray drying, Canning, Steps Involved, Types of Cans, Spoilage Encountered**,** Pasteurization and Sterilization

Unit 5: Preservation by Using Chemicals and Salts Fermentation **15**

Definition, Types of fermentation, Advantages. Common Fermented Foods, Wine and Cheese making, Tomato processing, General consideration Involved in preparation of sauce/ketchup. Pickling – Principles Involved and Types of Pickles- Indian Pickles, Vinegar, Salt Preservation, Chemical Preservatives – Definition, types of Preservatives Role of Preservation, Permitted Preservatives, and FPO Specifications.

Total Hours **60**

Text Books:

1. ***Sivasankar, B. (2013) Food Processing and preservation*** 2nd edition, prentice Hall, Pvt, Ltd.
2. ***Srilakshmi, N., (2016) 6th Edition, Food Science,*** New Age International Private Ltd., New Delhi,2002.
3. ***Swaminathan, M., Food Science***, Chemistry and Experimental Foods, Bappco Publishers, Bangalore, 2014.
4. ***Chandrasekhar, U, Food Science and Applications in Indian Cookery***, Phoenix Publishing House Private Ltd., New Delhi, 2012.
5. Preservation of Fruits and vegetables- Girdhari Lal, G. S. Siddappa, G. L. Tandon ; Publisher, Indian Council of Agricultural Research, 1960 ; Original from, University of California, Berkeley.

Reference Books:

1. ***Adams, M.R. and Moss, M.O., Food Microbiology***, New Age International (P) Ltd., New Delhi,2015.
2. ***Fellow, P., (2010) Food Processing Technology*** – Principles and Practices, 3rd Edition, CRC Press Woodland Publishers, England.
3. ***Sommers, C.H. and Xveteng Fan, Food Irradiation Research and Technology***, Blackwell Publishing, 2016.

Course Outcomes:

1. Understand the role of micro-organisms in food spoilage
2. Recall the terms in food preservation and explain concept of shelf life and factors affecting quality of food
3. Analyze the different types of drying and food concentration methods
4. Differentiate between various methods of freezing and its changes during preservation
5. Analyze the role of natural, chemical preservatives and recent preservation techniques
6. Apply the knowledge/ concepts to develop new products with minimal processing for Better retention of essential nutrients

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PS O1	PS O2	PS O3
CO1	M	L	M	-	-	-	L	L	M	-	L	M	L
CO2	L	L	M	-	-	-	L	M	L	-	M	L	M
CO3	M	L	M	L	L	L	M	L	L	M	M	M	L
CO4	M	L	M				M	L	M	L	L	M	M
CO5	M	L	M		L	L	L	L	M	L	L	M	M

Food Preservation and Processing Practical VIII

Semester V **Hrs of Instruction/Week:4**

23BFNC10 P **No. of Credits:2**

Course Objectives:

1. To learn the principles behind the methods of preservation
2. To understand the stages of cookery and chemical characteristics in the preservation of fruits
3. To formulate preserved fruit products with nutritional value addition
4. To acquire skills to preserve different food groups based on perishability

Unit 1: Stages in sugar cookery, Evaluation of pectin quality, sugar concentration (Brix), pH and acid content **12**

Unit 2: Preparation of jam, jelly, marmalades, preserves, candied, Tutti fruity Glazed, Crystallized fruits, Toffees, Preparation of dehydrated Fruits- Fruit Flakes / Fruit bars **12**

Unit 3: Preparation of squashes, fruit juice and RTS **12**
Preparation of Tomato sauce, Tomato ketchup

Unit 4: Preparation of pickles (oil, vinegar and salt based)Preparation of salted, dehydrated, vegetables preserves (vathals} **12**

Unit 5: Preparation of dehydrated cereal and pulse products (vadams) -Rice, Sago, Wheat, Maida, Rice flakes, black gram dhal, green gram dhal, Horse gram dhal. **12**
Visit to Fruits and Vegetable processing industry.

Total Hours 60

Text Book

1. ***Srivastava R.P. Fruit and vegetable preservation – Principles and Practices***, International Book Distributing Co., (IBDC), New Delhi..2013

Reference Books:

1. ***Maria Parloa (2012), Canned fruit, preserves and jellies: Household methods of preparation,*** Published by US department of Agriculture, Washington
2. ***M. Shafiur, Rahman (2017), Handbook of food preservation*** 2nd edition, CRC press.

Course Outcomes:

1. Know the principles of preservation behind the methods of preservation.
2. Understand the stages of sugar cookery, quality of pectin and acidity in the development of preserved fruit products.
3. Acquire skills to formulate fruits based preserved products with value addition for nutritional benefits.
4. Explore the principle of preservation in vegetables-based products and develop new products with maximum retention of essential nutrients
5. Prepare cereals and pulses based preserved products focusing the principle of preservation.

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PS01	PS02	PSO3
CO1	CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1
CO2	CO 1	L	L	L	L		M	M	L	L	M	L	M
CO3	CO 2	L			L		L	M	M	M	M	M	M
CO4	CO 3	L	M	M			H	M	M	M	H	M	M
CO5	CO 4	L	M	L			H	M	M	M	M	M	M

Product Development and Marketing

Semester VI **Hrs of Instruction/Week:4**

23BFNC11 **No. of Credits: 4**

Course Objectives:

1. Identify new marketable, nutritionally, and economically viable food products.
2. Develop entrepreneurship skills for setting up small scale food industries.
3. Understand packaging of different food products.

Unit 1	**Food consumption pattern** Trends in Food Consumption pattern. Economical, Psychological and Sociological, Dimensions of Food Consumption patterns. Trends in Social Change as a Base for New Product Development	**12**
Unit 2	**Introduction to Food Processing and Product Development** Food Components, Types of Food Processing, Status of Food Processing Industry in India and Scope of Growth in Future Principles and Purpose of New Product Development, Product Design and Specifications.	**12**
Unit 3	**Recipe Development** Traditional Foods, Weaning Foods, Convenience Foods, RTE, RTS, Extruded foods, IMF Foods, Speciality Products, Health foods, Nutritional Supplements, Functional Foods, Nutraceuticals and Designer Foods, Plant proteins – Emerging foods / Alternate to meat proteins, Sports Foods, Foods for Defence Services, Space foods.	**12**
Unit 4	**Testing, Evaluation and Packaging of Products** Standardization, Portion size, Portion Control, Quantity Cooking, Shelf-Life Evaluation - Sensory and Microbial Testing of Processed Foods, Nutrient, Safety and Quality Analysis Suitable Packaging Materials for Different Foods, SWOT Analysis.	**12**
Unit 5	**Financial Management and Marketing of Food Products** Institutional Support (Training and Finance) for Entrepreneurship Development Financial Institutions (Central and State Government) banks/Funding Agencies, Financial Accounting Procedures, Book keeping, Market Research, Marketing Strategies, Cost Calculation, Advertising Methods, Product sales, Product License, Legal specifications, Consumer Behaviors and Food Acceptance	**12**
	Total Hours	**60**

Text Books:

1. ***Sudhir Gupta (2017) Handbook of Packaging Technology***, Engineers India Research Institute, New Delhi
2. ***Khanaka, S.S., Entrepreneurial Development***, S. Chand and Company Ltd, New Delhi, 2016.

Reference Books:

1. ***Suja, R. Nair (2014) Consumer Behaviour and Marketing Research***, 1st Edition, Himalaya Publishers.
2. ***Hmacfie,(2017) Consumer led Food Product Development***, Weedhead Publishing Ltd., UK
3. ***Fuller, Gordon,W (2015) New Food Product Development***, 2nd Edition, CRC Press, Boca Raton, Florida,
4. ***Schaffner .D,J, Schroder , W.R.(2010)Food Marketing and International Perspectives,*** Web/McGraw Hill Publication

Course Outcomes:

1. Learn the trends and dimensions in food consumption pattern
2. Recall the types of food processing techniques
3. Apply the principles in product development and design
4. Understand the different steps involved in development of food products, testing and evaluation
5. Develop entrepreneurship skills in financial and marketing strategies

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2	PSO 3
CO 1	M	H	H	H	H	H				H	M	H	H
CO 2	M	M	M	H	L	H		L		H	H	H	H
CO 3	H	L	H	H	H	H			L	H	H	H	H
CO 4	H	H	H	M	H	H	M			H	H	H	H
CO 5	M	M	H	H	H	H				H	M	H	H

Product Development and Marketing Practical IX

Semester VI **Hrs. of Instruction/Week: 4**

23BFNC11P **No. of Credits: 2**

Course Objectives:

1. Identify suitable food groups for developing products
2. Categorize the foods for developing recipes and preserved foods
3. Understand the steps involved in the preparation of a new food product
4. Standardize the developed food product for large scale cooking
5. Learn marketing techniques and launch the developed products

Product Development and Standardization

A	1. Cereal Based Foods	**9**
	2. Pulse Based Foods	**9**
	3. Fruit Juices, Squash, Jams and Preserves	**6**
	4. Pickles, Ketchup, Sauce	**6**
	5. Weaning Foods	**6**
	6. Health Foods and Nutritional Supplements	**9**
	7. Convenience foods, RTS and RTE foods	

Marketing of a product

B	1. Selection of a product, preparation, standardization, and quality cooking	**6**
	2. Selection of packaging material, labeling, cost calculation and marketing	**6**
	3. Presentation of report	**3**
	Total hours	**60**

Text Books:

1) ***Sudhir Gupta (2007) Handbook of Packaging Technology***, Engineers India Research Institute, New Delhi
2) ***Khanaka, S.S., Entrepreneurial Development***, S. Chand and Company Ltd, New Delhi, 2006.

Reference Books:

1) ***Suja, R. Nair (2014) Consumer Behaviour and Marketing Research***, 1st Edition, Himalaya Publishers.
2) ***Hmacfie,(2007) Consumer led Food Product Development***, Weedhead Publishing Ltd., UK
3) ***Fuller, Gordon, W(2005) New Food Product Development***, 2nd Edition, CRC Press, Boca Raton, Florida,
Schaffner.D,J, Schroder,W.R.(2010)Food Marketing and International Perspectives,Web/Mc Graw Hill Publication

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2	PSO 3
CO 1	H					M					L	M	M
CO 2	M	L	M			H		L		H	L	M	M
CO 3	H		H	H	M	H	L	H	L	H	L	M	L
CO 4	H	M	M	H			M	M	H	H	H	L	M
CO 5	M	M	H	H	M	L	L	M	L	H	L	L	M

Assessment of Nutritional Status

Semester V **Hrs of Instruction/Week:4+4**
23BFNC12 **No. of Credits:6**

Course Objectives:

1. Understand the significance of nutritional assessment
2. Gain knowledge on methods of assessing nutritional problems
3. Study the direct methods of nutritional assessment
4. Acquire skills in diet and nutrition surveys
5. Provide insight on indirect methods of nutritional assessment

Unit1: Introduction to Nutritional Assessment **12**

Definition of Nutritional Status, Objective and Classification of Methods – Malnutrition, Under Nutrition, Over Nutrition

Characteristics of the ideal nutrition assessment method , Objectives of nutrition assessment; Nutrition assessment systems. Nutrition screening and risk assessment, Nutrition Surveillance Systems-International, National and Community

Unit2: Direct Methods of Nutritional Assessment **12**

Nutritional Anthropometry – Definition, Instruments, Standard of Reference, Age Assessment, Measurement Techniques, Weight, Linear Measurement, Circumferences, Soft Tissue Subcutaneous Fat, Body Composition, Growth Charts and BMI Percentiles

Clinical Examination – Specific Deficiency, Signs that need further investigation, Grouping of Signs, Classification systems to identify individuals at risk of malnutrition. Identifying signs of PEM, Vit A,Anemia, Iodine deficiency. Interpretation of descriptive list of clinical signs.

Practicals : Standardised techniques for the assessment of Height, Body weight, Head circumference, Chest circumference, Mid Upper Arm circumference, Skinfold thickness, Waist and Hip Circumference, Waist hip ratio, Body fat and body composition analysis. **15**

Clinical examination for PEM, Vit A and Iron deficiencies using ICMR proforma

Unit3: Biochemical Tests and Biophysical Methods **12**

Definition of Biochemical tests, Collection of Samples

Test for Specific Nutrients – Protein, Vitamin A, D, Ascorbic Acid, Thiamine, Riboflavin, Niacin, Iron, Folic Acid, Vitamin B12

Definition of Biophysical Method – Test for Physical Function

Radiographic Examination, Cytological Tests

Practicals : Standardised techniques for Collection of blood and urine samples. Haemoglobin estimation. BP measurement **9**

Unit4: Diet and Nutrition Surveys **12**

Types of Dietary Survey, General Survey, Special Survey, Comparison with Nutritional Requirements

Longitudinal Survey, Cross Sectional Survey, Merits and Demerits

Food Frequency Questionnaire , Food models and Z-score calculations

Interpretation-concept of consumption unit, intra and inter individual Distribution in family,Adequacy of diet with respect to RDA.

Objectives of nutrition survey; Uses of nutrition survey; Classification of nutrition surveys; Types of nutrition surveys; Planning & organization of nutrition surveys.

Practicals : Conduct of nutrition and diet surveys using Food weighment method, 3 day 24 hr recall, food frequency questionnaire , calculation of food and nutrient intake, comparison with RDA for adequacy of diet, Z-score calculation. **12**

Unit:5 **Indirect Methods of Nutritional Assessment** **12**

Vital Statistics, Age Specific Mortality Rate, Morbidity and Cause of Specific Mortality

Ecological Factors, Methods of Obtaining Information, Background Data

General Survey Data, Special Survey, Conditioning Infection, Nutritionally Relevant infection, food production, food consumption, cultural factors, socio economic profile and medical and educational services.

Practicals : Designing of Interview Schedule and Questionnaire for Socio economic, demographic and health surveys. Checking for Reliability and Validity.

Survey on ecological factors in Urban and rural areas for one day. **24**

Visit to Corporation Hospitals in Urban area and Rural Primary Health Centres

Total Hours 120

Text Books:

1. Mahtab, S. Bamji, 1996, Textbook of Human Nutrition, Oxford and IBM Publishing Co. Pvt. Ltd., New Delhi.
2. Park, K. 1995, Parks Textbook of Preventive and Social Medicine, Banarside Bhanot Publishers, Jabalpur.
3. Srilakshmi, B. 2002, Nutrition Science, New Age International Pvt. Publishers, New Delhi.
4. Gopalan.C, Rama Sastri, B.Vand Balasubramian, S.C,Nutritive Value of Indian Foods, NIN, ICMR,2021
5. Nancy Munoz and Melisa Bernstein ,Nutritional Assessment – Clinical and Research Application, Jones and Bartlett Publishers, Inc,2018

Reference Books:

1. Brahman, G.N.V., Lakshmaiah, A., Rao, M. and Reddy, G. (2005) Methodology on Assessment of Diet and Nutritional Status of Community, National Institute of Nutrition, Hyderabad.
2. Jellifee, D.B., 1989 The Assessment of Nutritional Status of the Community, WHO, Geneva.
3. Kathleen Mahan.L and Sylvia Escott-Stump, Krause's Food & the Nutrition Care Process - E-Book, Elsevier Health Sciences, 2011
4. Krause, M.V and Huncher.A. Food Nutrition and Diet Therapy, W.B Saunders Co ,2000

Course Outcomes:

1. Understand the principles and practicalities of methods used in assessing food/nutrient intake
2. Evaluate methods in terms of strengths, limitations and appropriateness for particular populations, individuals, clinical situations and study designs.
3. Practice nutritional screening, dietary and nutritional assessment of individuals in different situations.
4. Demonstrate leadership skills through effective and efficient group work
5. Plan and execute nutrition education programmes.

CO/ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PS O1	PS O2	PS O3
CO1	H		**H**	**H**			**H**	**H**	**H**	**H**	**H**	**H**	**H**
CO2	**H**	**L**	**H**	**M**		**M**	**H**	**H**	**H**	**H**	**H**	**H**	**H**
CO3	H	L	L				H	H	H	H	M	M	H
CO4	H	M	H				H	H	H	H	H	H	H
CO5	H	L	H	H			H	H	H	H	H	H	H

Department of Food Science and Nutrition
Professional Development Course
Professional Aspects of Food Safety

Semester I **Hrs of Instruction/week: 1 hr**
23BFNPD1 **Credits: Remarks**
Course Objectives:

1. To know the national and international food safety laws.
2. To understand the functions and initiatives of FSSAI.
3. To acquire skills for applications for food safety management systems.

UNIT 1: Indian Food Law **3 Hours**
Food Safety and Standards Act of India, 2006: The Food Safety and Standards Regulation, 2011, Provision, definitions and different sections of the Act and implementation.

UNIT 2: FSSAI - Role, Functions and Initiatives **3 Hours**

Genesis and Evolution of FSSAI
Structure and Functions of Food Authority of India
Overview of systems and processes in Standards, Enforcement, Certification, Laboratory, ecosystem, Imports, Third Party Audit etc.

UNIT 3: FSSAI Initiatives **3 Hours**
Eat Right India, FoSTac, Food Fortification, Clean Street Food Hub, RUCO, Food Safety on Wheels, Food Smart Consumer, Detect Adulteration with Rapid Test (DART).

UNIT 4: Food Safety Management Systems **3 Hours**
Introduction to Hazard Analysis and Critical Control Points (HACCP), Good Production and Processing Practices (GMP, GAP, GHP, GLP, BAP) and Standard Operating Procedures (SOPs)

UNIT 5: International Food Control System **3 Hours**
Overview of CODEX Alimentarius Commission (History, Members, Standards Setting, Advisory Mechanisms: JECFA, JEMRA, JMPR), WTO Agreements, FDA (SPS/TBT)

Total Hours: 15 Hours

Course Outcomes:

1. Knowledge on national and international food safety laws.
2. Understand the functions and initiatives of FSSAI in India.
3. Ability to implement and evaluate food safety management systems.

References:

1. Lexis, The Food Safety and Standards Act, 2006, Edition 2022, Universal Publishers, New Delhi.
2. Rajan Nijhawan, Food Safety and Standards Act, 2006, Rules & Regulations, 24th Edition, 2023, ILBCO India Publisher, New Delhi.
3. Muckett, M., & Furness, A. (2007). *Introduction to fire safety management*. Routledge.
4. FSSAI Website: www. fssai.gov.in for FSSAI publications and guidelines

Department of Food Science and Nutrition
Professional Development Course
Food Adulteration

Semester III **Hrs of Instruction/week: 3**
23BFNPD2 **Credits: Remarks**

Course Objectives:

- To gain elementary knowledge on various foods and adulteration
- To identify the adulteration of common foods and their adverse effect on health
- To understand basic skills in detecting food adulterants
- To understand food quality control and management
- To create consumer awareness and education

Unit 1	**Common Foods and Adulteration** Introduction to food and adulteration – definition, types, common foods subjected to adulteration - toxic substances, foreign matter, cheap substitutes, and spoiled foods; Food adulteration – definition, types of adulterants - intentional and incidental adulterants, methods of detection, health hazards and risks; Food hazard - definition, types.	**9 Hours**
Unit 2	**Adulteration of Common Foods and Methods of Detection** Adulteration, methods of detecting adulterants in common foods – cereals, pulses, fruits and vegetables, meat, fish and poultry, milk and milk products, fats and oils, sweeterners, spices and condiments, processed foods, additives	**9 Hours**
Unit 3	**Food Additives** Food additives – classification, nature and characteristics, use of additives in foods - antioxidants, chelating agents, colouring agents, curing agents, emulsions, flavours and flavour enhancers, flour improvers, humectants and anti-caking agents, nutrient supplements, non-nutritive sweeteners, artificial colours and flavours	**11 Hours**
Unit 4	**Quality Control and Quality Management in Food** Quality control - definition, scope, significance and objectives of quality management, dimensions of quality in foods, food quality evaluation techniques, quality control vs quality assurance. Quality control laboratories of Companies, Private testing laboratories, consumer co-operatives.	**9 Hours**
Unit 5	**Consumer Awareness and Education** Consumer education, Consumer's problems, rights and responsibilities, COPRA 2019 - Offenses and Penalties – Procedures to Complain – Compensation to Victims. Measures of complaints and proforma of complaints.	**7 Hours**
	Total	**45 hours**

Course Outcomes

- Knowledge in food adulteration, types of adulterants, detection and remedies
- Understand the health hazard due to food adulteration
- Familiarise with the additives used in foods.
- Acquire insight into food quality management.
- Recognise the rights and responsibilities of the consumers.

References

1. A first course in Food Analysis – A.Y. Sathe, New Age International (P) Ltd., 1999
2. Food Safety, case studies – Ramesh. V. Bhat, NIN, 1992.
3. Manay, Food Facts and Principles, New Age International (P) Ltd., 2000
4. A.Y.SatheA firstcourseinFoodAnalysis,NewAgeInternational(P)Ltd.,1999
5. Lexis, The Food Safety and Standards Act, 2006, Edition 2022, Universal Publishers, New Delhi.
6. Rajan Nijhawan, Food Safety and Standards Act, 2006, Rules & Regulations, 24th Edition, 2023, ILBCO India Publisher, New Delhi.
7. FSSAI Website: www. fssai.gov.in for FSSAI publications and guidelines
8. https://www.fssai.gov.in
9. https://indianlegalsolution.com/laws-on-food-adulteration/
10. https://fssai.gov.in/dart/ 8. https://byjus.com/biology/food-adulteration/

Department of Food Science and Nutrition
Professional Development Course
Entrepreneurial Skills

Semester V **Hrs of Instruction/week: 6**
23BFNPD3 **Credits: Remarks**

Course Objectives:

- Familiarize the concept, functions and growth of entrepreneurship.
- Develop the skill for entrepreneurial project preparation and appraisal.
- Understand the process and procedure involved in setting up MSMEs.
- Integrate the components of business ethics and entrepreneurship development to inculcate value based corporate practices.
- Discover the value of entrepreneurship in modern society.

Unit 1: Concept of Entrepreneur and Entrepreneurship **18**

Definition and concept - Entrepreneur and entrepreneurship, growth of entrepreneurship in India, Need, Functions, Types, characteristics of a successful Entrepreneur, Distinction between an Entrepreneur and Intrapreneur; social entrepreneurship; Entrepreneurial motivation, Problems in establishing an entrepreneurial system.

Practical: Survey of women entrepreneurs in food industry

Unit 2: Project Analysis **15**

Project identification and classification, internal and external constraints, project objectives, project life cycle, project formulation, need, concept, significance and elements of project formulation, feasibility analysis, project report, content, guidelines for formulating a project report

Practical: Preparation of a project proposal related to food industry

Unit 3: New Ventures **21**

Launching New Ventures: Idea Generation, Developing and Testing, New business ideas, Analyzing environmental dynamics and change, Business models and Industry Trends, Identifying and selling to Appropriate Markets, Marshalling the Information Resources, Developing Teams and Alliances, Business Model Canvas

Funding: Institutional support, Government schemes, Seed Capital, Angel Investors, Crowd Funding, Venture Capitalist

Practical: Preparing, trading and selling a food product.

Unit 4: Micro, Small and Medium Enterprises (MSMEs) **18**

Factors to be considered and Steps for starting a food industry, preparation of project report- guidelines-procedure and formalities for registration, opportunities for an entrepreneurial career features and characteristics of MSME in economic development, problems of small scale enterprises

Practical: To assess the major challenges faced by Micro, Small and Medium Enterprises.

Unit 5: Business Ethics **18**

Business Ethics: Ethics v/s Ethos, Indian v/s Western management, Work Ethos and Values for Indian Managers, Moral dilemmas, Relationship between Morals, Value and Ethics, Ethical Corporate Behavior - Assess practical issues and allot responsibilities, Analyzing current practices and framing a suitable Code of Conduct, ensuring Quality control measures

Practical: Observe ethics followed in a medium enterprise and reporting.

Related Experiences

1. Case studies of women entrepreneurs in food industry.
2. Visit to MSME

Total Hours **90**

Text books:

1. Gupta C.B., and Srinivasan M.P., (2020).Entrepreneurial development, Sultan chand publications New Delhi.
2. K.Ramachandran (2017),'Entrepreneurship Development'. Tata Mcgraw Hill Education Private Limited
3. Vasant desai(2018). Dynamics of Entrepreneurial Development and Management, Himalaya publishing house, Bombay.
4. Kanka S.(2012),'Entrepreneurial Development', 4th edition, S.chand &company Pvt. Ltd, New Delhi.

Reference books:

1. Prasanna Chandra (2019). Project Preparation, Appraisal, Implementaion, Tata MCGraw Hill, New Delhi.
2. Aswathappa,(2009) 'Essentials of Business Environment' 12th Edition, Himalaya Publishing House, New Delhi.
3. Poornima M Chharantimath(2007) 'Entrepreneurship Development Small Business Enterprises' 4th Edition , Pearson Education, India.

Course outcomes:

1. Understand the concept, functions and growth of entrepreneurship in India
2. Familiarize with project identification and feasibility analysis
3. Learn to design and appraise the project and factors influencing the plant location.
4. Understand the government policies for the growth of SSIs
5. Adopt Indian ethics in businesses to stand as a role model through displaying ethical corporate behavior

Department of Food Science and Nutrition

Skill Based Course II

Baking and Icings

Semester III **Hrs of Instruction /Week:4P**

23BFNSE1 **No. of Credits:2**

Course Objectives:

1. To understand the importance of baking
2. To gain knowledge on the principles and role of various food components involved in baking
3. To develop skills in the preparation of various baked products
4. To know the methods of cake decoration
5. To understand the preparation of breads and pastries

1	**Estimation of gluten content of flour** **Preparation of Biscuits / Cookies** - Plain Biscuit, Piped Biscuit, Salt Biscuit, Fruit Biscuit, Marble Biscuit, Short Bread Biscuit, Ginger Biscuit, Coconut Cookies, Chocolate Cookies, Icebox Cookies, Fruit and Nut Cookies	12
2	**Preparation of Cakes** - Egg and Eggless Cakes, Pound Cake, Carrot Cake, Fruit Cake, Genoise Cake, Birthday Cakes, Wedding Cakes, Black Forest, Cheese Cakes, Sponge Cake, Red Velvette Cake, Cup Cake, Brownie	15
3	**Cake Icings** - Butter cream icing, royal icing, glaze icing, ganache, whipped cream icing, fondant, boiled frosting,	12
4	**Preparation of Breads and Pastries** - Bread and variety breads, Coconut Balls, Danish Pastry, Doughnuts, Pizza, Puffs and varieties	12
5	Sensory evaluation of baked products Visit to wheat processing unit and baking unit	9
	Total Hours	**60**

Text Books

1. Yogambal Ashokkumar, Textbook of Bakery and Confectionery, Second Edition PHI Learning Private Limited, New Delhi, 2012
2. Dubey, S.C. (2002), Basic Baking IV Edition, The Society of Indian Bakers, New Delhi
3. Bakers Handbook on Practical Baking (1998), Compiled and Published by US Wheat Associates, New Delhi.
4. The Complete Technology Book on Bakery Products (2004), National Institute of Industrial Research NIR Board, New Delhi

Reference Books

1. Fellows, J.P. (1998), Food Processing Technology- Principles and Practice, Ellis Horword Limited, London.
2. Avantina Sharma, (2006), Text Book of Food Science and Technology, International Book Distributing Co., Chaman Studio Building, Charbagh, Lucknow

Course Outcomes:

1. Concept on bakery items
2. Demonstrate skilfully the role of various food ingredients used in baking
3. Apply skills in the preparation of bakery items
4. Demonstrate various decorative methods on bakery goods
5. Design and prepare variety breads and pastries.

Department of Food Science and Nutrition

Skill Based Course II

Functional Beverages

Semester III **Hrs of Instruction /Week:4P**

23BFNSE2 **No. of Credits:2**

Course Objectives:

1. Gain knowledge about the fundamental concepts of functional beverages.
2. Understand the functional elements and health effects
3. Study the processing technology of functional beverages
4. Gain insight on the preparation of functional beverages

1 Functional Beverages **12**

Discuss the classification of functional beverages – alcoholic and non alcoholic
Demonstration of production and processing, stabilization
Prepare and evaluate the sensory characteristics of selected functional beverages
Determine cost and nutritional aspects of selected functional beverages

2 Functional elements and health effect **12**

Demonstrate different methods of optimization and fortification of functional beverages.
Analyse nutrient content and bioactive elements of any two non fermented functional beverages - antioxidant activity, phytochemical property, omega -3 and MCT's .
Discuss role of beverages in healthy diet, health benefits.
Prepare and evaluate selected fermented beverages

3 Plant based functional beverages **12**

Prepare, evaluate and discuss the bioactive ingredients and benefits of
- Fruit Juices – apple, noni, mangosteen, fruit punch - specify.
- Vegetable juices – carrot, tomato, kale, sprout, apple-beetroot-carrot juice
- Herbal juices – wheat grass, amla, aloe vera, ginger root juice

Soy protein beverages

4 Dairy and caffeinated functional beverages **12**

Prepare, evaluate and discuss the bioactive ingredients and benefits of
Dairy based functional beverages – milk , whey protein and butter milk – smoothies, milkshakes, flavoured products
Caffeinated functional beverages – **functional tea** - green, oolong, black, herbal, **coffee** - black and green coffee , hot chocolate

5 Cereal and Other functional beverages **12**

Prepare, evaluate and discuss the bioactive ingredients and benefits of
- Cereal based functional beverages, Sports beverages, Energy drink
- Water – maple water, enhanced water

Demonstration and preparation of alcoholic beverages - Wine and beer,

Total Hours 60

References:

1. Functional and Medicinal Beverages: Volume 11: The Science of Beverages. (2019). United Kingdom: Elsevier Science.
2. Functional and Speciality Beverage Technology. (2009). United Kingdom: Elsevier Science.
3. Handbook of Functional Beverages and Human Health. (2016). United States: CRC Press.
4. Beverages : Processing and Technology. (2018). (n.p.): Scientific Publishers.
5. Nutrients in Beverages: Volume 12: The Science of Beverages. (2019). United Kingdom: Elsevier Science.
6. Functional Foods and Beverages: In Vitro Assessment of Nutritional, Sensory, and Safety Properties. (2018). Germany: Wiley.

Course Outcomes:

1. Learn about the functional beverages and their types
2. Apply the functional beverages in health and disease
3. Understand the technology of functional beverages
4. Develop novel functional beverages
5. Acquire skill in processing of functional beverages

Department of Food Science and Nutrition

Skill Based Course II

Millet Based Recipes

Semester III **Hrs of Instruction / Week:4P**

23BFNSE3 **No. of Credits:2**

Course Objectives:

1. To understand the importance of millets in the diet.
2. To gain knowledge on the nutritional benefits of millets and value addition
3. To develop skills in the preparation of various millet based products
4. To understand the potential of millets for diversified uses and entrepreneurship
5. To enhance shelf life of diversified millet products to enhance the economic value of millet

1	**Millets: Ancient Grains for Healthy Future** Value addition of millets**,** Composite Flours, blending of millet grains with widely utilized cereals like wheat and maize and some nutritious pulses. Preparation of breakfast recipes and snacks using composite millet flour.	12
2	**Millet-based bakery products preparation.** Preparation of varieties of cakes, biscuits ,cookies and bread using different millets like finger millet, little millet, barnyard millet and pearl millet.	**12**
3	**Millet based Ready to eat, ready to serve foods and premixes.** Ready to eat foods like, breads, bread rolls, sweet breads, sandwiches, buns. pizza, burger, ,premixes like, Gulab Jamun mix, snacks mix, dessert mix , curry mix, idli mix, upma mix, rava dosai mix, pongal mix, bisibelabath mix and icecream mix.	**12**
4	**Modern, Malted and Fermented Millet Foods** Preparation of Barnyard Flour kalajamun, Proso millet Shankarpala, Little millet Chinese fried rice, Ragi upma pakodi, Pearl millet rusk, Sorghum chocolate, Ragi Bounty Bars, Sorghum Pani – Puri. Millet based Fermented foods like, idli, dosai, appam and malted infant formulas.	**12**
5	**Traditional Millet Recipes Evaluation, Storage and Packaging of Millet Products** Traditional millet preparations of different regions, visit to a millet processing and preparation unit.	**12**
	Total Hours	**60**

Text Books

1. The Complete Technology Book on Bakery Products (2004), National Institute of Industrial Research NIR Board, New Delhi.
2. Millet Miracle- Recipes Unlimited, A COOK BOOK (2019) by Deccan Development Society Hyderabad Printed at: Aquarius Communications Hyderabad-500001.
3. The story of millets,(2018) Compiled and edited by: B Venkatesh Bhat, B Dayakar Rao and Vilas A Tonapi ICAR-Indian Institute of Millets Research, Hyderabad Published by Karnataka State Department of Agriculture in Association with ICAR Indian Institute of Millet Research.

Reference Books

1. Anil Kumar Siroha, Sneh Punia,Sukhvinder Singh Purewal Kawaljit ,Singh Sandhu 2021 Millets Properties, Processing, and Health Benefits. Published by CRC Press first edition.
2. Anil Kumar , Manoj Kumar Tripathi , Dinesh Joshi , Vishnu Kumar ,(2021), Millets and Millet Technology Publishers springer Singapore.
3. Dayakar Rao B., Bhaskarachary K., Arlene Christina G.D., Sudha Devi G., Vilas, A. Tonapi, 2017, Nutritional and Health benefits of Millets. ICAR Indian Institute of Millets Research (IIMR) Rajendranagar, Hyderabad.

Course Outcomes:

1. Acquire Knowledge on the nutritional composition, anti-nutritional factors and functional components of millets.
2. Demonstrate skills in preparation of millet based products and develop quality millet based traditional, modern and ready to eat foods and premix products.
3. Discover the versatility of millets and how they can be incorporated into daily diet to promote better health and well-being.
4. Generation of novel ideas for preparation of millet based products.
5. Understand the principles to set up a millet processing and product making unit

Department of Food Science and Nutrition

Skill Based Course IV

Soups and Salads

Semester IV **Hrs of Instruction Week:4P**

23BFNSE4 **No. of Credits:2**

Course Objectives:

1. To gain knowledge on the nutritional benefits of soups and salads and value addition
2. To develop skills in the preparation of various stress relieving food-based products
3. To enable students to understand the importance of nutrition in stress relieving foods.

1	**Soup– Millets, Pulses and Milk Products** Soup – definition, types and methods of preparation. Preparation of varieties soups: bajra soup, Raab soup, foxtail millet soup, milk carrot soup, Mexican chocolate soup.	12
2	**Soup- Vegetable and Fruits** Preparation of varieties of vegetable soups – Mixed vegetable soup, tomato soup, Broccoli soup with coconut milk, asparagus soup, palak soup, drumstick pods soup, Finnish fruit soup, tropical fruit soup, mixed fruit soup.	**12**
3	**Salads** Salads- definition, types, ingredients, Salad dressings, factors to consider in salad preparation, guidelines for salad preparation.	**12**
4	**Preparation of Salads** Salads- slaw salad, sweet potato salad, rainbow orzo salad, creamy veggie salad, banana salad crisp apple salad, dry fruit salad with yogurt, protein salad, vegan Greek millet salad.	**12**
5	**Salad Dressing Recipe** Definition, types, preparation- Greek salad dressing, honey mustard salad dressing, peanut salad dressing, apple cider vinegar dressing, French dressing, yoghurt dressing	**12**
	Total Hours	**60**

Course Outcomes

1. Comprehend the basics of Soup and Salad preparation
2. Acquire skills in making (millet, pulses. and milk based) soups based on different foods.
3. Procure expertise in preparation of salads and salad dressings
4. Large Scale preparation of soups and salads for income generation.

Department of Food Science and Nutrition

Skill Based Course IV

Chocolate Making

Semester IV **Hrs of Instruction /Week:4P**

23BFNSE5 **No. of Credits:2**

Course Objectives:

- Obtain knowledge on properties and functions of the basic ingredients used in chocolates
- Understand determinants of quality and types of chocolates
- Gain insight into preparation, application and packaging of chocolates

1	Selection and composition of ingredients involved in chocolate - Cocoa beans, Sugars and sweeteners, milk and milk products, fats. Demonstrate the methods of measuring ingredients in the laboratory to prepare standardized recipes Prepare and evaluate basic chocolate recipe - determine – measurement size, moisture and fat content, viscosity, texture, flavour and melting point	**12**
2	Prepare and evaluate the difference in sensory aspects, ingredients proportion and preparation methods of : Direct chocolate: dark, white, milk, ruby, gianduja, vegan, organic Prepare and evaluate recipes using dark chocolate – chocolate ice cream, chocolate sauce Prepare and evaluate recipes using dark chocolate – White chocolate Mousse, cheese cake Prepare and evaluate recipes using milk chocolate – milk chocolate bar, milk chocolate dip	**12**
3	Prepare and evaluate the difference in sensory aspects, ingredients proportion and preparation methods of : Confectionary chocolate **–** baking, couverture, compound and modeling Prepare and evaluate recipes using dark chocolate – chocolate bourbon, chocolate pudding Prepare and evaluate recipes using couverture – molten chocolate cake, chocolate cookies Prepare and evaluate recipes using compound chocolate – chocolate fudge, hot chocolate	**12**
4	Demonstrate the process of tempering, moulding, modelling, enrobing, filling, show pieces, stencils, chocolate couverture of chocolates and discuss the standards. Prepare and evaluate liquid chocolate using tempering methods - white, milk and dark chocolate Prepare and present chocolate shells and chocolate bars Prepare and present nut and chocolate bonbons, chocolate coated biscuits	**12**
5	Prepare and evaluate recipes using chocolates as toppings, fillings, truffles, décor, frostings, crafted candies, designs and garnishing. Prepare two selected chocolate products design appropriate package and label	**12**
	Total Hours	**60**

References:

1. The Science of Chocolate Beckett, S. T. (2007). . United Kingdom: Royal Society of Chemistry.
2. Bean-to-Bar Chocolate: America's Craft Chocolate Revolution: The Origins, the Makers, and the Mind-Blowing Flavors, Giller, M. (2017). . United States: Storey Publishing, LLC.
3. The Science of Chocolate, Beckett, S. T. (2008). . United Kingdom: RSC Publishing.
4. Science and Technology of Enrobed and Filled Chocolate, Confectionery and Bakery Products. (2009). United Kingdom: Elsevier Science.

Course Outcomes:

1. Learn about the chocolate making
2. Prepare a wide variety of chocolates and candies; understand how to vary basic formulas.
3. Understand the production of different chocolate products
4. Acquire skill in preparation and novelties in application of chocolates

Department of Food Science and Nutrition

Skill Based Course IV

Quality Evaluation of Foods

Semester IV **Hrs of Instruction / Week:4P**

23BFNSE6 **No. of Credits:2**

Course Objectives:

1. Learn different techniques of quality evaluation of foods.
2. Gain the knowledge about the necessity of evaluation of food quality.

1	Evaluation of food quality and adulteration: Simple methods of detecting adulterants in foods: detection of water, detergent and starch in milk, detection of other oil in coconut oil, detection of sugar in honey, detection of chalk powder in sugar, detection of extraneous matters in food grains, detection of iron fillings in maida or atta, detection of papaya seeds in pepper, detection of artificial colour in turmeric powder.	12
2	Techniques of quality evaluation of food: Subjective methods of evaluating food quality: Sample preparation of testing, Food tasting – chewing, nibbling, slurping, mouth rinsing. Organoleptic evaluation– flavour, colour, texture, taste and smell. Objective methods of evaluating food quality: measurement of volume, texture, moisture, colour and pH of foods and rheology	12
3	Food sensory evaluation: Threshold tests- Absolute, Recognition, Differential, Terminal Food sensory evaluation by paired comparison, single sample test, Duo-Trio test, triangular difference test, nine hedonic score cards.	12
4	Food Safety practices, handling and Storages: 5 keys to safer foods. Cleaning, washing and cutting of vegetables- sterilisation, thawing, cooking, blanching of food items-removing of toxins from food physically- storing in different ways.	12
5	Food microbial evaluation: Visit to Food Microbiology laboratories. Hanging Drop Method – Motility of Bacteria Staining of Bacteria – Simple Staining, Gram Staining Preparation of Media and Microbiological Analysis of Foods	12
	Total Hours	**60**

Course outcomes:

- Learn evaluation of food by human five senses.
- Gain the knowledge about analysis of food quality by objective methods.
- Learn to evaluate food quality by hedonic scale and score cards.

Textbooks:

1. Srilakshmi, B. Seventh Edition, Food Science, New Age International (P) Limited Publishers, NewDelhi.2020
2. Harry T. Lawless, Hildegarde, Sensory Evaluation of Food Principles and Practices, Second Edition, Springer Science,2010.
3. Joshi, V.K Sensory Science : Principles and Applications in Food Evaluation,., 2016.
4. Mrs. R. RajeshwariAnburaj, FOOD MICROBIOLOGY, Ryan Publisher, 2020
5. WHO, Five keys to safer food manual, 2006
6. https://vikaspedia.in/health/health-campaigns/beware-of-adulteration/quick-tests-for-some-adulterants-in-foods

Department of Food Science and Nutrition
Value Based Elective Course II
Holistic Wellness

Semester III **Hrs of Instruction/week: 2**
23BFNVB1 **No. of Credits:2**

Course Objectives:

1. To understand the importance of health and wellbeing.
2. To gain knowledge on the principles and role of food and nutrition to promote health and wellbeing.
3. To understand the role of foods in stress management.
4. To equip practical skill on warm-up exercises and Zumba dance in maintaining good health

Unit I	**Appetizers-** Definition, Classification, Health benefits, Principles of Soup preparation, Role of ingredients used in soup preparation, factors to be considered in serving soups, toppers used for preparation and garnishing. **Practicals** - Preparation of various types of soups	**6**
Unit II	**Immune Boosters-** Definition, History, Types, Ingredients used in vegetables/ fruit salads, Different sauces used in salad making, Methods of preparation and serving, factors to be considered in preparation and serving, Health benefits of salads. **Practicals** - Preparation of various types of salads and salad dressing.	**6**
Unit III	**Stress Relieving Foods-** Definition, Types of Stressors, Causes, Signs and symptoms, Consequences, Assessment, Relation between stress and Health, Stress management, Tips and techniques for reducing stress, Stress relieving foods, Stress and food cravings, stress and digestive system, stress and nutrition.	**6**
Unit IV	**Warm-Up Exercises**- 6 Ws of warm up exercises-What ,Why, Which, When, Where and Who, Principles, Types, Factors to be considered before and during warm up, Parts of the general warm up- aerobic, adaptation, Stage involved, Components of warm up. **Practicals**- Warm-up exercises.	**6**
Unit V	**Zumba**-Definition- Origin, Types of Zumba, 6 Ws of Zumba- What, Why, When, Which and Who, Health benefits, advantages and disadvantages, Zumba as a stress reliever. **Practicals** - Zumba Dance- session	**6**
	Total Hours	**30**

References:

1. Sarah Raven et al ,(2009) The Soup Book, DK Publications, London.
2. Harry Eatwood, (2016), A Salad for All Seasons, Bantam Press, London.
3. Yves C. Vanlandewijck and Walter R. Thompson (2011), The Paralympic athlete handbook of sports medicine and science, Wiley Black well.
4. Ken Haedrich, (2001), Soup makes the meal: 150 soul-satisfying recipes for soups, salads, and breads.
5. Ron J. Maughan (2009), The Olympic textbook of science in sport, Blackwell Publishing Ltd.

Course Outcomes:

1. Gain expertise in preparation of appetizers, immune boosters and stress relieving foods
2. Able to effectively manage stress
3. Enhance overall health and wellness through warm up exercises and Zumba dance

Department of Food Science and Nutrition
Value Based Elective Course II
Foods for Stress Management

Semester IV **Hrs of Instruction /Week:2**
23BFNVB2 **No. of Credits:2**

Course Objectives:

1. To know about the stress inducing diets.
2. To understand the Stress Relieving foods.
3. To develop skills in the preparation of anti-stress foods
4. To understand the knowledge about stress inducing foods.
5. To enhance the stress busting Techniques in daily life.

1	**Introduction to Stress** Introduction, Definition, Causes and effects Types Signs and Symptoms of Stress, Effects of Stress on Body, Identifying stress, Benefits of Stress Management, Relaxation Techniques-Types, Benefits.	6
2	**Anti-Stress Diets** Hormones and Diet: Serotonin Inducing Diet, Cortisol Inducing Diet, Dopamine Inducing Diet, and Oxytocin Inducing Diet Nutrition in Diet: Potassium, Magnesium Vitamin B Complex, Vitamin C, MUFA, Low carbohydrate-rich foods.	**6**
3	**Stress and Diet Therapy** Stress relieving foods-Different food groups, Methods of Cooking, Foods to included and excluded	**6**
4	**Stress Busting Foods and Brain Boosting Foods** Banana, Orange, Green Leafy Vegetables, Fatty Fish, Black Tea, Nuts, Raw Vegetable, Milk, Dark chocolate, Eggs, Herbal Teas, Whole Grains, Broccoli, Probiotics rich Foods and Foods rich in high fibre.	**6**
5	**Foods to be Avoided** Caffeine, Processed foods, Sugar products, High in trans-fat and saturated fats. Stress-Busting Techniques: Exercise and Yoga, Relax, Sleep,and Socialization	**6**
	Total Hours	**30**

Text Books

1. Brian Luke Seaward, (2022). Managing Stress. (10th Edition). Jones and Bartlett. ISBN: 978-1-284-19999- 4
2. Judi Nath (2021), Digesting Foods and Fads, ISBN: 9781476686400, 1476686408.
3. Amy E. Guptil, Denise. A. Copelton and Betsy Lucal (2017), Food and Society: Principles and Paradoxes.

Reference Books

1. Drew Ramsey (2021), Eat to Beat Depression and Anxiety ISBN: 9780063031739, 0063031736.
2. Liana Wener-Gray (2020), Anxiety-Free with food, ISBN:9781401961763, 1401961762.
3. Mike Dow, (2019), Heal your Drained Brain ISBN: 9781401952129,1401952127.

Course Outcomes:

1. Acquire Knowledge about stress-relieving and inducing foods.
2. Demonstrate skills in preparation of Stress relieving food and techniques
3. Understand the knowledge about reducing stress in daily life

Discipline Specific Elective Course

Food Quality Control and Management

SemesterV **Hrs of Instruction/Week: 5+1**

23BFNDE2 **No. of Credits:6**

CourseObjectives:

1. To learn the fundamental aspects of food quality control and management
2. To understand the standards for food quality assurance
3. To acquire the skill in the implementation of HACCP and TQM in food industry
4. To apply the statistical control procedures in food quality assurance

Unit1: Basic Concepts of Food Quality **15**

Meaning and definition of food quality, Concepts of food quality control and quality management, Dimensions of quality in foods, Quality factors in foods, Importance of food quality

Scope, Significance and Objectives of Quality management;

Role of CODEX and FDA in Food quality

Unit2: Food Quality Assurance **15**

FSSAI Standards: Food and Agricultural Products – Cereals, pulses and cereal products - Wheat flour, Semolina, Bakery products; Fruits, vegetables and their products,Herbs, spices & condiments, Concept of processed foods.

Standard tests for Food quality assurance by sensory tests (Difference test, Rating test and Consumer Preference test), physico-chemical tests (viscosity, consistency, texture and color) and microbial tests and compare with FSSAI standards.

Unit3: Food Quality Control System **15**

Hazard Analysis Critical Control Point (HACCP): History, background, structure, pre- requites and Good Hygienic Practices, principles and implementation, Case studies on HACCP.

Total Quality Management (TQM) – Concept, Organizational Issues Pointing to the need to Focus on TQ, Basic Tenets of TQM, Benefits of TQM

Good Manufacturing Practices (GMP), Good Hygienic Practices (GHP), Good Agricultural Practice(GAP), Good Laboratory Practices (GLP) and Good Veterinary Practice (GVP). Food Safety Management System (FSMS)

Unit4: Food Quality Management System **15**

Food safety and Quality management including ISO-22000, ISO-9001:2000, ISO22000:2005, ISO /IEC 17025:2017/CODES/GLP, Retailers standards: BRC food and BRC IOP standards, IFS, SQF: 1000, SQF: 2000.

ISO 14001:2004 Environmental Management System, OHSAS 18001:2007 Occupational Health and Safety Management, ISO/IEC 27001:2005 Information Technology-Security TechniquesInformation Security Management System, Concept of Food Audit.

Unit5: Quality Management Tools **15**

Seven old and new Quality management tools, Statistical process control – Mean & range chart, Pareto chart and Control chart, PDCA cycle, Quality circle, Quality audit, Internal audit, Continuous improvement of productivity- proficiency testing for product quality- Six Sigma Concept

TotalHours **75**

Practicals **15**

Related Experience

1. Determination of drinking water quality
2. Determination of milk quality
3. Case study on HACCP in Food
4. Case study on TQM in
5. Expert talk on Food quality control and management system

TotalHours **90**

Reference Books:

1. Poornimacharantimath, Total quality management, Dorling Kindersley, Publishers South Asia Ltd., 2009.
2. Sohrab, 2001 Integrated ISO 9001 HACCP for food processing industries, allied publishers ltd, Mumbai
3. Krammer, A. and Twigg, B.A. 2006. Quality control for the food industry, Volume 2, Applications. The AVI Publishing Company. Inc., Westport, Connecticut.
4. Ranganna, S. 1994. Hand book of analysis and Quality control for fruits and vegetable products. Tata McGraw hill. New Delhi.

CourseOutcomes:

1. Understand the concepts and principles of food quality control and management system.
2. Comprehend the FSSAI standards and standard tests for quality assurance of commonly consumed foods.
3. Equip to implement TQM and HACCP procedures in food quality control
4. Understanding the various management system for quality foods.
5. Implementation of statistical quality control procedures in quality assurance and management of foods.

CO/ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PS O1	PS O2	PS O3
CO1	H	M	H		H	L	L	M	M	M	M	L	L
CO2	H	M		L	H	M	L	M	H	M	H	M	M
CO3	H		L	M			L		H				L
CO4	H	L	M	M		M	L		H		H	H	
CO5	H		M	H	M	M	L	M	H	M	H	L	M

Discipline Specific Elective Course

Nutrition for Health and Fitness

Semester V **Hrs of Instruction/Week: 5+1**

23BFNDE3 **No. of Credits:6**

Course Objectives:

1. Understand the Importance of Nutrition, Fitness and Health
2. Gain Knowledge on Exercise Physiology and Nutrition for Physical Activity
3. Comprehend the Technique and Gadgets for Physical Activity Training
4. Understand the Risks of Hypokinetic Diseases
5. Understand the principles of Exercise and Stress Management

Unit1: Health and Fitness **15**

Definition, Components and Relationship among Physical Fitness, Wellness and Health – challenges and personalised approach, Benefits of fitness training

Unit2: Exercise Physiology and Nutrition for Physical Activity **15**

Pulmonary Structure and Function, Cardiovascular Regulation and integration, Skeletal and neural control, endocrines and exercise, role of macro and

Micro nutrients, optimum nutrition and Introduction - Food Groups, My Pyramid (FAO/WHO, 2005), Adequate Diet

Role of Macro and Micro nutrients – Carbohydrates, Proteins, Fats, Vitamin D, Calcium, Iron, Optimum Nutrition and Hydration for Health

Unit3: Physical Activity Training **15**

Aerobic and anaerobic training -To enhance Cardio Vascular Endurance, Flexibility and Body Composition, Physical Activity Level and Measurement;

Gadgets for measuring PAL – Motorized Treadmill, (aerobic Fitness), Functional Trainer, Fluid Rower (Upper body), Elliptical Bicycle and Bicyle Ergometer (Lower body), Stretch Trainer (Whole body), Multi Gym (9, 12, 16 station) for different muscle groups

Unit4: Diseases due to Faulty Food Habits and Physical Inactivity **15**

Life Style related diseases/disorders -Diabetes mellitus, Hypertension, Cancer, Cardiovascular Disease, Anaemia, Underweight, Obesity

Unit:5 Exercise, Stress and Health Management **15**

Exercise at Medium and High Altitudes;

Stress Assessment and Management Techniques;

Relaxation Techniques - Yoga and Meditation for Health;

Clinical Exercise Physiology for Cancer, CVD and Pulmonary Rehabilitation, Underweight, Overweight and Obesity

Total Hours **75**

Practical Experience **15 hours**

- Aerobic and Anaerobic Exercises
- Yoga and Meditation
- Hands-on training on Stress Relaxation Techniques
- Exposure to Motivational Sessions
- Visit to Fitness Centers and Yogalaya

Text Books:

1. ***Werner W. K Hoejer (1989), Life time Physical Fitness and Wellness,*** Morton Publishing Company, Colorado.
2. Mishra, S. C (2005) Physiology in Sports. Sports Publication, New Delhi
3. ***Greenberg, S. J and Pargman, D (1989) Physical Fitness*** – A Wellness Approach Prentice Hall International (UK) Limited, London
4. ***Swaminathan T, (2008) Essentials of Food and Nutrition*** Bangalore Printing Publishing Co.

Reference Books:

1. ***McArdle, W. D, Frank I. Katch, F. I and Victor L. Katch (1996) Exercise Nutrition: Energy Nutrition and Human Performance***. William & Wilkin Publishing USA.
2. Mahan, Kand Stump, E.S(1996) Krause Food and Nutrition and Diet TherapyW.B Saunders Company, USA.
3. ***McArdle, W. D, Frank I. Katch, F. I and Victor L. Katch (2010) Essentials of Exercise Physiology, 7th edition***. William & Wilkin Publishing USA.

Course Outcome:

1. Understand Concept of Fitness Training
2. Foster Fitness Skills
3. Prevent and Manage Lifestyle related Disorders
4. Utilise exercise in Stress and Health Management
5. Gain the Technical Ability to run Fitness Centers

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2	PSO 3
CO 1	M		L	M	M	M	L	M	L	M	M	M	H
CO 2	L			M	M	M		M	H	M	H	M	M
CO 3	L		L	M	M	M		M	H		H	M	H
CO 4	L		L	M	L	M		M	H		M	H	H
CO 5	L		M	M	M	M		M	M		L	M	M

Discipline Specific Elective Course

Food Biotechnology

Semester V **Hrs of Instruction/Week:5+1**

23BFNDE4 **No. of Credits:6**

Course Objectives:

1. Understand the role of enzymes as a tool in genetic engineering and biotechnology
2. To make learners aware on the principles of genetic engineering, plant tissue culture and molecular cloning
3. Enable learners to understand the concept of fermentation biotechnology
4. To delineate the role of microbes in the application of biotechnology in Food Science and Nutrition

Unit 1: Introduction and Tools of Genetic Engineering **15**

Definition, enzymes as tools - exonucleases, endonucleases, ligases, reverses transcriptase and alkaline phosphatase, cloning vectors-plasmids, bacteriophage, cosmids and phasmids

Unit 2: Genetic Engineering and Plant Tissue Culture **15**

Outline of genetic engineering in prokaryotes (microbial cells), concepts of molecular cloning, plant tissue culture, micro propagation, transgenic plants, genetically modified foods-golden rice, flavr savr tomato and Bt brinjal; enlisting applications of genetic engineering

Unit 3: Fermentation Biotechnology **15**

General structure of bioreactors and listing types, bacterial growth curve, batch and continuous culture, environmental factors, basic concepts of downstream processing, definition of biochips and biosensors

Unit 4: Use of Microbes in Food Industry **15**

Primary metabolites, secondary metabolites, synthesis of citric acid, glutamate, xanthan gum, vitamin B_{12}, riboflavin and Single Cell Protein – spirulina and yeast biomass

Unit 5: Enzyme Biotechnology **15**

Soluble enzymes, immobilization of enzymes – methods of immobilization, role of enzymes in food industry, safety assessment of transgenic crops

Total Hours 75

Practicals **15 hours**

Related Experience

- Food Biotechnology Techniques (Basic lab procedures, sampling, storage)
- DNA isolation and purification from food samples
- Microbial synthesis of riboflavin and vitamin C
- Yeast activity in food products
- Visit to Plant Tissue Culture Lab
- Visit to TNAU Genetic Engineering Laboratory

TextBooks:

1. **Byong H.Lee**, (2015), Fundamentals of Food Biotechnology. Wiley-Blackwell.
2. **Anthony Pometto, Kalidas Shetty, Gopinadhan Paliyath, Robert E. Levin**, (2005) Food Biotechnology. CRC Press
3. ***Dubey, R.C., 1996, A Text Book of Biotechnology***, S. Chand and Company Ltd., New Delhi.
4. ***Application of Biotechnology to Traditional Fermented Foods,*** 1992, Published by National Academy Press, Washington, DC.

ReferenceBooks:

1. ***Dietrich Knorr, 2017, Food Biotechnology***, Marcel Dekker Inc., New York.
2. ***Green, P.J., 2010, Introduction to Food Biotechnology***, CRC Press, USA.
3. ***Owen, P. Ward, 2018, Fermentation Biotechnology***, Principles, Processes and Products, Prentice Hall, Advanced Reference Series, New Jersey, 07632.

Course Outcomes:

1. Expand the knowledge of food biotechnology in relation to genetic engineering and plant tissue culture
2. Understanding the role of enzymes and microbes in food industry
3. Helps to keep abreast on development and applications of biotechnology in food and nutrition
4. Develop newer enzymes for improving the overall nutrition and process ability of a product

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2	PSO 3
CO 1	M		H	L	L	L		L	L	L	H	M	M
CO 2	M		M	L	L	M		M	M	M	H	M	M
CO 3	M		M	L	L	H		L	H	H	H	M	H
CO 4	M		M	L	L	H		M	M	H	H	M	M

Discipline Specific Elective Course

Food Sanitation and Hygiene

Semester VI **Hrs of Instruction/Week:5+1**

23BFNDE5 **No. of Credits:6**

Course Objectives:

1. Learn the various aspects and programmes related to food safety
2. Understand the available food laws and regulations
3. Keep pace with food safety standards both at national and international level
4. Study the importance of cleaning and sanitation in food establishments and among the food handlers

Unit1: Introduction to Food Safety and adulteration **15**

Food Safety - definition of food safety and food spoilage, factors affecting food safety and food spoilage: GMP, GAP, SSOP, GHP, food adulteration - definition, types of adulteration in various foods- intentional, incidental and metallic contaminants

Unit2: Food Laws and Regulations **15**

National Legislation – Essential Commodities Act, Standard of Weight and Measures Act, ISI, Mark of BIS, Agmark, Food Safety and Standards Bill 2005, International Laws and Agreements - FAO, WHO, Codex Alimentarious, WTO, JECFA, APEDA, Global Food Safety Initiative (GFSI), Hazard Analysis Critical Control Point (HACCP): principles of HAACP, applications of HACCP

Unit3: Current Food Safety Standards in India **15**

Current Food Safety regulations 2011, Food Safety and Standards Authority of India, objectives of developing food safety standards, enforcement of structure and procedure, role of food analyst, safety analysis, action by designated officer and report of food analyst

Unit4: Sanitation Procedures **15**

Cleaning and sanitizing- need for efficient cleaning program, cleaning agents, equipments, methods to wash, rinse and sanitising food contact surfaces. Importance and methods of pest control; outlining methods of disposal of food waste, wet and dry cleaning – COP and CIP

Unit:5 Importance of Personal hygiene of food handlers **15**

General principles of hygiene – personal and environmental hygiene, hygienic practices in handling and serving foods, planning and implementation of training programme for health personnel

Total Hours **75**

Practical's Related Experience

1 Visual examination and grading	**2**
2 Testing of Food Samples for Adulteration	2
3 Organoleptic Test (Sensory)	2
4 Shelf life studies	2
5. Nutritional and proximate analysis	2
6 Chemical parameters like moisture Ph, acidity, etc	2
7 Analysis of microbial load	**3**

Total Hours 15

Text Books:

1. ***Frazier. W., Food Microbiology***, McGraw-Hill co Ltd, NewDelhi.2015
2. ***Adams M,R and Moss M,O., Food Microbiology***, New Age International (P) Ltd., New Delhi,2015.
3. ***Vijaya Ramesh, Food Microbiology***, MJP Publications, 2007.
4. David, A. Shapton, and Naroh F. Shapton (2011) Principles and Practices for the Safe Processing of Foods, Heineman Ltd., Oxford.

Reference Books:

1. Recommended International Code of Practice–General Principles of Food Hygiene,
   CAC/RCP/. Rev.3. Amd. (2012)
2. Instruction Manual – Part I and II – (Methods for detection of Adulterants), (2012), Food Safety and Standards Authority of India (FSSAI), FDA Bhavan, Kotla Road, New Delhi- 110002,India

Course Outcomes:

1. 1. Understand the national and international programmes and laws on food safety and standards
2. Recognize the role of food handlers, food safety officers and health personnel
3. Master the standards followed for food safety
4. Appreciate the importance of personnel and environmental hygiene

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PS01	PS02	PS03
CO1	H	M		M		L	MH	MM	M	M	MM	M	M
CO2	M L	L		M		L				M	L	M	
CO3	H		H	H	M	L	L	H		M	M	L	M
CO4	H	M	M	H			M	M	H	H	M	H	
CO5	M	M	H	H		L	L	M	H	H	M	L	L

Discipline Specific Elective Course

Nutraceuticals and Nutrigenomics

Semester VI **Hrs of Instruction/Week: 5+1**

23BFNDE6 **No. of Credits:6**

Course Objectives:

1. Gain knowledge about functional foods, nutraceutical and nutragenomics.
2. Understanding the molecular level interaction between nutrients and other dietary bioactives with human genome.
3. Know the applications of Nutrigenomics in wellness and disease management.

Unit 1: Nutraceuticals and Functional Foods **15**

Definition of functional and traditional foods, nutraceuticals, designer foods and pharma foods, history of functional foods, components of functional foods, foods containing nutraceuticals and classification of nutraceuticals – based on plant sources, mechanism of action and chemical nature

Unit 2: **15**

Role of Dietary Supplements and Nutraceuticals in Health and Disease

Concept of dietary supplements, sources and functions of phytochemicals with suitable examples, FOSHU foods – concepts, regulatory aspects

Unit 3: Probiotics and Prebiotics **15**

Human gastrointestinal tract and its microbiota, functions, concept of probiotic, prebiotics and symbiotics; applications of probiotics in human nutrition

Unit 4: Nutrigenomics **15**

Definition of nutrigenomics, gene expression – transcription, translation, post translational modification, nutrition in the omics era- elementary concepts on epigenetics, transcriptomics, proteomics, metabolomics; genetic variation and nutritional implications

Unit 5: Nutrition and Gene Expression and Nutrigenomics and Complex Diseases **15**

Nutrient control of gene expression – amino acids, nucleotides, basic concepts of nutrigenomics and complex diseases – diabetes, cancer and obesity, Personalised Nutrition and Precision Nutrition

Total Hours **75**

Practicals **15**

Related Experience

1. Qualitative tests for nutraceuticals
2. Extraction methods for nutraceuical compounds
3. Isolation and Purification of any ONE nutraceutical compound
4. Demonstration on Thin Layer Chromatography
5. Expert talk on Nutrients and Genes in human health

Total Hours **90**

Reference Books:

1. ***Simopoulus, A.P. and Ordovas, K.J.M., 2004, Nutrigenetics and Nutrigenomics***, Vol. 93, Karger, Switzerland.
2. ***Tamine, A., 2015, Probiotic Dairy Products***, Blackwell Publishing Ltd., UK
3. ***Narasinga Rao, B.S., 2015, Nutrition Research in India*** – A Country Report, Published by INSA, New Delhi.
4. ***Webb, G.P., 2016, Dietary Supplementations and Functional Foods***, Blackwell Publishing Ltd., New York.
5. ***Tai, E.S. and Gillies, P.J., 2007, Nutrigenomics –*** Opportunities in Asia, Karger, Singapore.

Course Outcomes:

1. Understand the developments in the field of nutraceuticals and nutrigenomics.
2. Comprehend the components of functional foods and foods containing nutraceuticals
3. Know the importance of probiotics and prebiotics in human health
4. Understanding the effects of nutrients in molecular level process in the body and the effect of pytochemcials in disease conditions.
5. Articulate and advocate the principle of nutrigenomics in controlling life style diseases.

CO/ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PS O1	PS O2	PS O3
CO1	H	M	M		H	L	L	M	M	L	H	L	M
CO2	H	M		L	H	M	L	M	M	L	M	L	M
CO3	H			M			L		M				M
CO4	H	M	M	M		M	L		H		H	H	
CO5	H		M	H	M	M	L	M	H	L	M	L	M

Discipline Specific Elective Course

Food Packaging

Semester VI **Hours of Instruction/ week - 5+1**

23BFNDE7 **No. of Credits: 6**

Course Objectives:

1. Gain knowledge about packaging of foods, packaging materials and systems.
2. Understand packaging of different food products
3. Attain insight into the aspects of labeling, testing and evaluation of packaged foods.

Unit1 **Concept of Packaging and package design** **15**

Introduction and History of Packaging, Principles and Functions of Packaging Classification, Application, Evaluation Packaging Operations

Packaging Terminology Design of Packages

Package Design Requirements

Unit2 **Packaging Materials** **15**

Basic Packaging Materials – Paper, Wood, Plastics, Glass, Metals Containers

Packaging Films – Polyethylene, Cellophane, Aluminium foil, Laminates, Etc. New Polymeric Packaging Films, BOPP

Shrink Film, Cling and Wrap Film, Edible Film Testing of Packaging materials

Determination of contaminants in food packaging and labeling materials as per FSSAI

Unit3 **Packaging Methods and Systems** **15**

Traditional Food Packaging, Retortable, Lined Cartons, Bag in Box

Aseptic, Modified Atmosphere Packaging, Controlled Atmosphere packaging, Vacuum and Gas Packaging, Bio Based Packaging

Eco-friendly and Safe Packaging for Exports, Nano Packaging Ovenable Packages, Transport Packages

Packaging Equipments–Filling, Cartoning, Vacuum packaging, Conveyors, Sealing, Coding and Marking

Unit4 **Packaging of Food Products** **15**

Bakery Products, Dairy Products, Fats and Oils, Fresh Foods, Beverages, Processed Foods Meat and Sea Foods

Unit5 **Storage, Handling and Distribution of Packages** **15**

Testing of Packaged Foods- Shelf life, Physical and Chemical Labelling – Definition, Purpose, Types, Materials, Adhesives Barcode and Universal Product code, Food and Nutritional Labelling

Packaging and labeling Regulations and Specifications - FSSAI International Food Package Related to Food Safety, Quality and Trade

Practicals **15**

1. Experiment on packing material for different food products
2. Experiment on bursting strength
3. Experiment on tensile strength
4. Experiment on vacuum packing
5. Experiment on packing, storage, handling of food products

Total Hours **90**

Text Books

1. ***Potter, N.M., Food Science,*** The AVI Publishing Company Inc., West Post, Connecticut, USA ***2015,***
2. ***Daise, Frank, A. (Ed.) 2015, Modern Processing, Packaging and Distribution System for Food,*** Blackie, Glasgow and London.

Reference Books

1. ***Food Packaging Technology Handbook, 2013***, NIIR Board of Consultants and Engineers, National Institute of Research, New Delhi.
2. ***Modern Packaging Industries, 2014,*** NIIR Board of Consultants and Engineers, National Institute of Industrial Research, New Delhi.

Course Outcomes:

1. Understand the concepts of packaging in terms of history, principle and functions
2. Identify the various packaging materials available in the market
3. Gain knowledge on the packaging methods and systems
4. Enumerate the packaging of different food products
5. Ascertain the safety of packages through storage, handling and distribution

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO 1	H	H					L	L		M	H	M	M	M
CO 2	M	H					M			H	H	M	M	M
CO 3	H	M				M	M	M		H	M	H	H	H
CO 4	M	M				M	M	M		M	H	H	H	H
CO 5	M	L								H	H	H	H	H

Department of Food Science and Nutrition
Generic Elective Courses – I
Perspectives of Home Science

Semester I **Hrs of Instruction /Week:4+4**
23BFNGE1 **No. of Credits:6**

Course Objectives:

1. Understand the concept and scope of Home science and its components.
2. Know the trends and job opportunities in home science
3. Enable the students to gain knowledge on different areas of home science

Unit 1: Meaning and Components of Home science **10**

Meaning of Home Science education – Philosophy of home and family , Components of Home science, career perspectives –its relation to other disciplines – science and humanities

The Home science Association of India- history and objectives, achievements of the Association – representation in National bodies.

Unit 2: Interior Design and Resource Management and Textile and Clothing Concept of **15**

Interior Décor- Importance of good taste, design-types, elements and principles of design, colour theory and colour schemes

Resource classification- Characteristics- goals, values & standards

Decision making in family- Types,Steps in Decision Making

Textile fiber to fabric: Fiber- definition, classification and properties of natural and manmade fiber. Yarn- definition, types and characteristics of simple and novelty yarns. Fabric – definition, types, characteristics and end uses of woven, knitted and non-woven fabrics. Introduction to Fashion Designing- definition, terminologies in fashion designing, types of fashion and fashion cycle. Wardrobe Planning and care.

Practical

Designing greeting card for different occasions using elements and principles

Application of various color harmonies in room interiors and observe the effect of color on each textile fiber to fabric: Identification of fibers

Wardrobe Planning for different age groups **20**

Stain Removal Techniques

Unit 3: Foods and Nutrition and Food Service Management and Dietetics **15**

Classification of foods according to functions and origin, Basic Food Groups,

meaning and importance of balanced diet, my plate, meal planning, macro and micro nutrients in foods – sources, functions, deficiency and Recommended Dietary Allowance (RDA).

Introduction to dietetics, Principles of diet therapy, aims, objectives, classification of commercial and non-commercial food service operations, Indian cuisines and their features, Setting up a cover and simple service

Practical

Diet for Pre-school and School going children

Healthy diet for adolescents

Diet for adults and elderly **20**

Identification of foods for the preparation of My plate

Methods of measuring ingredients based on texture (solid and liquid states) and coarse and refined forms.

Determination of edible portion of foods

i) perishable and non- perishable foods, ii) coarse and refined foods

Methods of cooking

i)Moist heat method, ii) Dry heat method, iii) Combination method

Unit 4: Human Development **10**

Definition, Goals and Principles, factors influencing growth & development
Domains of development and its inter-relatedness - Physical, Cognitive, Emotional and Social, Stages of Development (Prenatal period, Infancy, Toddlerhood, Early Childhood, Middle childhood, Adolescence, Adulthood, Old age)
Characteristics, Developmental tasks and Problems.

Practical

Visit to the Child lab

Observation and recording of developments in preschool (Physical, motor, cognitive, emotional, social and language development) **10**

Unit:5 Home Science Extension Education **10**

Meaning, definition, objectives, philosophy and principles of extension education, third dimension of Higher Education, Home science extension service at various levels – village, block and district level, Role of home science extension in rural and national development.

Practical

Preparation of Audio visual aids for community extension works

Preparation of pamphlets, leaflets, booklets, flyers and information notices **10**

Preparation of puppets for extension outreach programmes

Total Hours 120

Text Books:

1. Jalihal, K.A and Veerabhadran, V.(2007).Fundamentals of Extension Education and Management in Extension. Concept Publishing Company, New Delhi.
2. Premalata, M,(2007).Text Book of Home science. Kalyani Publishers, Chennai.
3. Pundir, N.(2007).Fashion Technology – Today, Tomorrow. New Delhi, Mittal Publications, India.
4. Nisha, M.(2006).Wings of Home Science. New Delhi: Kalpaz Publications, India.
5. Frings, G.S.(2005).Fashion from Concept to Consumer.7th edition, New Delhi: Pearson education, India.
6. Dahama.O.P., and Bhatnagar. O.P,.(2012).Education and Communication for Development. New Delhi, Oxford and IBH Publishing Co. Pvt Ltd, India.
7. Reddy A.A (2010).Extension Education. Bapatla: Sri Lakshmi Press, India.
8. Ray G.L (2013). Extension Communication and Management. Kalyani Publications, India.

Reference Books:

1. Seema Sekhri, (2011).Textbook of Fabric Science, Fundamentals to finishing .New Delhi: PHI Learning Private Limited, India.
2. Meenakshi Rastogi. (2009).Fibres and Yarn.New Delhi: Sonali Publications, India.
3. Andrews.S.(2008).Text book of Food & Beverage Management, Tata McGraw – Hill Publishing Company Limited
4. Sethi.M.(2011).Institutional Food Management, New Age International (P) Limited

Course Outcomes:

1. Gain fundamental knowledge in Home science.
2. Educate population on relevance of nutrients
3. Plan and recommend a balanced diet for different age groups.
4. Understand the characteristics, developmental tasks and stages of lifespan.
5. Disseminate home science research outcome to the community through extension activities.

Department of Food Science and Nutrition

Generic Elective Courses – II

Preservation of Fruits and Vegetables

Semester III **Hrs of Instruction /Week:4+4**

23BFNGE2 **No. of Credits:6**

Course Objectives:

1. Understand the importance of food preservation and processing
2. Gain knowledge on the types of food spoilage
3. Comprehend the use of different temperatures in food processing
4. Understand processing of various foods using sugar, chemicals and salt
5. Understand the principles and concept of food fermentation

Unit 1: **Introduction to Food Preservation** **10**

Importance of Food Preservation, Types of Food Preservation, Types of Spoilage, Basic Principles of Food Preservation. Vegan Foods and Organic Foods

Unit 2: **Preservation by Using Sugar** **11**

Sugar Concentrates – Principles of Gel Formation,
Preparation of Jam, Jelly, Marmalades Sauce, Squash
Preserves, Candied, Glazed, Crystallized Fruits

Practical - Stages in sugar cookery, Preparation of jam/ jelly/marmalades, preserves/ candied/ Tutti fruity / Toffees, Tomato sauce / Tomato ketchup **28**

Unit 3: **Preservation by the Use of Low and High Temperature** **12**

Refrigeration and Freezing Advantages, Factors to be Considered, Difference Between Refrigeration and Freezing, Freeze drying and Freeze concentration, Steps Involved in Freezing Common Foods, storage
Canning, Pasteurization and Sterilization

Practical

Preparation of dehydrated Fruits- Fruit Flakes / Fruit bars

Unit 4: **Preservation by Using Chemicals and Salts** **12**

Preparation and Preservation of Fruit Juices, RTS
Chemical Preservatives, Permitted Preservatives

Practical **28**

Preparation of squashes, fruit juice and RTS
Preparation of pickles –(oil/vinegar/salt based)

Unit 5: **Preservation by Drying and Fermentation** **15**

Sundrying and Solar drying, Merits and demerits, Preparation of Foods for Drying

Preservation by Fermentation

Common Fermented Foods, Wine and Cheese Making, Pickling and Types of pickles

Practical

Preparation of Dehydrated vegetables
Preparation of pickles and fermented vegetables

Visit to Fruits and Vegetable processing industry **4**

Total **120 hrs**

Reference Books:

1. Adams, M.R. and Moss, M.O., Food Microbiology, New Age International (P) Ltd., New Delhi, 2015.
2. Fellow, P., (2010) Food Processing Technology –Principles and Practices, 3rd Edition, CRC Press Woodland Publishers, England.
3. Sommers, C.H. and Xveteng Fan, Food Irradiation Research and Technology, Blackwell Publishing, 2016.

Text Books:

1. RP Srivastava and Sanjeev Kumar(2002 & reprints 2020) Fruit and vegetable preservation-Principles and Practices 3rd revised edition, CBS publishers and distributors New Delhi,
2. Sivasankar, B. (2013) Food Processing and preservation 2nd edition, prentice Hall, Pvt,Ltd.
3. Srilakshmi, N., (2016) 6th Edition, Food Science, New Age International Private Ltd., NewDelhi, 2002.
4. Swaminathan, M., Food Science, Chemistry and Experimental Foods, Bappco Publishers, Bangalore, 2014.
5. Chandrasekhar, U, Food Science and Applications in Indian Cookery, Phoenix Publishing House Private Ltd., New Delhi, 2012.

Course Outcomes:

1. Understand the role of micro-organisms in food spoilage
2. Recall the terms in food preservation and explain concept of shelf life and factors affecting quality of food
3. Analyse the different types of drying and food concentration methods
4. Differentiate between various methods of freezing and its changes during preservation
5. Analyze the role of natural, chemical preservatives and recent preservation techniques
6. Apply the knowledge/concepts to develop new products with minimal processing for better retention of essential nutrients

Department of Food Science and Nutrition
Generic Elective Courses – III
Functional Foods and Nutraceuticals

Semester III **Hrs of Instruction /Week:5+1**
23BFNGE3 **No. of Credits:6**

Course Objectives:

1. Learn the development of functional foods along with the types of functional foods
2. Understand the category of nutraceuticals based on sources, mechanism of action and chemical nature
3. Analyse the health benefits of foods of different biotics origin
4. Acquire the skills on identification of foods of bioactive compounds with functional efficiency
5. Aware of the National and International regulatory aspects of Functional foods

Unit 1: Introduction to Functional Foods and Nutraceuticals **15**

Definition, History, Classification - designer foods and pharma foods, Nutritional Supplements, Ayurvedic Ahara, Health effects of functional foods, Stages involved in development of functional foods.

Unit 2: Categorization of Nutraceuticals **15**

Classification - Based on food source, mechanism of action and chemical nature - isoprenoid, phenolic substances, fatty acids and structural lipids, terpenoids – saponins, tocotrienols and simple terpenes, carbohydrates and amino acid based derivatives, isoflavones

Unit 3: Probiotics, Prebiotics and Synbiotics **15**

Probiotics: Concept, Human gastrointestinal tract and its microbiota, Classification of probiotics, role of probiotics in health and diseases

Prebiotics: Oligosaccharides, Dietary fiber, Resistant Starch, Gums, Spirulina as bioactive component.

Synbiotics: Concept and Synbiotic foods with examples

Unit 4: Functional nature of Nutraceuticals **15**

Polyphenols : Flavonoids, Catechins, Isoflavones, Tannins: Phytoestrogens, Phytosterols, Glucosinolates, Pigments, Organosulphur compounds, proteins and peptides, Conjugated linoleic acid, Omega 3 Fatty acids, Vitamins and Minerals

Bioactive compounds: Saponins, Heamagglutinins, Reservatrol, Kaempferol, Quercetin, Cinnamaldehyde, Lutoline, Capsaicin, Piperine, Gingerol, Eugenol, Rosemarinic acid, Apigenine, Thymoquinone.

Unit:5 Regulatory Aspects of Functional Foods and Nutraceutical **15**

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

Regulatory perspective of FOSHU Foods

Total Hours 75

Practicals Related Experience

1. Preparation of sample **2**
2. Methods of Extraction **2**
3. Qualitative analysis of primary metabolites **2**
4. Qualitative analysis of secondary metabolites **2**
5. Qualitative analysis of vitamins **2**
6. Determination of total phenols and flavonoids **2**
7. Development of Functional food products **3**

Total Hours 15

Total Hours 90

Text Books

1. Gibson, G.R. and Williams, M.C. (2001). Functional Foods Concept to Product, CRC Press.
2. Wildma, R.E. (2016). Handbook of Nutraceuticals and Functional Foods. CRC Press.
3. Yashwant Patak (2010). Handbook of Nutraceuticals Voume I Ingredients, Formulations and Applications, CRC Press.

References

1. Webb G.P (2016), Dietary Supplements and Functional Foods, Blackwell Publishing Ltd, New York.
2. Tamine. A (2015), Probiotic Dairy Products, Blackwell Publishing Ltd, United Kingdom.
3. Vishnu Balamurugan, Sheerin Fatima.M.A, Sreenithi Velurajan (2019), A Guide to phytochemical analysis, International Journal of Advance Research and Innovative Ideas in Education, vol 5, p 236 – 245.
4. USFDA regulations on functional foods
5. FSSAI regulation of India

Journals

1. Journal of functional foods
2. Journal of Nutraceuticals

Course Outcomes:

1. Gain knowledge on the development of functional foods with the conceptual difference between functional foods and nutraceuticals.
2. Acquire skills to categorize nutraceuticals.
3. Gain awareness on the functional foods and nutraceuticals of biotics origin.
4. Apply the knowledge of functional nature of nutraceuticals
5. Understand the regulatory aspects of functional foods and nutraceuticals.

Department of Food Science and Nutrition
Generic Elective Courses – IV
Fundamentals of Food Science

Semester III **Hrs of Instruction /Week:5+1**
23BFNGE4 **No. of Credits:6**

Course Objectives:

1. To enable the students, know the basics of food groups and their contribution tonutrition
2. Develop understanding about different foods and their nutrient composition
3. Illustrate the various cooking methods, losses during cooking and preventivetechniques

Unit 1: Introduction to Food Science **15**

Definition, classification and functions of food, basic food groups 4,5,7&11,functions, food pyramid, physicochemical properties of food

Cooking methods – Moist heat, dry heat and combination method(process,merits and demerit)

Unit 2: Cereals, millets and Pulses – Nutrient composition and processing of rice andwheat, nutrient content and uses of ragi, bajra and jowar,

Germination and Malting of Grains – process, characteristics and Nutritionalbenefits, role of cereals in cookery

Pulses - structure, nutrient composition, anti-nutritional factors, germination and nutritional enhancement, factors affecting pulse cookery and role of pulse in Cookery **15**

Unit 3: Fruits, vegetables and milk and milk products **15**

Vegetables and Fruits– Classification**,** nutrient composition, pigments and flavors compounds, selection, preparation, methods and effects of cooking. changes during ripening and enzymatic browning reaction and prevention – role of pectin in nutrition – guidelines for conservation of nutrients during cooking. Role of fruits and vegetables in cookery

Milk and milk products – Nutritive value, types of milk and milk products, pasteurization and homogenization, effect of processing on milk and milk products, maillard reaction, role of milk and milk products in cookery

Unit 4: Meat, Fish and Poultry **15**

Eggs - Nutrient composition, factors affecting the quality, selection criteria – Grading, methods and effect of cooking on eggs and role of egg in cookery **Poultry -** Types, nutrient composition, selection criteria, methods of cooking.role of poultry in cookery

Meat - Nutrient composition, selection criteria - meat quality, post mortemchanges, aging, tenderness, methods and effect of cooking on meat

Fish - Nutrient composition, selection criteria - fish, methods and effects of Cooking

Unit:5 Nuts, oilseeds, fats and oils and sugars **15**

Nuts and oilseeds – nutrient composition, processing and role of nuts in cookery **Fats and oils** – Nutritional significance, types, smoking point and role of fats andoils in cookery

Sugars – Types, nutritional value, stages of sugar cookery, artificial sweeteners, role of sugar in cookery

Total Hours **75**

Demonstration / Practical Experience **15**

1. Food groups, food pyramid and my plate
2. Methods of measuring food ingredients and portion size
3. Microscopic examination of the starch gel from different cereals
4. Effect of soaking, sprouting and addition of acid or alkali during cooking of pulses
5. Effects of addition of acid or alkali during cooking on pigments in vegetables and fruits
6. Maillard reaction in milk and enzymatic browning in fruits and its preventive methods
7. Role of egg in different preparations – thickening agent, binding agent, leavening agent and emulsifying agent
8. Determination of stages of crystallization in sugar cookery
9. Methods and effect of cooking on meat, poultry and fish

Total Hours 90

References:

1. Srilakshmi, B. (2011) Dietetics. 6th Edition, New Age International Publisher, New Delhi, 313.
2. Swaminathan, M. Food Science, (2015) Chemistry and Experimental Foods, Bappco Publishers, Bangalore.
3. Chopra H.K, Panesar, P.S,Textbook of Food and Nutrition. (2006). India: Lotus Press.
4. Jamesen, K. S. (1997). Food Science Laboratory Manual. United States: Prentice Hall PTR.
5. Potter, N. N. (2012). Food Science. Netherlands: Springer Netherlands.

Course Outcomes:

At the end of the course the students will gain knowledge on

1. Basic concepts of Food Science
2. like food groups, food commodities, their structure and nutritive value
3. Develop understanding on cooking methods and their effects
4. Apply the knowledge to prevent losses and promote utilization of nutrients

Department of Food Science and Nutrition
Generic Elective Courses – V
Principles of Nutrition

Semester IV **Hrs of Instruction /Week:4+4**
23BFNGE5 **No. of Credits:6**

Course Objectives:

1. Acquire an understanding of nutrition science for health promotion and disease prevention
2. Gain knowledge on functions, explore the dietary sources, metabolism, requirements and effects of deficiency of different nutrients of nutritionally important.
3. Gain scientific knowledge about the vital link between nutrition and health of individuals.
4. Understand the interrelationship of the various nutrients
5. Present current evidence for the role of key nutrients in the prevention of chronic diseases

Unit 1: Energy **12**

Definition of Energy, Units of Energy- Calorie and Joule

Measurement of Calorific Value of Foods using Bomb Calorimeter, physiological fuel values of foods, relationship between oxygen used and calorific values. Determination of energy requirements-direct and indirect calorimetry, relation between Respiratory quotient and energy output, specific dynamic action of foods (Diet Induced Thermo genesis),

Basal Metabolism- definition, determination of basal metabolism -Benedicts Roth Apparatus, Factors Affecting BMR, determination of energy metabolism during work-Energy requirements for various age groups.

Practical **6**

Estimation of calorific value of foods using bomb calorimeter

Determination of moisture content in foods

Unit 2: Carbohydrates and proteins **12**

Carbohydrates - Composition, classification, digestion, absorption and metabolism, Functions, Sources and Requirements of Carbohydrates. Dietary fiber –definition, sources, Role of Fibre in Human Nutrition

Proteins - Composition, classification, functions, digestion, absorption and metabolism, Requirements and Sources, Evaluation of protein quality-PER, BV and Chemical score

Practical **18**

Qualitative tests for sugars – glucose, fructose, lactose, maltose, sucrose

Quantitative estimation of glucose

Qualitative estimation of protein

Demonstration of estimation of nitrogen and fibre

Unit 3: Lipids and Water **12**

Lipids - Classification, functions, digestion, absorption and metabolism, Functions, Sources and Requirements

Water – Importance, distribution in the body, functions of water and sources, water intake and loss

Practical **3**

Demonstration of estimation of fat

Unit 4: Macro, Micro and Trace Minerals **12**

Classification, Distribution in the body, Functions, Sources and requirement and Effects of Deficiency of Calcium, Phosphorus , Magnesium, Sodium, Potassium, Selenium, Iron, Zinc, Iodine and Fluorine.

Practical **12**

Qualitative tests for minerals

Quantitative estimation of iron, calcium, phosphorus, ascorbic acid

Unit:5 Vitamins **21**

Fat soluble vitamins Chemistry, Functions, Sources, Requirements, Deficiency and Hypervitaminosis of Vitamin A, D, E and K

Water Soluble Vitamins - Chemistry, Functions, Sources, Requirements and Deficiency of B-Complex Vitamins- Thiamine, Riboflavin, Niacin, Pyridoxine, Folic Acid, Pantothenic Acid Cyanocobalamin and Vitamin C

Practical **12**

Quantitative estimation of ascorbic acid

Demonstration of estimation of vitamin A, thiamine and riboflavin

Total Hours 120

Text Books:

1. Srilakshmi, B., Nutrition Science, New Age International (P) Ltd., New Delhi, 2017.
2. Mahtab, S, Bamji, Kamala Krishnasamy, G.N.V. Brahmam, Text Book of Human Nutrition, Third Edition, Oxford and IBH Publishing Co. P. Ltd., New Delhi, 2015
3. Swaminathan, M., Advanced Textbook on Food and Nutrition, Vol. 1, Second Edition, Bangalore Printing and Publishing Co. Ltd., Bangalore, 2012.
4. Varley, H., Gowenlak, A.H. and Hill, M. Practical Clinical Biochemistry, William Itinmaon Medical Books, London, 2010.
5. Oser, B.L., Harke's Physiological Chemistry XIV Edition Tata McGraw Hill Publishing Company Ltd., Bombay, 2011

References:

1. Dietary Guidelines for Indians, ICMR, National Institute of Nutrition, Hyderabad, 2013.
2. Gordon M. Wardlaw, Paul M.Insel, Perspectives in nutrition third edition, Mosby-year Book,Inc.St.Louis,Missouri,2015
3. Krause, M.V. and Hunesher, M.A., Food, Nutrition and Diet Therapy, 14thEdition, W.B. Saunders Company, Philadelphia, London, 2013
4. Sadasivam, S. and Manickam, A. Biochemical Method, Second Edition, New Age International P. Ltd., Publishers, New Delhi, 2013.
5. Raghuramulu, N., Madhavannair, K. and Kalyana Sundaram, National Institute of Nutrition, 2013, A Manual of Laboratory Techniques, Hyderabad, 50000

Course Outcomes:

1. Application of the science of nutrients in normal and disease conditions.
2. Able to conceptualize, implement and evaluate the functions, metabolism, requirements and effects of deficiency of nutrients
3. Understand the role of food and nutrients in health and disease prevention.
4. Gain basic knowledge and apply the principles of nutrition to ensure good health for the individual and community
5. Evaluate nutrition information based on scientific reasoning for clinical and community application.

Department of Food Science and Nutrition
Generic Elective Courses – VI
Community Nutrition

Semester IV **Hrs of Instruction /Week:5+1**
23BFNGE6 **No. of Credits:6**

Course Objectives:

Enable the students to

1. To learn about the nutritional programmes and policies overcoming malnutrition
2. To understand various nutritional organizations combating malnutrition
3. Gain knowledge on food and nutritional security, epidemiology in public health

Develop skills to assess nutritional status of the community

Unit 1: Introduction to Community nutrition **15**

Definition of community, public health nutrition, nutrition cycle, nutritional status of community. Public health nutrition and relation of nutrition to national development, assessment of public health and nutritional status of the community. Concepts of Community Health; Health care of the community

Unit 2: Health and Nutritional Assessment of Community- An Overview **15**

Direct parameters - Anthropometry, biochemical, Clinical and dietary methods – definition, instruments and tools, standard of reference and measurement techniques Indirect parameters – vital statistics, health indicators, socio- economic indices, KAP, ecological factors

Unit 3: Food and Nutritional Security **15**

Introduction and definition of food and nutritional security, factors affecting food and nutritional security, National and International approaches to improve food security, Consequences of malnutrition Environmental impact-biodiversity, Econutrition, Dietary diversity-per capita availability and consumption

Unit 4: Epidemiology in Public Health **15**

Introduction and definition of epidemiology, role of epidemiology in public health Epidemiology of communicable diseases-causes, signs, symptoms, treatment and prevention- respiratory, intestinal and other infections Immunization- types of immunity, immunization agents, schedules. National and International programmes on immunization

Unit:5 Strategies for Promoting Public Health Nutrition **15**

Health and Nutrition intervention programmes and policies, - Nutritious Noon Meal Programme , International and National Organizations and agencies involved in public health nutrition-World Public Health Nutrition Association (WPHNA), WHO, UNICEF, ICMR,NIN,CFTRI, NFI, Ministry of Health and Family Welfare-National Institute of Health and Family Welfare, Public Health Foundation of India (PHFI), Indian Institute of Public Health, Global Alliance for Improved Nutrition(GAIN)

Total Hours 75

Practicals Related Experience

1. Assessment of Nutritional Status by Direct Methods- Height, Weight, Head Circumference, Chest and Mid arm Circumference, Clinical, Biochemical Methods, Anthropometric measurement in children, adolescent **15**
2. Know about various governmental programmes implemented regarding Community health, Preparation of visual aids for nutrition education kits.

Field visit to (a) Observe the working of nutrition and health-oriented programmes (survey-based result).

Field visit to (a) Anganwadi Centers and Primary Health centers

To observe the working of nutrition and health-oriented programmes

Nutrition education – Adolescent/Pregnant Women/ lactating Women/ Elderly

Total Hours 90

Reference books

1. Swaminathan M (2007), Essentials of Food and Nutrition And Advanced Textbook Vol. I,
2. The Bangalore Printing and Publishing Co. Ltd, Bangalore
3. Gibney MJ, Margetts BM, Kearney JM, Arab L (2004) Public Health Nutrition Blackwell Publishing Co. UK
4. Understanding Nutrition: Whitney E.N. & Rolfes S.R. 8th Edition West/ Wordsworth.1999
5. Dietetics: B Srilakshmi, New Age International (P) Ltd., Publishers 3rd Edition, 2000
6. Nutrition and Dietetics :Shubhangini A.Joshi , Tata McGraw Hill Publishing Co. Ltd., New Delhi,1992

Journals

1. Indian Journal of Pediatrics, Valley Nicro, Missouri, U.P.
2. Indian Journal of Nutrition and Dietetics, Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore.
3. Proceedings of the Nutrition Society of India, NSI, Hyderabad

Course Outcomes:

1. Develop comprehensive skills in public health nutrition
2. Become professionals in Public health Nutrition
3. Acquire knowledge in epidemiological aspects
4. Excel in assessment of nutritional status on the community
5. Opportunities in government and NGOs as public health nutritionist

Department of Food Science and Nutrition
Generic Elective Courses – VII

Nutrition in Health and Diseases

Semester IV **Hrs of Instruction /Week:4+4**
23BFNGE7 **No. of Credits:6**

Course Objectives:

1. Learn about the growth and scope of dietetics and concepts of diet therapy
2. Gain knowledge about the role of nutrition in disease conditions.
3. Develop skills and techniques in the planning and preparation of therapeutic diets for various disease conditions
4. Understand the causes and symptoms of deficiency disorder

Unit 1: Concepts of diet therapy **12**

Growth and Scope of Dietetics
Purposes and Principles of Therapeutic Diets, Modifications of Normal Diets Classification of the Therapeutic Diets, Role of Dietitians
Characteristics of Dieticians, Diet Counseling, Team Approach to Nutritional Care, Principles of Food Prescription Indian Dietetic Association, Related Practical Experts

Practical

Visits to dietary department of hospitals
Preparation of Hospital diets using functional foods and presentation of case studies **12**

Unit 2: Obesity and Underweight **12**

Obesity – Etiological Factors, Assessment of Obesity, Complications, Reducing Diets, Importance of Exercise Underweight: Etiological Factors, Diet Modifications

Practical: Low and High Calorie Recipes in obesity and under weight **12**

Unit 3: Diabetes Mellitus **12**

Etiology, Types, Clinical and Biochemical Changes, Diagnostic Tests, GTT, HbA1c
Diet Modifications, Use Of Food Exchange Lists, Insulin-Types and Use Oral Hypoglycemic Agents Glycemic Index, Acute and Chronic Complications of Diabetes

Practical : Low Glycemic Index Recipes **12**

Unit 4: Diseases of the Cardio Vascular System **12**

Cardiovascular Diseases – Atherosclerosis, Coronary Heart Disease, Congestive Heart Failure – Etiology, Complications, Diet Modifications Hypertension – Etiology, Sodium Restricted Diets, Fat Controlled Diets

Practical : Low Sodium High Potassium recipes, DASH Diet **12**

Unit:5 Deficiency Disorders **12**

Prevalence, Causes, Symptoms and Prevention of PEM, Iron, Vitamin A and zinc deficiency disorders

Practical **12**

Planning and preparation of recipes for PEM, IDA, VAD and Zinc Deficiency

Total Hours 120

References:

1. ***Srilakshmi, V. Dietetics*** New Age International P. Ltd., New Delhi,2016.
2. Dietary Guidelines of Indians–A Manual, National Institute of Nutrition, Hyderabad, 2015.
3. ***Garg, M. Diet, Nutrition and Health***, ABD Publishers, 2016.

Journals:

1. ***Krause, M.V. and Mahan, L.K. Food, Nutrition and Diet Therapy***, 9th Ed., W.B. Saunders Company, Philadelphia, 2009.
2. ***Maimun Nisha, Diet Planning for Diseases***, Kalpaz Publishers,2016.

Course Outcomes:

1. Understand the concept, purpose and principles of diet therapy and role and types of dietitians
2. Gain knowledge on the etiological factors and complications, assessment parameters and dietary modifications in obesity and underweight
3. Learn about the causes, types, biochemical changes, diagnostic tests, glycemic index, acute and chronic complications and dietary management of diabetes mellitus
4. Enumerate on the etiology, complications and dietary modifications of various cardiovascular diseases
5. Delineate various deficiency disorders with respect to their prevalence, causes, symptoms and preventive measure

Avinashilingam Institute for Home Science and Higher Education for Women
(Deemed to be University, Estd. u/s 3 of UGC Act 1956, under Category A by MHRD)
Re-accredited with A++ Grade by NAAC. CGPA 3.65/4, Category by I UGC
Coimbatore – 641 043, Tamil Nadu, India

Department of Food Science and Nutrition
M.Sc. Food Science and Nutrition

Programme Outcomes:

1. Apply basic knowledge of food science and nutrition for solving related problems(H,3)
2. Inculcate human values and professional ethics towards personal and professional development (H,3)
3. Design innovative food products and processing techniques with health, nutritional and environmental concern (H,3)
4. Assess community nutritional problems and impart nutrition education based on the needs of community (L,1)
5. Apply the principles of nutrition in the planning of diets for normal and therapeutic nutrition. (L,1)
6. Demonstrate professional attitudes, effective communication and behavioural skills that support and enhance individuals and team performance (L,1).
7. Evolve nutritional practices in the preparation and consumption of food at individual, family and community levels (M,2)
8. Analyze the nutritive value and hazardous components towards providing safe foods to consumers (L,1)
9. Exhibit interdisciplinary science and technological approaches for critical appraisal(M,2)
10. Adapt to the upcoming challenges and advancement in the field of Food Science and Nutrition(M,2)
11. Apply the research knowledge and competency for problem solving and innovation(M,2)

Programme Specific Outcomes:

1. To enable students with nutritional assessment and identification of nutritional problems
2. To develop the innovative food products with quality evaluation
3. To demonstrate meal planning based on normal and therapeutic conditions.

Scheme of Instruction and Examination
(For students admitted from 2023-2024 onwards)

Part	*Subject code*	*Name of paper / component*	*Hours of Instruction/week*		*Scheme of examination*				
			Theory	**Practical**	**Duration of exam**	**CIA**	**CE**	**Total**	**Credit**
First Semester									
I	23MFNC01	Nutrition through Life Span	5	_	3	40	60	100	4
I	23MFNC02	Food Microbiology and Food Safety	5	_	3	40	60	100	4
I	23MFNC03	Community Nutrition and Public Health	5	_	3	40	60	100	4
I	23MFNC04	Research Methods and Statistical Applications	5	_	3	40	60	100	4
I	23MFNC05	Chemistry of Foods – I	5	_	3	40	60	100	4
I	23MFNC06	Chemistry of Foods – II (Practical)	_	3	3	40	60	100	3
II		CSS/ Adult Education/Community Engagement	2	-	-	-	-	-	
Second Semester									
I	23MFNC07	Physiological Basis for Nutrition	5	_	3	40	60	100	4
I	23MFNC08	Food Biotechnology	4	-	3	40	60	100	4
I	23MFNC09	Post Production Systems (CIA paper)	4	-	3	100	-	100	4
I	23MFNC10	Analytical Instrumentation for Foods	4	_	3	40	60	100	4
I	23MFNC11	Techniques for Clinical Nutrition (Practical)	_	6	3	40	60	100	4
I	23MFNC12	Mini Project	1	-	-	100	-	100	2
I		**Interdisciplinary Course**	4	-	3	40	60	100	4
II	23MXCSS1/ 23MXAED1/ 23MXCSR1	CSS/Adult Education/Community Engagement and Social Responsibility	2	-	3	-	-	100	2
II		Professional Certification	-	-	-	-	-	-	2
	Internship during summer vacation (1 month)								

Third Semester									
I	23MFNC13	Therapeutic Nutrition	4	2	3	40	60	100	4
I	23MFNC14	Advances in Nutrition – I	4	_	3	40	60	100	5
I	23MFNC15	Biomolecules and Intermediary Metabolism	4	_	3	40	60	100	4
I	23MFNC16	Food Product Development and Packaging (Open book exam)	3	_	3	100	-	100	3
I	23MFNC17	Techniques for Experimental Nutrition (Practical)	_	6	3	40	60	100	4
I	23MFNC18	Functional Foods and Nutraceuticals	4	_	3	40	60	100	4
I	23MFNC19	Food Safety and Security (Self Study)	1	-	3	40	60	100	4
I		Multidisciplinary Course	2	_	3	100	-	100	2
II	23MFNC20	Internship				100	-	100	2
Fourth Semester									
I	23MFNC21	Advances in Nutrition – II	5	_	3	40	60	100	5
I	23MFNC22	Research Project	25			100	100	200	8
Total Credits									**98**

Other courses to be undertaken by the student:
MOOC Course – 2 to 4 Credits
Note: Minimum 98+2 to 4 credits to earn the degree

Other Courses offered by the Department
Interdisciplinary Course 23MFNI01 **Nutritional Management for Lifestyle Diseases**
Multidisciplinary Course 23MFNM01 **Wellness and Fitness**

Nutrition through Life Span

Semester I **Hrs of Instruction /Week: 5**
23MFNC01 **No. of Credits: 4**

Course Objectives:

Enable the students to

1. Familiarize with the different methods of assessing nutritional status
2. Assess the nutritional status of the community using ABCDE methods
3. Gain knowledge about the methods of assessment of nutritional problems and their implications.
4. Understand the role of nutrition in different stages of life cycle.
5. Comprehend the nutritional requirements for special events

Unit 1: Assessment of Nutritional Status **10**

Concept and objectives; Methods available to assess the nutritional status; Direct methods – anthropometric measurements, biochemical estimation, clinical examination and diet surveys; Indirect methods- Mortality and Morbidity rates, Vital statistics, Assessment of ecological factors; Techniques of diet and nutritional surveys; Assessing the food and nutritional problems in the community

Computer assistance for consolidation and documentation of survey data (SS)

Unit 2: Maternal and Pediatric Nutrition **13**

Stages of gestation, weight gain, complications of pregnancy

Physiological adjustments, nutritional problems and dietary management, Importance of nutrition during and prior to pregnancy and dietary allowances. Physiology of lactation, hormonal control and reflex action, efficiency of milk production, problems of breast feeding, nutritional composition of breast milk, galactogogues, dietary modification and allowances. Nutritional status of infants, infant feeding, nutritional needs and allowances, premature infant and their feeding, breast feeding ,formula feeding

Weaning foods and supplementary foods (SS)

Unit 3: Nutrition During Early And Late Childhood And Adolescence **12**

Growth and development of preschool children- nutrition and cognitive development, prevalence of malnutrition in preschool age, feeding programmes for preschool children, food habits and nutrient intake of preschool children, dietary allowances.

Nutrition in school children – feeding school children and factors to be considered. School lunch programme

Food habits and nutritional requirements, packed lunch, Dietary allowances (SS)

Nutrition during adolescence – changes in growth and development, hormonal influences, psychological problems, disordered eating behaviors, nutritional problems, changes needed to prevent malnutrition

Unit 4: Adult and Geriatric Nutrition **10**

Nutritional requirement for the adults; Nutrition and work efficiency

Menopausal and post menopausal women – hormonal changes, nutritional requirements; Physiological changes in aging

Clinical, psycho-social and economical factors affecting eating behaviour, social situation, institutionalization, common health problems (SS)

Nutritional requirements, modification in diet, feeding old people.

Unit:5 **Nutritional Requirements For Special Events** **10**

Sports nutrition

Nutritional requirements and food modification in higher altitudes,

Space travels and sea voyage (SS)

Related Experience **20**

Assessment of nutritional status and nutritional knowledge through anthropometric measurements, vital statistics, mortality and morbidity rate, clinical, biochemical and biophysical assessments, Food and nutrition survey on selected groups

Camp for 7 days in a village

Total Hours **75**

References:

Books:

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

Journals:

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

Course Outcomes:

1. Relate foods and nutrients to the biological requirements of humans at different stages of the life cycle
2. Generate resources to communicate nutritional information compiled from recommendations and scientific sources
3. Explain about the nutritional requirements of humans during different stages of the life cycle
4. Relate the nutrition-related concerns specific to each stage of the human life cycle to consequences for health
5. Explain and reflect upon the consequences of physical, biochemical, physiological, social and psychological factors impacting nutritional intake and status during each stage of the human life cycle

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO 1	H	H	M	M	H	L	H	M	M	M	M	H	M	M
CO 2	H	M	H	M	H	L	H	M	M	M	M	H	M	M
CO 3	H	H	H	M	H	L	H	M	M	M	M	H	M	M
CO 4	H	H	M	M	H	L	H	H	M	M	M	H	M	M
CO 5	H	H	H	M	H	L	H	L	M	M	M	H	M	M

Food Microbiology and Food Safety

Semester I **Hrs of Instruction /Week: 5**
23MFNC02 **No. of Credits: 4**

Course Objectives:

Enable the students to

1. Learn about the structure, growth and multiplication of microorganisms
2. Acquire knowledge and understand the relevance of microbiology and its application in food industry and maintenance of health.
3. Gain knowledge about food additives and contaminants
4. Analyse the food additive and contaminants from the aspects of safety and hygiene.
5. Understand the importance of food safety and quality management in food processing.

Unit 1: Introduction to Microbiology **15**

Structure, Growth and Multiplication of micro-organisms

Definition and History: *Microscopy, General Morphology and Types of microorganisms Bacteria, Fungi, Algae, Yeast and Virus –Bacteriophage (SS),* growth curve, batch and continuous culture, factors affecting growth: intrinsic factors, nutrient content, pH, redox potential, antimicrobial barrier and water activity; extrinsic factors: relative humidity, temperature and gaseous atmosphere.

Unit 2: Microbiology of Foods, Benefits of Microbes **15**

Contamination, spoilage and *preservation of cereal and cereal products, sugar and sugar products vegetables and fruits, milk and milk products and canned foods, meat and meat products, egg and poultry, fish(SS)* food fermentation-types; fermented food products

Unit 3: Introduction to Food Safety: **10**

Food safety in processing, packaging and labeling, food spoilage,factors affecting food safety, food borne hazards of food poisoning and its types and food intoxication and its types microbial origin.

Unit 4: Food Additives and Contaminants, Hygiene and Sanitation **10**

Food colors, flavoring agents, preservatives, antioxidants, emulsifiers, stabilizers, antimicrobial substances; natural contaminants, toxins alkaloids, lathyrogens, goitrogens, haemagglutinins, phytates; indirect additives, pesticides, metallic and microbial contaminants and adulterants *Food hygiene and sanitation–personal hygiene (SS)* and pest control in the food industry, industrial hygiene.

Unit 5 ***Food Laws (SS) and Quality Management, Recent Concerns in Food Safety*.** **10**

International and National food laws, Essential Commodities Act (ECA). ISI, BIS, AGMARK, Food Safety and Standards Bill 2005, Food Safety Act, 2006, Food Safety Rules and Regulations of FSSAI, 2011, FAO,WHO, Codex Alimentarius, WTO, JEFA, APDA, ISO 22000 series, *HACCP- definition, principles, and affiliations (SS),* consumer education, food safety education and training, food sampling and analysis of food

Related Practical Experience **15**

1. Hanging Drop Method – motility of bacteria.
2. Staining of Bacteria – simple staining, gram staining
3. Preparation of media and microbiological analysis of foods
4. Detecting food contaminants in some common foods.
5. Introduction to microbiological kits
6. Methods of detecting food pathogens
7. Destruction of food pathogens
8. CCP – in various foods

Total Hours **75**

References:

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

Course Outcomes

1. Understand the general morphology of microorganisms and understand the growth inhibiting and promoting factors for microorganisms.
2. Categorize the sources, contamination and type of spoilage in respective food groups and infer suitable presentation techniques.
3. Enumerate food poisoning food borne hazards and food intoxication of microbial origin to ensure food safety.
4. Interpret the different clauses used and applications of safety management in food industry.
5. Define different food laws and regulations for quality management in food industry.

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO 1	H	H	H	L	L	M	L	H	L	M	M	H	M	L
CO 2	H	M	L	M	M	M	L	L	L	M	H		M	H
CO 3	H	H	L	M	L	M	M	M	M	L	H	M	L	H
CO 4	H	H	M	M	L	L	M	L	M	M	H	H	M	L
CO 5	H	H	H	L	M	M	L	M	M	M	H	H	M	L

Community Nutrition and Public Health

Semester I **Hrs of Instruction /Week: 5**
23MFNC03 **No. of Credits: 4**

Course Objectives:

Enable the students to

1. To learn nutritional programmes and policies overcoming malnutrition
2. To understand various nutritional organizations combating malnutrition
3. To be able to apply computers in the formulation of community nutrition education programme
4. To apply the principles of supplementary feeding intervention during emergency.

Unit 1: **Nutrition and National Development**: **13**

Ecology of Malnutrition, Strategies To Overcome Malnutrition

Relation of nutrition to national development, nutrition and food security; Consequences of malnutrition;

IMR, NMR,MMR and prevalence of common nutritional problems- PEM, Vitamin A Deficiency Diseases, Anaemia, Iodine Deficiency Disorders and Fluorosis

Ecological factors leading to malnutrition; Synergism between malnutrition and infection; Measures to overcome malnutrition

Nutrition Intervention programmes – Nutritious Noon Meal Programme. ICDS, Prophylaxis programme – Vitamin A deficiency, Iron deficiency anaemia, Iodine deficiency (Eat Right India Movement, Anemia Mukt Bharat, Poshan Abiyan, NeTProFaN

National Nutrition policy, *Empowering women towards improving the nutritional status of the family, community and nation at large (SS)*

Unit 2: **National, International and Voluntary Organizations to Combat Malnutrition** **10**

History of malnutrition in India (SS)

National organization – ICAR, ICMR, CSWB, SSWB, NNMB, NIN, CFTRI, DFRL, NIPCCD and NFI;

International Organizations - WHO, FAO, UNICEF, World Bank, FFHC, WFP; Voluntary organizations – Global Alliance for Improved Nutrition(GAIN) Micronutrient Initiatives, CARE, CRS, AFPRO, IDA; Concepts of Community Health; Health care of the community

Unit 3: **Nutrition Education** **10**

Meaning, nature and importance of Nutrition education to the community and lessons to be taught (SS)

Training workers in nutrition education programmes, Methods of education when to teach, whom to teach

Use of computers to impart nutrition education

Organization of Nutrition education programmes

Unit 4: **Epidemiology of Communicable Diseases** **15**

Definition of epidemiology – causes, signs and symptoms, treatment and prevention of communicable diseases, respiratory infections, intestinal infections, Other infections- dengue, filariasis.

Types of immunity- active, passive and herd-group protection

Immunization agents- vaccines, immuno globulins

Immunization schedules (SS) – Active- National and WHO Expanded Programme on Immunization- Universal Passive, Combined, Chemoprophylaxis, non-specific measures

Unit:5 Environmental Sanitation and Disaster Management

Pollution, *Biomanure, Vermicomposting (SS)*, Effective MicroorganismsWater purification and recycling **12**

Types of disaster – natural and manmade –earthquakes, volcanic eruptions, flash foods, major floods, tsunami and drought, fire accidents, bomb blast.

Disaster management-mitigation strategies-Role of NGO's and GO's and nutritionists, Major nutritional and health considerations in disaster

Emergency feeding, mass and supplementary feeding, management of feeding operations, water and food safety

Related Experience

Planning and conducting nutrition education programmes in a selected village for three days **15**

Total Hours **75**

References:

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

Journals:

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

Course Outcomes:

1. Create awareness on nutritional programmes and policies and disease management.
2. Evaluate the impact of community nutrition on national development and analyze the effect of nutrition education programs on public Health
3. Apply the principles of supplementary feeding intervention during emergency
4. Understand the role of various nutritional organizations in combating malnutrition
5. Remember the etiology and epidemiology of communicable diseases and importance of immunization

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO 1	H	H	H	L	L	M	L	H	L	M	M	H	M	L
CO 2	H	M	L	M	M	M	L	L	L	M	H		M	H
CO 3	H	H	L	M	L	M	M	M	M	L	H	M	L	H
CO 4	H	H	M	M	L	L	M	L	M	M	H	H	M	L
CO 5	H	H	H	L	M	M	L	M	M	M	H	H	M	L

Research Methods and Statistical Applications

Semester I **Hrs of Instruction /Week: 5**
23MFNC04 **No. of Credits: 4**

Course Objectives:

1. Understand the fundamental principles and techniques of methodology concerning research.
2. Use effective tools and techniques to collect research data, organize them appropriately for facilitating further analysis.
3. Enable students conduct research work, formulate synopsis and report writing.
4. Apply statistical procedure to analyse numerical data and the interpreting data meaningfully.
5. Familiarise learners with statistical tools and Statistical Package for interpretation and drawing conclusions.

Unit 1: Introduction to Research, Types of Research and Research process **12**

Definition, Objectives, significance and characteristics of research
Types of Research – Descriptive, analytical, applied, fundamental, quantitative, qualitative, conceptual, empirical and current types of research
Hypothesis – Definition, concepts, tests of hypothesis
Basic components of research design
Sampling design- Probability and non- probability sampling methods

Unit 2: Data and Tools of Data Collection **11**

Primary and secondary data and data sources – Interview, observation, schedules and questionnaires – Definition, types, requirements, advantages, disadvantages, limitations
Census Vs sample survey
Pre-testing and pilot study, Editing and coding of data

Unit 3: Organization and Representation of Data, Report writing **12**

Classification – Definition, objectives, requisites, methods, qualitative, quantitative; frequency distribution – definition, terms; discrete and continuous
Tabulation of data- parts of a table, preparation of blank tables
Diagrammatic – One dimensional diagrams, two dimensional diagrams, pictogram and cartographs
Graphical- Frequency graphs- line, polygon, curve, histogram, cumulative frequency graphs- ogives
Components or layout of a thesis (SS)

Unit 4: Descriptive Measures **19**

Mean*, median*, mode* and their applications
Measures of dispersion*- standard deviation, coefficient of variation, percentiles and percentile ranks
Correlation coefficient and its interpretation*, Rank correlation*
Regression equations* and predictions. Association of attributes, contingency table

Unit:5 Probability and Tests of Significance **11**

Rules of probability and its applications
Normal, binomial – properties, importance in research studies, Wilcoxan Rank Test, Mann Whitnes U test, Kruskal Wallis Test
Large and small sample tests –'t'*, F* and chi square tests* ANOVA* and applications,Multiple paired comparison test – DMRT test, Tukeys test, Duncan'stest
Statistical software – SPSS

Related Experience **10**

1. Identifying the research problems under each type
2. Formulation of questionnaires and schedules
3. Consolidating data and forming tables
4. Drawing graphs and diagrams appropriately
5. Working out numerical sums and interpret
6. Numerical applications and drawing inferences, demonstration of SPSS

Total Hours **75**

*Inclusive of simple problems

Text Books:

1. C.R.Kothari and Gaurav Garg, Research Methodology: Methods and Technique, New Age International Publishers, 2019, 4th Edition
2. S. P. Gupta, Statistical Methods, Sultan Chand & Sons, 2012.

Reference Books:

1. Devadas.R.P. A Handbook on methodology of Research, Sri Ramakrishna Vidyalaya, Coimbatore, 2000
2. Gosh.B.N. Scientific Methods and Social Research Sterling Publishers Pvt.Ltd. New Delhi.
3. Kulbir Singh Sidhu, Methodology of Research in Education Sterling Publishers Pvt. Ltd., New Delhi, 2006
4. Srivastava.A.B.L and Sharma. K.K., Elementary Statistics in Psychology and Education, Sterling Publishers Pvt.Ltd.2003
5. G.C.Ramamurthy**,** Research Methodology, Kindle Edition, Dream tech Press, 2011
6. Ranjit Kumar, Research Methodology, SAGE publications, 2011, 3rd Edition
7. S.C. Gupta and VK Kapoor, Fundamentals of Mathematical Statistics, Sultan Chand & Sons, 2014

Course Outcomes:

1. Possess the knowledge on the basic concepts related to research methodology and statistics.
2. Develop understanding on the characteristics of research and sampling design along with data collection, presentation and analytical tools using software
3. Acquire the skill in the design of sampling along with selection, collection, analysis and interpretation of data using statistical procedures.
4. Analyse the situation for identification of problems and assess for fitting hypothesis and statistical procedures for related data.
5. Construct the research design with appropriate tools and statistical analysis in solving problems related to food science and nutrition.

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PS O 2	PS O 3
CO 1	H	M	M	H	M	L			M	M	H	M		L
CO 2	H	M	L	M	M	L			M	M	H	M		L
CO 3	H	M	L	M	L	M			M	L	H	M		L
CO 4	H	M	M	M	L	L			M	M	H	M		L
CO 5	H	M	H	L	M	M			M	M	H	M		L

Chemistry of Foods-I

Semester I **Hrs of Instruction /Week: 5**
23MFNC05 **No. of Credits: 4**

Course Objectives:

1. Outline the basic and advanced concepts of food chemistry
2. Provide insight into the chemistry of various food components
3. Understand the major chemical reactions in food preparation
4. Learn the physico chemical properties of food substances
5. Familiarise with non-nutritive components of food

Unit 1: Physico Chemical Changes in Foods **15**

Physical properties of water, structure of water and ice, types of water in foods, water activity in foods, water soluble interactions, role of water in food systems, Hydrogen ion concentration (pH), Solubility, Solutions, Crystallization, Gels, Foams, Colloids, Stabilisers and Emulsions, Oxidation – reduction, Denaturation and coagulation of proteins, *Osmosis, Enzyme action (SS)*

Unit 2: Chemistry of Starch and Sugars **15**

Components and characteristics of food starches, non starch polysaccharides, Swelling of starch granules, Gel formation, factors affecting gelatinization, retrogradation, syneresis, effect of sugar, acid, alkali, fat and surface active agents onstarch

Stages of sugar cookery (SS), Crystal formation, factors affecting crystal formation, types of candies, Action of Acid, Alkali and Enzymes, Non enzymatic browning

Unit 3: Chemistry of Proteins and Enzymes **15**

Physicochemical properties of amino acids, *structure and functional properties of protein (SS)*. Gluten formation, effect of soaking, fermentation and germination, Action of Heat, Acid and Alkali on vegetable and animal proteins – egg, milk, meat and fish

Enzymes in foods – Nature of enzymes, stability and action, proteolytic enzymes, oxidases, lipases, enzymes decomposing carbohydrates and applications. Enzymes infood fermentations. Immobilized enzymes.

Unit 4: Chemistry of Lipids **15**

Physicochemical properties of Fats and Oils, Rancidity, hydrogenation,winterization, decomposition of triglycerides, Shortening power of Fats

Role of lipids in flavour enhancement(SS), Changes in Fats and Oils during heating and storage, Factors affecting fat absorption of foods

Unit:5 Chemistry of Non-nutritive components in foods **15**

Pectins, phenolic components, vegetable gums, volatile compounds, water and fat soluble pigments, Action of heat, acid and alkali on vegetable pigments, enzymatic browning reactions in fruits and vegetables, preventive measures.

Active principles of spices and condiments(SS)

Food additives- Definition, types of food additives, role in food processing

Total Hours **75**

References:

1. Paul, P.C., and Palmer, H. H., (2000) Food Theory and Applications. John Wiley and Sons, Newyork, Revised Edition.
2. Belitz, H.D and Grosh. W, (2005). Food Chemistry. Springer – Verlag.
3. Fennema O.R (1996). Food Chemistry, Fourth Edition, Marcel Deckker,.
4. Meyer, L.H. (1987). Food Chemistry. CBS publishers and Distributors, New Delhi.
5. Manay, S N. and Shadaksharaswamy (2017) Foods: Facts and Principles, Third Revised Edition, New Age International (P) Publishers, New Delhi.
6. Potter, N.N. and Hotchkiss, J.H. (2006), Food Sciences, Fifth edition, CBS Publishers and Distributors, New Delhi.

Journals

1. Journal of Food Science.
2. Advances in Food Research.
3. Journal of Food Science and Technology.
4. Journal of Agricultural and Food Chemistry.

Course Outcomes:

1. Relate and analyse the composition and chemical groups on food molecules and their role in reaction mechanisms in foods.
2. Acquire knowledge on the physico chemical changes with regard to carbohydrates, lipids, proteins and water
3. Assess implications for food formulations to achieve food quality, palatability, cost and health
4. Analyse and interpret the role of food chemistry in food preparations
5. Analyse the components of foods in relation to processing and preservation

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO 1	H	L	L	L	H	M	M	H	M	L	M	L	M	M
CO 2	H	L	M	M	H	L	M	M	M	L	M	L	L	M
CO 3	H	M	H	M	H	H	H	H	M	L	L	M	M	M
CO 4	H	M	M	L	H	L	M	M	L	L	L	L	H	H
CO 5	H	L	M	L	H	M	H	H	H	L	L	L	L	L

Chemistry of Foods- II (Practical)

Semester I **Hrs of Instruction /Week: 3**
23MFNC06 **No. of Credits: 3**

Course Objectives:

1. Associate the theoretical concepts to the physico chemical changes in foods
2. Explore the structural changes in foods
3. Provide insight into the effect of various factors involved in food preparation
4. Determine the changes in foods during preparation
5. Prepare recipes based on the physico chemical changes in foods

Unit 1:	Gelatinization of various starches, microscopic examination of starches Stages of sugar cookery, preparation of Fondant, Fudge, Caramel, Pulled toffees and brittles and microscopic examination for crystallization of sugars, Determination of gluten content in doughs from different flours	**9**
Unit 2:	Smoking temperature of fats and oils. Factors affecting fat absorption in shallow and deep fried foods	**6**
Unit 3:	Effect of soaking time, types of water, cooking, acid, alkali and germination on pulses. Fermentation of batter in terms of volume and pH Preparation of cottage cheese, Setting of curd	**9**
Unit 4:	Changes in cooking of meat, factors affecting the tenderness of meat Effect of cooking time on egg protein, coagulation of egg, preparation of mayonnaise	**6**
Unit:5	Effect of acid, alkali and heat on vegetable pigments Determination of the strength of pectin in different fruits and vegetable extracts. Preparation of fruit jelly and tomato soup	**6**
	Mini project on the application of the concepts of food chemistry in food preparation	**9**
	Total Hours	**45**

References:

1. Paul, P.C., and Palmer, H. H., (2000) Food Theory and Applications. John Wiley and Sons, Newyork, Revised Edition.
2. Fennema O.R. (1996) Food Chemistry, Fourth Edition, Marcel Deckker.
3. Chandrasekhar U (2002), Food Science and Applications in Indian Cookery, Phoenix Publishing House Pvt Ltd, New Delhi.
4. Manay, S N. and Shadaksharaswamy (2017) Foods: Facts and Principles, Third Revised Edition, New Age International (P) Publishers, New Delhi

Course Outcomes:

1. Identify the physico chemical changes in foods and apply the knowledge acquired in food preparation
2. Evaluate the effect of chemical reactions of foods
3. Interpret the food interactions and outcomes
4. Demonstrate skills in food preparation and develop quality food products
5. Generation of novel ideas through small research projects

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PS O 2	PS O 3
CO 1	H	H	H	L	M	M	M	M	L	L	M	M	H	H
CO 2	H	M	H	M	H	H	H	M	L	L	M	M	H	H
CO 3	H	H	H	H	H	M	M	H	M	L	L	M	H	H
CO 4	H	M	H	M	H	M	H	H	M	M	L	L	H	H
CO 5	H	H	H	L	H	H	H	H	H	M	H	H	H	H

Physiological Basis for Nutrition

Semester II **Hrs of Instruction /Week: 5**
23MFNC07 **No. of Credits: 4**

Course Objectives:

To enable the students to

1. Understand the significance of blood and immunity
2. Gain knowledge on body fluids and circulatory system
3. Comprehend the organization and structural plan of the digestive system
4. Gain insight into renal and respiratory physiology
5. Understand the structure and functions of endocrine and nervous system

Unit 1: Blood and Immunology **15**

Blood composition (SS) and functions, plasma proteins- origin and its functions, blood volume haemostasis, *blood coagulation(SS)*

Development of red blood cells and anaemia, white blood cells, platelets, blood groups and blood transfusion.

Definition and types of immunity, lymphocytes in immunity, antigens, development of cellular immunity, development of humoral immunity, immune deficiency diseases and auto immune disease

Unit 2: Body Fluids and Circulatory System **15**

Compartment of body fluids, composition of body fluids, significance of body fluids, methods of measuring body fluids, lymphatic system and lymph. *Introduction to cardiovascular system(SS)*, origin and spread of cardiac impulse, *cardiac cycle(SS)* heart sounds, electro cardiogram, *heart rate(SS)* blood pressure-regulation of blood pressure and factors influencing blood pressure, hypertension, effect of exercise on cardio vascular system.

Unit 3: Digestive System **15**

Organization and structural plan of gastrointestinal system, *Functions of the stomach, liver and intestine(SS)*, mechanism of secretion of saliva, gastric juice, bile, pancreatic juice and intestinal juice, movements of gastrointestinal tract, Hormones in the gastrointestinal tract, gastric function tests and liver function tests

Unit 4: Respiratory Physiology and Renal Physiology **15**

Physiological anatomy of respiratory tract (SS), mechanics of respiration, transport of respiratory gases in blood, exchange of respiratory gases pulmonary volumes, regulation of respiration, effect of exercise on respiration, high altitude and acclimatization. Structure of kidney and nephron, urine formation, micturition, renal function test, acid base balance by kidney, dialysis, renal disorders.

Unit:5 Endocrine and Nervous System **12**

Structure and functions of pituitary glands, thyroid glands, endocrinal functions of pancreas, adrenal cortex and medulla, *disorders of endocrine glands (SS)*, Introduction to nervous system, neuron, receptors, synapse, neurotransmitters, reflex activity, general anatomy of nervous system, functions of the different parts

Related Experience

Determination of bleeding time, Determination of coagulation time, Estimation of haemoglobin, RBC count, **3**

Recording of blood pressure and heart rate at rest and in exercise

Total Hours **75**

References:

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

Course Outcomes:

1. Gain knowledge on the composition of fluids and system of organs in human body.
2. Comprehend the mechanism behind the functions of fluids and system of organs in human body
3. Enumerate the factors associated with normal functions of body fluids and organs
4. Explore the pathological symptoms associated with the physiological dysfunctions.
5. Acquire the skill in basic physiological tests related to the health of human body.

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO 1	L	M		L	L	M			H	L	L	M		M
CO 2	L	M		L	L	M			H	L	L	M		H
CO 3	M	L		L	L	M			H		M	M		L
CO 4	M	L		H	M	M			H		L	M		M
CO 5	M	L		H	L	M			H	M	L	M		M

Food Biotechnology

Semester II **Hrs of Instruction /Week: 4**
23MFNC08 **No. of Credits: 4**

Course Objectives: Enable the students to

1. To gain knowledge on the techniques and tools of genetic engineering
2. To understand fermentation and enzymatic technology in food industries
3. To explore biotechnological techniques in the production of food based products.
4. To learn the safety of biotechnological implications in foods.
5. To imbibe skills on biotechnological approaches in the production of food additives.

Unit 1: Introduction and Genetic Engineering **10**

Definition, scope and importance of biotechnology (SS) Tools of genetic engineering: Enzymes-exonuclease, endonuclease, restriction endonuclease, ligase, reverse transcriptase and alkaline phosphatase. Commonly used cloning vectors-plasmids, bacteriophage, cosmids, phasmids: Genetic Engineering and Gene cloning – definition, basic steps and applications

Unit 2: Microbial Growth and Fermentation Systems **10**

Microbial cell growth, microbial metabolism, regulation of metabolism and product secretion (SS). Fermentation systems – batch, fed batch and continuous process; general structure of fermenter, factors influencing fermentation, Bioreactors – definition and types, Downstream processing – steps involved, biosensors and biochips – definition and applications.

Enzyme Technology – soluble enzymes, immobilized enzymes – methods of immobilization, general pathway for synthesis of enzymes, Synthesis and applications of enzymes in food industries - amylases, invertase, glucoseisomerases.

Unit 3: Tissue Culture and Single Cell Protein (SCP) **10**

Plant tissue culture – basic requirements,techniques and applications, Technique of gene transfer into plants- transgenic plants - flavrsavr tomato, golden rice, Btbrinjal, GM mustard, safety aspects of transgenic crops; animal tissue culture - basic requirements and techniques, Applications in food industry.

Microbial biomass and Single cell protein- definition, importance and applications, synthesis of single cell protein (SS) spirulina, mushroom culture and yeast biomass production. Single cell cultures for production of food flavours and colours.

Unit 4: Role of Biotechnology in Food Industries **10**

a) Food additives, synthesis of acidulants – citric acid, gluconic acid, lactic acid, itaconic acid; sweeteners – glucose syrup and High Fructose Corn Syrup (HFCS): thickeners and gelling agents - xanthan gums.

b)Vitamins and amino acids – vitamin A, ergosterol, riboflavin, vitamin B_{12}, fatty acid; amino acids – lysine, methionine, glutamate.

c) Food fermentations – alcoholic beverages, cheese making, fermented soya based foods, meat fermentation, vinegar (SS)

Unit:5 Xenobiotics, Nanotechnology, Nutrigenomics and Regulatory Aspects of Biotechnological Methods **10**

Definition, components, metabolism of xenobiotics- Phase I and Phase II reactions, Bio- dynamics of xenobiotics, Nanotechnology and Nutrigenomics.: Definition, Concepts and applications; *Impact of biotechnology on the nutritional quality of foods (SS),* Safety aspects of foods produced by biotechnology and genetic engineering

Related Experience **10**

Visit to biotechnology/genomics lab
Visit to plant tissue culture laboratory
Visit to animal tissue culture laboratory

Total Hours **60**

References:

Books:

1. V.K.Joshi and Ashok Pandey (2009) Biotechnology: Food Fermentation- Microbiology, Biochemistry and Technology, volume –I. Asia Tech Publishers, New Delhi.
2. V.K.Joshi and Ashok Pandey (2009) Biotechnology: Food Fermentation - Microbiology, Biochemistry and Technology, volume- I . Asia Tech Publishers, New Delhi.
3. Satyanarayana, U, 2008. Biotechnology, Books and Allied (P) Ltd., Kolkata
4. Mansi, EMT, Bryce, CFA, Demain, A.L and Allman, R (2007) Fermentation Microbiology and Biotechnology, Taylor and Francis, New York.
5. Meenakshi Paul (2007) Biotechnology and Food Processing Mechanics, Gene-Tech Publishers
6. JayantoAchrekar , (2007) Fermentation Biotechnology, Dominant Publishers
7. Green P.J 2002, Introduction to Food Biotechnology, CRC Press, U.S.A

Journals:

1. Food Technology, Journal of Institute of Food Technology, Illinois, USA
2. Journal of Food Science and Technology by Association of Food Scientists and Technologists, CFTRI India
3. Food Technology, Abstracts, Central Food Technological Research Institute, Mysore.
4. Food Processing, Pitman Publishing Company, New York, USA
5. Journal of Food Science, The Institute of Food Technologists, Illinois, USA.
6. Nutrition and Food Science, Forbes Publications Ltd., Hatree House, Queenway, London.
7. Trends in Biotechnology, USA.
8. R. D. King, Food Biotechnology, Springer, 2011
9. R C Dubey, A Textbook of Biotechnology, Fifth Revised Edition 2014, S Chand Publications
10. Byong H. Lee, Fundamentals of Food Biotechnology, 2nd Edition, 2015, Wiley-Blackwell
11. Joshi VK, Food Biotechnology, Principles and Practices, 2013, I K International Publishing House Pvt. Limited

Course Outcomes:

1. Gain knowledge on the techniques and tools of genetic engineering and food biotechnology
2. Recognize the importance of fermentation, xenobiotics, nanotechnology, nutrigenomics and applications of enzyme technology in food industries
3. Identify key genetically modified foods and animal tissue culture in the production and safety of transgenic plants and animals
4. Explore microbial pathways and appreciate the role of microorganisms in industrial processes
5. Elucidate the nutritional and safety aspects of implications of biotechnology in foods

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO 1	H	H	M	L	L	L	M	L	M	H	H	L	H	L
CO 2	H	M	H	M	M	L	M	H	H	H	H	L	H	M
CO 3	H	H	H	H	L	L	M	M	H	H	H	L	H	H
CO 4	H	M	H	M	M	L	M	H	H	H	H	L	H	H
CO 5	H	H	H	H	L	M	H	H	H	H	H	M	H	M

Post Production Systems (CIA Paper)

Semester II **Hrs of Instruction /Week: 4**
23MFNC09 **No. of Credits: 4**

Course Objectives:

Enable the students to

1. Learn about national and international agencies controlling food losses
2. Study about agents causing food losses
3. Understand the importance and methods of post-production techniques for foods
4. Gain knowledge in food processing and food conservation

Unit 1: Introduction To Post Production Technology and Agencies Controlling Food Losses **12**

Need for post-production technology, important measures adopted by Government to augment food production, *Green, Blue, and white revolution (SS)*

Role of SGC, FCI,CWC,SWC,IGS, Pest Control of India(PCI) in controlling food losses

Unit 2: Agents Causing Food Loss and Control Measures **12**

Types and reasons for losses of foods, extent and cost of losses; Agents causing losses - insects, rodents, micro-organisms, Birds and other physical agents

Importance and methods of sanitary handling (SS)

Physical, chemical, biological measures to control insects, rats, rodents and birds; Fumigants, fumigation, safety measures and integrated pest control

Unit 3: Storage of Grains, Fruits and Vegetables **12**

Importance and requirements of storage structures, *Study of traditional structures and improvements needed (SS)*, modern storage structures, metal bins, silos, storage godown, cold storage chains in India.

Unit 4: Food Processing I **10**

Importance of processing- methods of processing cereals (wheat, rice, maize), breakfast cereals; premixes and convenience foods, Processing of pulses; Processing of fruits and vegetables, meat, fish, poultry, egg; Processing of sugars

Unit:5 Food Processing II **10**

Processing of oil seeds – ground nut, coconut, soya, gingelly, sunflower, cotton seed Processing of milk and milk products; Processing of condiments and spices – cumin, mustard, pepper, turmeric, chilli, ginger, coriander, cinnamon, COve, aniseed and garlic

Beverages , tea, coffee and cocoa (SS)

Related Experience **4**

Visit to FCI, TNAU, Milk processing unit and cold storage facilities

Visit to sugar manufacturing and oil processing unit

Total Hours **60**

References:

Books:

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

Journals

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

Course Outcomes

1. Understand the various roles of national and international agencies in preventing and reducing food losses.
2. Acquire knowledge about the agent casing food losses and the measures to control the food losses.
3. Learn the different types of the storage of grains, fruits and vegetables - traditional and modern.
4. Understand the importance of the processing of sugar, cereals, pulse, fruit, vegetables and Meat and meat products.
5. Gain knowledge about the processing of oil seed, condiments and spices.

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO 1	L	M	L	M	L	M	M	L	H	M	M	L	M	M
CO 2	M	M	M	M	H	M	M	M	H	M	M	M	M	M
CO 3	L	M	L	M	M	M	M	M	M	L	M	L	M	M
CO 4	M	M	M	M	M	M	M	H	M	M	M	M	M	M
CO 5	M	M	M	M	M	M	M	H	M	M	M	M	M	M

Analytical Instrumentation for Foods

Semester II **Hrs of Instruction /Week: 4**
23MFNC10 **No. of Credits: 4**

Course Objectives:

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

Unit 1: Spectrometric Techniques **10**

Need for analysis and instrumentation, Selecting an appropriate instrumental technique, criteria for selecting a technique, Limit of Detection (LOD) and Limit Of Quantification(LOQ), *Colorimetry (SS),* Spectrophotometry-definition and derivation of Lambert-Beer's Law, UV-VIS Spectrophotometer, Atomic-Absorption Spectroscopy (AAS),Inductively Coupled Plasma – Optical Emission Spectrophotometry (ICP- OES/MS)

Unit 2: Chromatographic Techniques **12**

Basics and Classification of Chromatography- Adsorption, partition, size exclusion, ion-exchange, affinity Gas Chromatography, Liquid Chromatography - Instrumentation, Sampling Techniques and Applications, *Applications of HPLC, Comparison of HPLC and GC (SS)* Thin Layer Chromatography, High Performance Thin Layer Chromatography (HPTLC), Hyphenated Techniques - Gas Chromatography-Mass Spectrometry (GC-MS), Liquid Chromatography-Mass Spectrometry (LC-MS)

Unit 3: Fluorimetry and Flame Photometry and Electrophoresis **10**

Theory of fluorescence and instrumentation, Instrumentation in Flame Photometry-oxidant, fuel, filter, detector, amplifier, applications, Principles and procedure of electrophoresis – Paper and Agar Electrophoresis, Moving boundary electrophoresis, PAGE, *Applications in food systems (SS)*

Unit 4: Radioactivity Measurement and Advanced Microscopic Techniques **10**

Radioactive isotopes (SS) Methods and Types, Radioactive Counters- gas and liquid Scintillation- uses, applications and safety, Food Morphology - Scanning Electron Microscopy (SEM), Transmission Electron Microscopy (TEM), Atomic Force Microscopy (AFM)

Unit:5 Techniques for Analysis of Physical Properties of Foods **12**

Rheology and Viscosity of foods – Rheometer, Viscometer, Barbender Farinograph, Texture Analyser, Hunter Calorimeter, Refractometer, *practical interpretation of texture profile analysis in food systems (SS),* Nuclear Magnetic Resonance Spectroscopy (NMR), Fourier Transform Infrared Spectroscopy (FTIR), Thermo gravimetric analysis (TGA) and differential scanning calorimetry (DSC) - Principle, Instrumentation and Applications

Related Experience

1. Visit to laboratories **6**
2. Demonstration of one chromatographic technique or one electrophoretic technique

Total Hours **60**

Text Books:

1. Kaur.N(2006.) Instrumental Methods of Chemical Analysis. PragatiPrakashan Educational Publishing. 3rd Edition,
2. Alan H.Gowenlock, Jannet R Mc Murray and Donald M. McLauchlex (2006) Varley's Practical Clinical Biochemistry, sixth edition. CBS Publishers and distributors, New Delhi.

Reference Books:

1. Egon Stahl, (2005) Thin Layer Chromotography, A Laboratory Handbook, 2nd edition, Springer International Edition, Heidelberg.
2. Rodney Boyer, (2006) Biochemistry Laboratory- Modern Theory and Techniques; Pearson Education Inc. Publications, USA.
3. Official Methods of Analysis, Association of Official Analytical Chemists (2011) - Officially recognized methods of analysis for many food components. 18th edition .
4. Y. Pomeranz and C.E. Meloan (2002). Food Analysis: Theory and Practice. Springer International Edition, Heidelberg.

Course Outcomes:

1. Understand the need for analysis and instrumentation
2. Identify an appropriate technique for analysing specific substances
3. Learn the principles of different instruments used for analysis
4. Have an insight into the advanced techniques in food and nutrient analysis
5. Update knowledge on analytical instruments by visiting laboratories

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO 1	H	M	H	L	L	M	L	L	L	L	M	M	M	L
CO 2	M	H	L	M	M	M	L	L	L	M	H	L	M	H
CO 3	M	H	L	M	L	M	M	M	M	L	H	M	L	H
CO 4	H	M	L	M	L	L	M	L	M	M	H	H	M	L
CO 5	H	M	H	L	M	M	L	M	M	H	H	H	M	L

Techniques for Clinical Nutrition (Practical)

Semester II **Hrs of Instruction /Week: 6**
23MFNC11 **No. of Credits: 4**

Course Objectives:

1. To learn the normal level of biochemical parameters in blood and urine
2. To know analytical techniques in biochemical assessment in blood and urine
3. To analyze the biochemical parameters with the diagnostic level of nutritional status
4. To understand the clinical significance of biochemical chemical parameters in human health
5. Acquires the skills on exploiting kit methods in the analysis of biochemical parameters.

	Topic	Hrs
Determination of Blood for		
a)	Glucose	**3**
b)	Haemoglobin - Cyanmethaemoglobin method	**6**
c)	Iron and haemoglobin - Wong's method	
d)	Total Cholesterol	**3**
e)	Triglycerides	**3**
f)	High Density Lipoproteins(HDL)	**3**
g)	Serum Calcium	**6**
h)	Serum Total Protein and A/G ratio	**6**
i)	Serum Phospholipid	**6**
j)	Serum Creatinine	**3**
k)	Serum Alkaline Phosphatase	**3**
l)	Serum Glutamic Oxalate Transaminase	**6**
m)	Serum Glutamic Pyruvate Transminase	**6**
n)	Serum Bilirubin	**6**
Analysis of Urine for		
a)	Creatinine	**3**
b)	Urea	**6**
c)	Total nitrogen	**9**
d)	Calcium	**3**
e)	Phosphorus	**3**
f)	Iodine	**3**
Estimation of Serum Glycosylated Haemoglobin - Demonstration *Invitro absorption studies for macronutrients and micronutrients (SS)*		**3**
	Total Hours	**90**

References:

1. Raghuramulu N. Madhavan Nair K. Kalyana Sundram S (2007) A Manual of Laboratory Techniques Silver Printers, NIN.
2. Charles George Lewis Wolf, (2007) A Laboratory Hand-book of Urine Analysis and Physiological Chemistry, W. B. Saunders & Co., Harvard University,
3. Nancy A. Brunzel (2004) Fundamentals of Urine and Body Fluid Analysis, Saunders; 2nd Edition
4. Varley, H., Gowenlak, A. H and Hell, M. Practical Clinical Biochemistry, William Itinmaon Medical Books, London, 2000.

Course Outcomes:

1. Acquire the knowledge on diagnostic levels of biochemical parameters in blood and urine
2. Understand the clinical significance of levels of biochemical parameters in association with nutritional status
3. Learn the analytical techniques in the assessment of biochemical parameters.
4. Acquire the analytical skills for the estimation of biochemical parameters in blood and urine.
5. Acquire the skills on employing the appropriate kit methods for the analysis.

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO 1	H	L		L	M	M			M	M	L	H		M
CO 2	H	L		L	H	M			M	M	L	H		M
CO 3	H	M		L	H	M			M	M	L	M		H
CO 4	M	M		L	M	M			M	M	L	M		H
CO 5	M	M		L	M	M			M	M	L	M		M

Therapeutic Nutrition

Semester III **Hrs of Instruction /Week: 6 (4+2)**
23MFNC13 **No. of Credits: 4**

Course Objectives:

1. Understand the role of nutrition for health and diseases.
2. Obtain knowledge of different therapeutic diet and their preparation
3. Develop capacity and attitude for taking up the profession as a dietician.

Unit 1: Introduction and concept of therapeutic nutrition **12**

Growth and scope of dietetics, purpose and principles of therapeutic diets, modification of normal diet, classification of therapeutic diet. Concept of tube feeding (intravenous feeding & total parenteral nutrition)

Pre and post-operative nutrition, enteral and parenteral nutrition- *Enteral formula composition, advantages and disadvantages. Pharmacological use of nutrients, Characteristics and role of dietitians and IDA Nutrition and diet counselling. Allergy- definition, classification, manifestation, common food allergies, tests for allergy and diet modification (SS).*

Unit 2: Endocrine and genetic disorders **12**

Diabetes mellitus: etiology, types, clinical and biochemical changes, Clinical signs andsymptoms, complications, diagnosis, mode of treatments.

Disorders of thyroid and para thyroid glands, tetany, gout and arthritis (SS).

Obesity- etiology, theories on Obesity, types, nutritional/dietary management, complications.

Under weight- etiology, nutritional/dietary management; Genetic disorders: phenyl ketonuria, galactosemia, fructosuria,Maple syrup urine disease

Unit 3: Diseases of the gastrointestinal tract and liver **12**

Diseases of gastrointestinal tract- etiology, type, clinical, signs and symptoms, diagnosis, nutritional/dietary management-peptic ulcer, diarrhoea, dysentery, constipation and *other GIT problems like gastritis, tropical sprue dumping syndrome, lactose intolerance, irritable bowel syndrome, diverticulosis celiac disease (SS).*

Diseases of liver: functions of liver, etiology, physiological and metabolic consequences, clinical signs and symptoms, mode of treatment and nutritional/dietary management of jaundice, hepatitis, Cirrhosis, hepatic coma, hepatic encephalopathy

Diseases of Gall Bladder and pancreas: *cholecystitis, cholelithiasis and pancreatitis.(SS)*

Unit 4: Diseases of cardiovascular system and renal disease **12**

Concepts and terms related to cardiovascular disease (SS). Risk factors for cardiovascular diseases, dietary management. *Role of fat in the development and prevention of cardiovascular diseases, Functional foods for CVD(SS).* Hypertension, atherosclerosis, Hypercholesterolemia, Hyperlipoprotenemia, causes, consequences, prevention and dietary management. Diseases of renal system: function of kidney, etiology, physiological and metabolic consequences, clinical signs and symptoms and nutritional management for nephritis, nephrosis, nephrosclerosis, renal failure-acute and chronic; *Dialysis: principles and types (SS).Kidney stones and urolithiasis- etiology, types, nutritional/dietary management(SS)*

Unit:5 Diets in other disease conditions , Fever and Infections 12

Classification, risk factors, symptoms, general systemic reactions, nutritional problems of cancer therapy, nutritional requirement and dietary management; Functional foods for CVD; Pulmonary diseases- bronco pulmonary disease, asthma, respiratory failure; HIV and AIDS- etiology, signs and symptoms, stages, diagnosis and nutritional/dietary management. *Fevers- causes, types, metabolic changes, fevers of short duration and chronic fever and infections, Typhoid, Tuberculosis, malarial infections Dengue, Swine flu and viral fever (COVID19)(SS)*

Total Hours **60**

Practicals/related experience

Visits to dietary department of hospitals Preparation of Hospital diets using functional foods and presentation of case studies	**6**
Preparation of diet for diabetes mellitus	**3**
Diet in obesity and under weight	**3**
Diet for peptic ulcer, Diarrhoea, constipation	**3**
Diet for liver disease- jaundice, cirrhosis	**3**
Diet for Cardiovascular disease, atherosclerosis and hypertension	**3**
Diet for nephritis, renal failure, acute and chronic	**3**
Diet for cancer and HIV patient	**3**
Diet for febrile condition- TB, Typhoid, Fever Diet	**3**
Total Hours	**30**
Total Hours	**90**

References:

1. Robinson C.H. (2015) Normal and Therapeutic nutrition, 12th edition, Macmillan Publishing Co. Inc, Newyork.
2. Krause M.V and Mahan L.K (2016) Food, Nutrition and Diet therapy, 14th edition, W.B. Saunders Co, Philadelphia
3. Srilakshmi. B (2016), Dietetics, New Age International Pvt Ltd, New Delhi.
4. Dietary Guidelines of Indians- A Manual, National Institute of Nutrition, Hyderabad, 2015.

Journals:

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

Course Outcomes:

1. Understand the concept of therapeutic diets and diet counselling.
2. Learn the formulation of different modified diets and feeding techniques
3. Categorize the diseases and disorders for planning suitable diets
4. Prepare diets and calculate nutrient composition for dietary intervention

CO/ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PS O1	PS O2	PS O3
CO1	M	M	L	M	H	M	H	H	L	M	M	H	-	H
CO2	M	M	M	M	H	L	M	H	L	M	M	M	M	H
CO3	L	L	M	M	M	M	M	M	M	H	M	M	M	H
CO4	M	M	M	H	H	-	M	H	L	L	H	H	M	H
CO5														

Advances in Nutrition- I

Semester III **Hrs of Instruction /Week: 4**
23MFNC14 **No. of Credits: 5**

Course Objectives:

1. Provide an insight into the concepts of Nutrition
2. Explore the metabolism and utilisation of macronutrients
3. Associate bioavailability and nutritional significance of macronutrients
4. Learn the techniques and methods of assessing nutrients
5. Understand the role of body fluids and body composition in nutrition and health

Unit 1: Energy **10**

Definition of Energy, Components of energy requirements: BMR, RMR, thermic effect of food, physical activity. Energy Content of Foods, Total Energy Expenditure, Energy balance, Factors affecting energy requirements, methods of measuring energy expenditure, Energy utilization in cells, Energy metabolism during Physical Activity, CED and Obesity *Energy requirements and Recommended Dietary Allowances- ICMR, FAO and WHO (SS)*

Unit 2: Carbohydrates **12**

Nutritional Importance of Carbohydrates. Review of Classification, Digestion, Absorption, Utilization and Metabolism of Carbohydrates, Glycemic Index and Glycemic Load

Dietary Fibre – Classification, Sources and its role in Human Nutrition, Interrelationship with proteins and fats.

Disorders related to carbohydrate metabolism(SS)

Unit 3: Proteins **12**

Historical Review, Functions and Classification, Sources,Digestion, Absorption,Utilization and storage of proteins, Protein Turnover, Amino acids and Peptide transporters. Evaluation of Protein Quality- BV, DC, PER, NPR, NPU, PDCAAS, Supplementary value of proteins related to PEM.Computation of Protein Requirements. *Recommended intakes- ICMR, FAO and WHO. Novel proteins (SS)*

Animal model study on estimation of PER and Nitrogen balance- Practical

Unit 4: Lipids **11**

Digestion and absorption of lipids, metabolism and transport of lipids in blood. Lipid transformation in the liver, Lipotropic factors, role of essential fatty acids, deposition of fat in the body, Free radical formation and role of antioxidant enzymes in mammalian cells, Consequences of high and low fat intakes

Review of Lipid Nutrition - saturated, poly unsaturated, mono unsaturated and transfat, Fat Burners and Replacers(SS)

Unit:5 Body fluids and body composition **10**

Body fluid compartments, Water -*Sources, Distribution, Functions and Requirements(SS)* Regulation and disorders of Water Balance, Importance of Euhydration; Assessment of Hydration Status- Common indices

Body composition- Methods of assessment, relation of body composition to nutritional status

Related Experience **5**

Animal model study on estimation of PER and Nitrogen balance

Total Hours **60**

Text Books :

1. Recommended dietary allowances, ICMR, National Institute of Nutrition, Hyderabad, 2020.
2. Mahtab S. Bamji, Prahlad Rao.N and Vinodhini Reddy, Textbook of Human Nutrition, Oxford IBH Publishing Co Pvt Ltd, 2004

Reference Books:

1. Krause,M.V and Hunsher,M.A, Food, Nutrition and Diet Therapy, 14th edition, W.B.Saunders Company, Philadelphia, 2016.
2. Carolyn D. Berdanier, Lynette A. Berdanier and Janos Zempleni, Advanced Nutrition: Macronutrients, Micronutrients, and Metabolism 1st Edition, 2008, Elsevier Inc, USA, 2008
3. Progress in Molecular Biology and Translational Science, Recent Advances in Nutrigenetics and Nutrigenomics Edited by Claude Bouchard and Joseph. M. Ordovas Academic Press, USA, 2012
4. Sareen, S, James, J , Advanced Nutrition in Human Metabolism, 4th Edition, Thomson Wordsworth Publication, USA, 2005.
5. Michael J. Gibney, Hester V Vorster and Frans J Kok Introduction to Human Nutrition. Blackwell Publishing Oxford, U.K, 2003.

Course Outcomes:

1. Comprehend the concepts of Nutrition.
2. Apply the knowledge in professional research on macronutrients
3. Acquire skills to evaluate protein quality
4. Create strategies to improve nutritional significance of macronutrients
5. Develop analytical designs in advanced nutrition research.

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO 1	H	M	H	L	L	H	L	M	L	L	M	M	M	L
CO 2	H	M	L	M	M	M	L	L	L	M	H	H	M	H
CO 3	M	H	L	M	L	M	M	M	M	L	H	M	L	H
CO 4	H	M	M	M	M	L	M	L	M	M	H	M	M	L
CO 5	H	H	L	L	M	M	L	M	M	M	L	H	M	L

Biomolecules and Intermediary Metabolism

Semester III **Hrs of Instruction /Week: 4**
23MFNC15 **No. of Credits: 4**

Course Objectives:

1. To enable the students to obtain depth in the study of biochemistry of major nutrients
2. To help the students to understand the basic metabolic pathways
3. To gain knowledge about the defects in various metabolic pathway

Unit 1: Carbohydrates **12**

Introduction, Classification. Structure and Properties of monosaccharides (hexoses and pentoses). Reactions of monosaccharides – oxidation, reduction and reaction with hydrogen cyanide, hydroxyl amine and phenyl hydrazine.
Oligosaccharides – Sucrose, maltose, lactose, isomaltose, cellobiose.
Homopolysaccharides - Structures of storage polysaccharides (Starch and glycogen)
Heteropolysaccharides – Structures of Hyaluronic acid, Heparin and Chondroitin sulphate.
Metabolism – Glycolysis, TCA cycle, HMP Shunt and energy production in the above pathways.
Oxidative phosporylation and Electron Transport Chain, Uronic acid pathway.
Glycogenesis and Glycogenolysis. (SS)

Unit 2: Lipids **12**

Classification – Triglycerides (Fats), Phospholipids and other non-phosphorylated lipids – cerebrosides, gangleosides, sulfolipids.
Characterisation of fats. Rancidity of fats. Chemistry of Essential fatty acids. Metabolism – Oxidation of fatty acids, biosynthesis of fatty acids (palmitic acid)
Biosynthesis of triacyl glycerol, phospholipids. (SS)

Unit 3: Aminoacids and Proteins **12**

Structure and classification of aminoacids. Classification of proteins – denaturation, Metabolism – General breakdown of aminoacids, deamination, transamination, decarboxylation and urea formation.
Structure of proteins with special reference to insulin, myoglobin andhaemoglobin. (SS)

Unit 4: Nucleic acids **12**

Composition and function.
Structure and properties of DNA and RNA (t-RNA, m-RNA and r-RNA), minor RNA types.
Metabolism – Biosynthesis and breakdown of purine nucleotides. Biosynthesis and breakdown of pyrimidine nucleotides.
Defects in nucleic acid metabolism(SS)

Unit:5 Enzymes **12**

Classification of enzymes. IUB classification Enzyme kinetics – Michaelis Menten equation.
Factors affecting enzyme activity (pH, temperature, substrate concentration and enzyme concentration).
Enzyme inhibition – Competitive, Non- competitive and Uncompetetive (Kinetics not necessary).
Clinical significance of enzymes in myocardial infarction and liver disorders(SS)

Total Hours **60**

References

1. Murray, R.K., Granner, D.K., Mayes, P.A. and Rodwell, V.W. (2021), Harper's Illustrated Biochemistry, 31st edition, International Edition.
2. Deb, A.C. (2002), Fundamentals of Biochemistry, New Central Book Agency (P) Ltd.
3. Nelson, L. and Michael.M.Cox. (2021), Lehninger Principles of Biochemistry, 8thEdition, W.H. Freeman and Company, NewYork.
4. Palmer, T. (1995), Understanding enzymes, 4th Edition, Prentice Halls, Ellis Horwood, London.
5. Voet, D., Voet, G.J. and Pralt, W.C. (2018), Fundamentals of Biochemistry, fifth edition, John Wiley and Sons, Inc.
6. West, E.S., Todd, W.R., Mason, H.Sand and Van Brugge, T.J. (1966), Biochemistry, 4thedition, The Macmillan Company, London.

Course Outcomes:

1. Gain basic knowledge about the classification and various aspects of carbohydrate metabolism
2. Describe the classification and oxidative process of lipid metabolism
3. Recognize the structure and metabolism of proteins and specialized structure of proteins
4. Integrate the biosynthesis and degradative pathways of nucleic acids and their disorders
5. Correlate the classification of enzymes and enzyme kinetics and isoenzymes of clinical importance

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO 1			M			M		H	H	H	H		L	M
CO 2			M			M		H	H	H	H		M	M
CO 3			M			M		H	H	H	H		L	M
CO 4			M			M		H	H	H	H		L	M
CO 5			M			M		H	H	H	H		H	M

Food Product Development and Packaging (Open book exam)

Semester III **Hrs of Instruction /Week: 3**
23MFNC16 **No. of Credits: 3**

Course Objectives:

1. Gain insight into production and processing of foods
2. Learn about quality management considerations
3. Develop new marketable, nutritionally and economically viable food products
4. Gain knowledge about packaging of foods, packaging materials and systems of labeling, testing and evaluation of packaged foods.
5. Develop entrepreneurship skills for setting up small scale food industries

Unit 1: Production and processing of food **10**

Criteria for selection of raw materials for food processing. Quality standards for various food groups – cereals and pulses, milk and its products, egg, meat, fish and poultry, fruits and vegetables, fats and oils, sugars and its products, spices and condiments, miscellaneous foods. Production systems used in the manufacture of food - small scale, large scale, manual, automated, computerized

Quality management considerations to achieve safe foods for public consumption (SS) - Hazard Analysis and Critical Control Point (HACCP), Food Safety and Standards Authority of India (FSSAI)

Unit 2: Product Development **10**

Principles and stages involved in product development, Sensory, chemical and microbiological evaluation of processed foods. Convenience Foods, Extruded foods, Health foods Nutritional supplements *RTS, RTE foods (SS)*

Definition, classification, characterization, factors influencing product development - social and health concerns, generation and screening of ideas for new product development, impact of technology and marketing. (SS)

Unit 3: Packaging Materials **10**

An introduction to packaging materials, Basic Packaging Materials – Paper, Wood, Plastics, Glass, Metal Containers (SS) Packaging Films – Polyethylene, Cellophane, Aluminium foil, Laminates, New Polymeric Packaging Films, Shrink Film, Cling and Wrap Film, Edible Film. Packaging Methods and Systems-Traditional Food Packaging, Retortable, Lined Cartons, Bag in Box, Aseptic, Modified Atmosphere Packaging, Vacuum, Gas Packaging, Bio Based Packaging, Eco-friendly and Safe Packaging for Exports Ovenable Packages, Transport Packages, Packaging Equipments

Unit 4: Storage, Handling and Distribution of Packages **8**

Shelf Life Testing of Packaged Foods, Evaluation of Packaged Foods

Labeling – Definition, Purpose, Types, Materials, Adhesives (SS)

Food and Nutritional Labeling as per FSSAI specifications

Packaging Laws and Regulations – National and International Specifications

Unit:5 Marketing of Food Products **7**

Product Cost Calculation, Product Specifications, Marketing Strategies, Advertising Methods, *Consumer Behaviour and Food Acceptance (SS)*

Total hours **45**

References:

1. Food Packaging Technology Handbook, 2019, NIIR Board of Consultants and Engineers, National Institute of Research, New Delhi.
2. Potter, N.M., Food Science, The AVI Publishing Company Inc., West Post, Connecticut, USA
3. Modern Packaging Industries, 2014, NIIR Board of Consultants and Engineers, National Institute of Industrial Research, New Delhi.
4. Fuller, Gordon, W., New Food Product Development, 2nd Edition, CRC Press, Boca Raton, Florida, 2015.
5. Paul Baines, BalChansarkar, Introducing Marketing Research, John Wiley & Sons Ltd., 2012.
6. Sudhir Gupta, Handbook of Packaging Technology, Engineers India Research Institute, New Delhi, 2017.

Course Outcomes

1. Know about the production and processing of food.
2. Understand and acquire knowledge on product development.
3. Learn the different types of packaging material.
4. Gain awareness of storage, handling and distribution of packages.
5. Enumerate the marketing of the product.

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PS O1	PS O2	PS O3
CO 1	M		H				M	H					H	
CO 2	M		H				M	H					H	
CO 3	M		H				M	H					H	
CO 4	M		H				M	H					H	
CO 5	M		H				M	H					H	

Techniques for Experimental Nutrition (Practical)

Semester III **Hrs of Instruction /Week: 6**
23MFNC17 **No. of Credits: 4**

Course Objectives:

1. Know the analytical procedures in estimation of nutrients of foods.
2. Acquire skills in the analysis of macro and micronutrient contents of foods.
3. Demonstrate the analysis of nutritional quality of foods.
4. Get equipped in the use of high end equipments
5. Understand the principles of reaction in the identification of nutritional constituents.

	Topic	**Hrs**
Analysis of Food for		
a)	Calories and Carbohydrate- Anthrone method	**6**
b)	Fibre – Crude and Dietary	**9**
c)	Moisture	**6**
d)	Nitrogen by Kjeldahl Method	**6**
e)	Ash	**3**
f)	Calcium	**3**
g)	Phosphorus	**3**
h)	Iron	**6**
i)	Total and β Carotene	**6**
j)	Vitamin A	**3**
k)	Thiamine	**3**
l)	Riboflavin	**3**
m)	Vitamin C	**3**
n)	Fat	**6**
o)	Starch	**3**
p)	Fats – Saponification Value	**3**
q)	Iodine Number	**3**
r)	Acid Number	**3**
s)	RM Value	**3**
t)	Sorenson's Formal Titration Method	**3**
u)	Estimation of Total Antioxidant Activity	**6**
	Total Hours	**90**

Reference Books:

1. Raghuramulu, N., Madhavan Nair, K., Kalyanasundaram, S. A Manual of Laboratory Techniques. Silver Printers, NIN, 2019.
2. Sadasivam, S and Manickam, A., Biochemical Methods, New Age International Pvt. Ltd., Publishers, New Delhi, Second Edition, 2018.
3. Oser, B. L. Hawk's Physiological Chemistry, XIV Edition, Tata McGraw Hill Publishing Company Ltd, Mumbai, 2001.
4. Varley, H., Gowenlak, A. H and Hell, M. Practical Clinical Biochemistry, William Itinmaon Medical Books, London, 2000.

Course Outcomes:

1. Gain knowledge on the analytical techniques in the nutritional estimation of foods.
2. Understanding of the principles in the estimation of nutritional composition of foods.
3. Acquire analytical skills in the analysis of macro and micronutrient content of foods.
4. Enable to demonstrate the analysis of nutritional quality of foods.
5. Able to identify and analyse the constituents in foods in a logical sequence of steps analysis.

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO 1	H					M		H	M	M	M	H	M	L
CO 2	M					M		H	M	M	M	L	M	H
CO 3	M	M			H	H		H		M	H	M	L	H
CO 4	M				H	H		H		L	H	H	M	L
CO 5	L	M				L		H	L	L	H	H	M	L

Functional Foods and Nutraceuticals

Semester III **Hrs of Instruction /Week: 4**
23MFNC18 **No. of Credits: 4**

Course Objectives:

1. Learn the development of functional foods along with the types of functional foods
2. Understand the category of nutraceuticals based on sources, mechanism of action and chemical nature
3. Analyse the health benefits of foods of different biotics origin
4. Acquire the skills on identification of foods of bioactive compounds with functional efficiency
5. Aware of the National and International regulatory aspects of Functional foods.

Unit 1:	**Introduction to Functional Foods and Nutraceuticals** Definition, History, Classification - designer foods and pharma foods, Health effects of functional foods, Stages involved in development of functional foods.	**12**
Unit 2:	**Categorization of Nutraceuticals** Classification - Based on food source, mechanism of action and chemical nature - isoprenoid, phenolic substances, fatty acids and structural lipids, terpenoids – saponins, tocotrienols and simple terpenes, carbohydrates and amino acid based derivatives, isoflavones.	**12**
Unit 3:	**Probiotics, Prebiotics and Synbiotics** Probiotics: Concept, Human gastrointestinal tract and its microbiota, Classification of probiotics, role of probiotics in health and diseases Prebiotics: Oligosaccharides, Dietary fiber, Resistant Starch, Gums, Spirulina as bioactive component. Synbiotics: Concept and Synbiotic foods with examples	**12**
Unit 4:	**Functional nature of Nutraceuticals** Polyphenols : Flavonoids, Catechins, Isoflavones, Tannins: Phytoestrogens, Phytosterols, Glucosinolates, Pigments, Organosulphur compounds, proteins and peptides, Conjugated linoleic acid, Omega 3 Fatty acids, Vitamins and Minerals Bioactive compounds: Saponins, Heamagglutinins, Reservatrol, Kaempferol, Quercetin, Cinnamaldehyde, Lutoline, Capsaicin, Piperine, Gingerol, Eugenol, Rosemarinic acid, Apigenine, Thymoquinone	**12**
Unit:5	**Regulatory Aspects of Functional Foods and Nutraceutical** Regulatory aspects- International and national regulatory aspects of functional foods in India, ICMR guidelines for Probiotics, Research frontiers in functional foods. Regulatory perspective of FOSHU Foods	**12**
	Total Hours	**60**

Text Books

1. Gibson, G.R. and Williams, M.C. (2001). Functional Foods Concept to Product, CRC Press.
2. Wildma, R.E. (2016). Handbook of Nutraceuticals and Functional Foods. CRC Press.
3. Yashwant Patak (2010). Handbook of Nutraceuticals Volume I Ingredients, Formulations and Applications, CRC Press.

Journals

1. Journal of functional foods
2. Journal of Nutraceuticals

References

1. Webb G.P (2016), Dietary Supplements and Functional Foods, Blackwell Publishing Ltd, New York.
2. Tamine. A (2015), Probiotic Dairy Products, Blackwell Publishing Ltd, United Kingdom.
3. USFDA regulations on functional foods
4. FSSAI regulation of India

Course Outcomes:

1. Gain knowledge on the development of functional foods with the conceptual difference between functional foods and nutraceuticals.
2. Acquire skills to categorize nutraceuticals.
3. Gain awareness on the functional foods and nutraceuticals of biotics origin.
4. Apply the knowledge of functional nature of nutraceuticals
5. Understand the regulatory aspects of functional foods and nutraceuticals.

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PS O 2	PS O 3
CO 1	H	H	H	L	M				M	H	H		M	M
CO 2	H	M			L	M			M	M	M		M	M
CO 3	M	M	L	L	M	L			M	M	M		M	H
CO 4	M	M	L		L				L	M	M		M	M
CO 5	M	M	M		L					L	M		M	

Food Safety and Security (Self study)

Semester III **Hrs of Instruction /Week: 1**
23MFNC19 **No. of Credits: 4**

Course Objectives:

1. Get insight on food safety issues in India
2. Know the National and International Food Safety Laws
3. Understand the Safety Management of future foods, Foods in Household and Food Industries
4. Learn about the Food Security Management Concepts and Practices
5. Study about safety policies on future foods and recent packaging technologies

Unit 1:	Introduction to food safety and issues in India, food adulteration, food hazards (physical, chemical and biological) natural toxins, Need and importance of food safety in household and food industries; Factors affecting food safety in household and food industries; Regulatory authorities at local, district and national levels ensuring food safety in food industries	**3**
Unit 2:	National Food legislation - FSSAI, Essential Commodities Act, ISI / BIS, AGMARK, International Organization for food safety - FAO, WHO, Codex Alimentarius, APEDA and WTO	**3**
Unit 3:	Safety assessment of food additives, adulterants, pesticide residues, safety aspects of water, beverages such as soft drinks, tea, coffee, cocoa and safety evaluation of heat treatments and related processing techniques. Artificial Intelligence and Robotics in food safety Good Manufacturing Practices (GMP), Good Agricultural Practices (GAP) and Good Hygienic Practices, Management of disposal of food wastes.	**3**
Unit 4:	Food and Nutrition Security: Hunger and malnutrition, Definition and measurement. Factors contributing to food insecurity, Food security model, Food availability. Foreign aid, food aid and development. Global sustainability, environmental impacts of the world food system. National and international intervention. Globalization of the food system	**3**
Unit:5	Food and agricultural policies including Supply side policies, Infrastructure and production policies, Demand side policies, income support and redistribution, Food assistance programs Policies on future foods and packaging:-Super and Organic foods, In vitro meat, Plant based meat Analogue, Insect based foods; Intelligent or smart packaging, Green packaging, Edible Packaging	**3**
	Total hours	**15**

References

1. Early, R. (1995). Guide to Quality Management Systems for the Food Industry, Blackie, Academic and Professional, London
2. Gould, W.A. and Gould, R.W. 1988. Total Quality Assurance for the Food Industries, CTI Publications Inc, Baltimore
3. Pomeranz, Y. and Meloan, C.E. 1996. Food Analysis : Theory and Practice, CBS Publishers and Distributor, New Delhi

4. Askar, A. and Treptow, H. 1993. Quality Assurance in Tropical Fruit Processing, Springer – Verlag, Berlin
5. Leathers, H.D. and Fosters, P., The World Food Problem: Tackling the Causes of Under nutrition in the Third World, 3rd Edition. Lynne Rienner Publishers, 2004.
6. Southgate, D., Graha, D.H. and Tweeten, L., The World Food Economy, Blackwell Publishing, 2007.
7. Fogel, R. W. 2004. Health, nutrition, and economic growth. Economic Development & Cultural Change 52(3): 643-658.

Course Outcomes

1. Understand the introduction to food safety and issues in India
2. Enumerate on the functions of national and international organizations for food safety
3. Gain knowledge on safety assessment of food additives and supporting laws
4. Acquire insight on food and nutrition security and globalisation of food system
5. Learn about the food and agricultural policies and safety policies on future foods and recent packaging technologies

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO1	PSO2	PSO3
CO 1	H	M	L	H		L	M	H	M	H	M	H	M	L
CO 2	M	L		H		L				M	L	M		
CO 3	H		H	H		L	L	H		M			M	L
CO 4	H	M	M	H			M	M	H	H	M	H		M
CO 5	M	M	H	H		L	L	M	H	H	H	L	L	

Advances in Nutrition - II

Semester IV **Hrs of Instruction /Week: 5**
23MFNC21 **No. of Credits: 5**

Course Objectives:

1. Gain insight into the physiological and biochemical role of Vitamins, Minerals.
2. Outline the role of ultra trace minerals in nutrition.
3. Understand the interrelationship of micronutrients.
4. Explore the bioavailability and deficiencies of micronutrients
5. Enlighten on the significance of gut microbiome in nutrition and health.

Unit 1: Fat soluble vitamins **15**

Vitamins A,D,E and K- History, structure, nomenclature, chemistry, functions, metabolism, transport, storage, excretion and methods of assay, Bioavailability and factors affecting bioavailability, Interaction with other nutrients. *Human deficiency, Dietary sources, recommended intakes (SS)* Pseudovitamins

Unit 2: Water soluble vitamins **15**

Thiamine, riboflavin, niacin, vitamin B12, folic acid, pyridoxine, panthothenic acid, biotin, ascorbic acid - History, structure, chemistry, functions, metabolism, , transport, storage, excretion, Bioavailability and factors affecting bioavailability, methods of assay, *dietary sources, recommended intakes, human deficiency, hypervitaminosis, antivitamins (SS)*

Unit 3: Macro Minerals **15**

Calcium, Phosphorus, Magnesium, Sulphur, Choride, Sodium and Potassium Distribution, functions, absorption and utilization, , deficiency and toxicity, calcium - phosphorus ratio, absorption and utilization, Phosphates in blood, Inter relationship of Ca, P ,Vitamin D and parathyroid hormone, calcium balance, Sodium and potassium balance *Hypocalcaemia and hypercalcaemia, sources, requirement (SS)*

Unit 4: Micro Minerals **15**

Iron, Zinc, Flouride and Copper - Distribution, functions, absorption, metabolism, transport and utilization, deficiency, assessment of iron status, *sources, requirement, effect of excess iron retention and deficiency (SS)*

Interaction with other nutrients

Ultratrace Minerals- Iodine, cobalt, copper, molybdenum, manganese, selenium, nickel, chromium, boron, cadmium- Functions, sources and requirements, Pharmacological and therapeutic effects.

Unit:5 Gut microbiome in Nutrition **15**

Gut microbiome- An Introduction, Human microbiota , distribution, composition and functions of the gut microbiota, role of gut microbiota in nutrition, *The Human Microbiome project- implications for human health (SS)*, models to study gut microbiota, future perspectives for gut microbiome research in nutrition.

Total Hours **75**

Text Books :

1. Recommended dietary allowances, ICMR, National Institute of Nutrition, Hyderabad, 2020
2. Mahtab S. Bamji, Prahlad Rao.N and Vinodhini Reddy, Textbook of Human Nutrition, Oxford IBH Publishing Co Pvt Ltd, 2004

Reference Books:

1. Krause,M.V and Hunsher,M.A, Food, Nutrition and Diet Therapy, 14th edition, W.B.Saunders company, Philadelphia, London, 2016.
2. Sareen, S, James, J, Advanced Nutrition in Human Metabolism, 4th Edition, Thomson Wordsworth Publication, USA, 2005.
3. Michael J. Gibney, Hester V Vorster and Frans J Kok, Introduction to Human Nutrition , Blackwell publishing Oxford, U.K. ,2003
4. Edward Ishiguro Natasha Haskey Kristina Campbell , Gut microbiota: Interactive effects on Nutrition and Health, 1st Edition, Academic Press, 2018
5. Dirk Haller , The Gut microbiome in health and disease , 1st Edition, Springer, 2018
6. Ana Maria R. Moise , The Gut microbiome: Exploring the connection between, microbes, diet and health, 1st Edition, Greenwood Press, USA, 2017

Course Outcomes:

1. Identify the role of micronutrients in health and disease.
2. Associate the inter relationship between vitamins and minerals
3. Develop intervention strategies to combat micronutrient malnutrition.
4. Exhibit professionalism in micronutrient research
5. Interpret the significance of gut microbiome in human nutrition

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO 1	H	H	H	L	M	M	M	M	L	L	M	M	H	H
CO 2	H	M	H	M	H	H	H	M	L	L	M	M	H	H
CO 3	H	H	H	H	H	M	M	H	M	L	L	M	H	H
CO 4	H	M	H	M	H	M	H	H	M	M	L	L	H	H
CO 5	H	H	H	L	H	H	H	H	H	M	H	H	H	H

Internship

Semester III

23MFNC20 **No. of Credits: 2**

Course Objectives:

1. Provide experiential learning opportunities for developing work ethics and Professional demeanor.
2. Develop learning experience for integrating knowledge, skill and work.
3. Acquire professional identity and competence.

Course Outcomes

CO1: Gain work experience and skills in food industries and hospitals

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO 1	H	H	H	L	H	M	M	M	H	H	H	L	H	H

Research Project

Semester IV **Hrs of Instruction /Week: 25**
23MFNC22 **No. of Credits: 8**

Course Objectives:

1. Get deeper insights into current research and work.
2. Draw ancillary knowledge of methods in the major subject / field of study.

Course Outcomes

CO1: Gain insight on community and experimental nutrition research

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO 1	H	H	H	H	M	H	H	H	H	H	H	H	H	H

DEPARTMENT OF FOOD SCIENCE AND NUTRITION

Interdisciplinary Course

Nutritional Management for Lifestyle Diseases

Semester II **Hrs of Instruction /Week: 4**

23MFNI01 **No. of Credits: 4**

Course Objectives:

1. Obtain knowledge of nutrients and different therapeutic diets
2. Understand the nutritional management for different disease conditions.
3. Develop skills in planning and preparation of diets suitable for various disease conditions.
4. Study about the nutritional management of lifestyle diseases
5. Understand the preventive measures and lifestyle modification

Unit 1: **Introduction to Therapeutic Nutrition** **6**

Basics of foods and nutrients, purpose and principles of therapeutic diets, factors to be considered in the modification of normal diets in to therapeutic diets

Unit 2: **Nutritional Management for Diabetes Mellitus** **6**

Definition, etiology, types, signs and symptoms, complications, diagnosis, adolescence and diabetes, alcohol and diabetes, physical activities and diabetes and modes of treatment.

Unit 3: **Nutritional Management for Cardiovascular Diseases** **6**

Atherosclerosis : risk factors, role of fat in development of atherosclerosis, types of clinical features, diet therapy

Hypertension- Definition, classification, signs and symptoms and diet therapy.

Unit 4: **Nutritional Management for cancer and metabolic disorders** **6**

Cancer: Definition, etiology, diagnosis, general systemic reactions, nutritional problems of cancer therapy, nutritional requirements and role of functional foods in prevention of cancer

Obesity: Definition, etiology, diagnosis, general systemic reactions, nut, nutritional requirements and role of functional foods and physical activity and lifestyle modification in prevention of obesity

Unit:5 **Nutritional Management for other diseases** **6**

Overview, causes, signs and symptoms, diagnosis, diet therapy in Alzheimer's disease, Parkinson disease, Osteoporosis and Rheumatoid Arthritis

Related Experience **30**

Planning and preparation of diet suitable for various disease conditions

1. Diabetic diet -4
2. Low sodium diet -4
3. Low fat diet -4
4. Low calorie diet -4
5. High calorie diet -4
6. High fibre diet -4
7. Recipes with functional foods for CVD -3
8. Recipes with functional foods for Cancer -3

Total Hours **60**

Textbooks

1. Srilakshmi. B (2016). Dietetics, New Age International Pvt Ltd., New Delhi
2. Swaminathan, M. (2015) Advanced Textbook on Food and Nutrition, Vol II. Bangalore Printing and Publishing Co.Ltd.

References:

1. Robinson C.H. (2015) Normal and Therapeutic nutrition, 12th edition, Macmillan Publishing Co. Inc, Newyork.
2. Krause and Mahan's Food & the Nutrition Care Process, 15th Edition, W.B Saunders Company, USA, 2020.

Course Outcomes:

1. Gain knowledge on the basics of foods and nutrition in health and diseases.
2. Acquire skills on nutritional management of lifestyle diseases.
3. Enable to understand the nutritional care and support for metabolic disorders.
4. Obtain knowledge on functional foods and nutritional requirements to prevent lifestyle diseases.
5. Acquire skills to prepare therapeutic diets.

DEPARTMENT OF FOOD SCIENCE AND NUTRITION

Multi Disciplinary Course

Wellness and Fitness

Semester III **Hrs of Instruction /Week: 2**

23MFNM01 **No. of Credits: 2**

Course Objectives:

1. Elementary knowledge on wellness and fitness
2. Knowledge on relationship between nutrition and health
3. Insight into physical activity training
4. Knowledge on diseases due to Faulty Food Habits and Physical Inactivity
5. Understanding on Stress and Health Management

Unit 1: Wellness, Fitness and Health **6**

Definition and Indicators of Health - Parameters, Components and Relationship between Wellness, Fitness and Health - Challenges and Personalized Approach.

Unit 2: Nutrition and Health **6**

Introduction - Food Groups, Adequate Diet, My Pyramid, Gandhian Foods for Health, Sustainable Development Goals,

Role of Macro and Micro nutrients – Carbohydrates, Proteins, Fats, Vitamin D, Calcium, Iron, Optimum Nutrition and Hydration for Health,

Unit 3: Physical Activity Training **6**

Aerobic and anaerobic training -To enhance Cardio Vascular Endurance, Flexibility and Body Composition, Measurement of PAL, Benefits of Fitness training and Gadgets for measuring PA.

Unit 4: Diseases due to Faulty Food Habits and Physical Inactivity **6**

Non communicable Disease conditions- Underweight, Obesity, Diabetes mellitus, Hypertension, Cancer, Cardiovascular Disease, Anaemia

Unit:5 Stress and Health Management **6**

Stress Assessment and Management Techniques-Under Weight, Overweight and Obesity, Relaxation Techniques –Yoga and Meditation for Health

Total Hours **30**

References:

1. Werner W. K Hoejer, Life time Physical Fitness and Wellness, Morton Publishing Company Colorado, 1989.
2. Swaminathan T, ‘Essentials of Food and Nutrition’, Bangalore Printing Publishing Company, 2008.
3. William D. Mc Ardle, Frank I. Katch, Victor L. Katch ‘Exercise Nutrition: Energy Nutrition and Human Performance” William & Wilkinson Publishing, USA, 1996.
4. Janice L Raymond & Kelly Morrow, Krause and Mahan's Food & the Nutrition Care Process, 15th Edition, W.B Saunders Company, USA, 2020.

Course Outcomes:

1. Gain knowledge on the basic concepts related to wellness and fitness.
2. Understand the various approaches and parameters of health in the maintenance of wellness and fitness.
3. Analyse the disease and distress conditions based on the relationship of wellness, fitness and nutrition to health
4. Assess the wellness and fitness based on measurement of related factors.
5. Acquire the skill in tackling challenges and designing personalized approaches through appropriate techniques for sustainable health.