Dr. N.G.P. ARTS AND SCIENCE COLLEGE
(An Autonomous Institution, Affiliated to Bharathiar University, Coimbatore)
Approved by Government of Tamil Nadu & Accredited by NAAC with A++ Grade (3rd Cycle-3.64 CGPA)
Dr. N.G.P.-Kalapatti Road, Coimbatore-641 048, Tamil Nadu, India
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REGULATIONS 2024-25 for Post Graduate Programme

(Outcome Based Education model with Choice Based Credit System)

M.Sc. FOOD AND NUTRITION

(For the students admitted during the academic year 2024-25 and onwards)

Eligibility:

A pass in any one of the following Degree Courses of B.Sc. Nutrition and Dietetics, Nutrition, Food Service Management and Dietetics, Food Science and Quality Control, B.VOC-Food Processing Technology, Food Science and Nutrition, Botany, Zoology, Biochemistry, Biotechnology, Chemistry, Microbiology, Home science or Family and Community Science or an Examination accepted as equivalent thereto by the Academic Council, subject to such conditions as may be prescribed thereto are permitted to appear and qualify for the M.Sc. Food and Nutrition Examination of this College after a course study of two academic years.

Programme Educational Objectives:

The Curriculum is designed to attain the following learning goals which students shall accomplish by the time of their graduation:

1. To provide advanced knowledge on food science and nutrition to enhance the quality of life through the improvement of human health and nutritional status
2. To enable the students to implement the basic food science in operation
3. To develop skills and techniques in food preparation with conservation of nutrients and palatability using cooking methods generally employed
4. To help the students to contribute proper utilization of foods and prevent wastes
5. To understand the prevalence of malnutrition in our Country and gain knowledge on effective methods to combat malnutrition.

PROGRAMME OUTCOMES:

On the successful completion of the program, the following are theexpected outcomes.

PO Number	PO Statement
PO1	To develop the knowledge of the students in the area of human nutrition, food science, food product development, food safety and quality management.
PO2	Apply recently advanced novel foods in medical nutrition therapy and recommend the physical activity to manage the common diseases and metabolic disorder to achieve the fitness and wellbeing.
PO3	Familiarize with the problems and plan, implement, monitor and evaluate interventional programs related to food and nutrition and security to the community.
PO4	To build entrepreneurial values, attitudes, quality and desire in developing innovative food products by fulfilling quality parameters, used to meet the consumer needs nutritionally and commercially viable.
PO5	To develop skills and techniques for the students to become professionals in service industries.

Total Credit Distribution

Course	Credits	Total		Credits	Cumulative Total
Core	4	14x 100	1400	56	92
Core Practical	3	2 x 100	200	06	
	2	2 x 100	200	04	
EDC	4	1 x 100	100	04	
Core Project Work	8	1 x 200	200	08	
Internship	2	1 x 100	100	02	
Electives	3	3 x 100	300	09	
Elective Practical	3	1 x 100	100	03	
			2700	**92**	**92**

PG
CURRICULUM

M.Sc. Food and Nutrition
AY 24-25

Course Code	Course Category	Course Name	L	T	P	Duration		Exam (h)	Max Marks			Credits
						Week	Total		CIA	ESE	Total	
First Semester												
24FNP1CA	Core – I	Advanced Food Science	4	1	1	6	72	3	25	75	100	4
24FNP1CB	Core – II	Nutrition Through Life Cycle	4	1	1	6	72	3	25	75	100	4
24FNP1CC	Core – III	Nutritional Biochemistry	4	-	-	4	48	3	25	75	100	4
24FNP1CD	Core – IV	Food Chemistry	4	1	1	6	72	3	25	75	100	4
24FNP1CP	Core Practical – I	Food Science and Food Chemistry	-	-	4	4	48	3	40	60	100	2
24FNP1DA	DSE - I	Functional Foods and Nutraceuticals	4	-	-	4	48	3	25	75	100	3
24FNP1DB		Food Product Development										
24FNP1DC		Harvest Technology of Agricultural Produce										
		Total	**20**	**03**	**07**	**30**	**360**				**600**	**21**

Course Code	Course Category	Course Name	L	T	P	Duration		Exam h	Max Marks			Credits
						Week	Total		CIA	ESE	Total	
Second Semester												
24FNP2CA	Core – V	Food Processing	4	-	1	5	60	3	25	75	100	4
24FNP2CB	Core - VI	Applied Physiology	4	-	-	4	48	3	25	75	100	4
24FNP2CC	Core - VII	Therapeutic Nutrition – Lifestyle Disorders	4	-	-	4	48	3	25	75	100	4
24FNP2CD	Core - VIII	Macronutrients	4	-	-	4	48	3	25	75	100	4
24FNP2CP	Core Practical – II	Food Analysis	-	-	6	6	72	3	40	60	100	3
24FNP2CE	EDC	Computer Application in Nutrition	4	-	-	4	48	3	25	75	100	4
24FNP2DA	DSE - II	Food Biotechnology	3	-	-	3	36	3	25	75	100	3
24FNP2DB		Food Waste and By-Product Utilization										
24FNP2DC		Food Toxicology										
Total			**23**	**-**	**7**	**30**	**360**				**700**	**26**

BoS Chairman/HoD
Department of Food Science & Nutrition
Dr. N. G. P. Arts and Science College
Coimbatore – 641 048

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Course Code	Course Category	Course Name	L	T	P	Exam (h)	Max Marks			Credits
							CIA	ESE	Total	
Third Semester										
24FNP3CA	Core – IX	Micronutrients	4	-	-	3	25	75	100	4
24FNP3CB	Core – X	Therapeutic Nutrition – Systemic Disorders	4	-	-	3	25	75	100	4
24FNP3CC	Core – XI	Research Methodology and Statistics	4	1	-	3	25	75	100	4
24FNP3CD	Core – XII	Food Additives and Contaminants	4	-	-	3	25	75	100	4
24FNP3CP	Core Practical - III	Food Analytical Techniques	-	-	6	3	40	60	100	3
24FNP3CQ	Core Practical - IV	Therapeutic Nutrition- Systemic Disorders	-	-	4	3	40	60	100	2
24FNP3CT	IT	Internship	-	-	-	3	40	60	100	2
24FNP3DA	DSE - III	Instrumentation in Food Industry	3	-	-	3	25	75	100	3
24FNP3DB		Food Packaging Techniques								
24FNP3DC		Food Microbiology								
		Total	**19**	**01**	**10**				**800**	**26**

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Course Code	Course Category	Course Name	L	T	P	Duration		Exam (h)	Max Marks			Credits
						Week	Total		CIA	ESE	Total	
Fourth Semester												
24FNP4CA	Core – XIII	Public Health Nutrition	4	-	-	4	48	3	25	75	100	4
24FNP4CB	Core - XIV	Food Safety and Quality Management	4	-	-	4	48	3	25	75	100	4
24FNP4CC	Core – XV	Project Work and Viva Voce	-	-	16	16	192	3	80	120	200	8
24FNP4DP	DSE - IV	Food Quality Control	-	-	6	6	72	3	40	60	100	3
24FNP4DQ		Nutrition in Health										
24FNP4DR		Food Fermentation Techniques										
Total			**08**	**-**	**22**	**30**	**360**				**500**	**19**
***Grand Total**											**2600**	**92**

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Academic Council * Dr.N.G.P. Arts and Science College * CHAIRMAN

DISCIPLINE SPECIFIC ELECTIVE

Semester I (Elective I)

(Student shall select any one of the following courses as Elective in first semester)

List of Elective Courses

S. No.	Course Code	Name of the Course
1.	24FNP1DA	Functional Foods and Nutraceuticals
2.	24FNP1DB	Food Product Development
3.	24FNP1DC	Harvest Technology of Agricultural produce

Semester II (Elective II)

(Student shall select any one of the following courses as Elective in second semester)

List of Elective Courses

S. No.	Course Code	Name of the Course
1.	24FNP2DA	Food Biotechnology
2.	24FNP2DB	Waste and By-Product Utilization
3.	24FNP2DC	Food Toxicology

Semester III (Elective III)

(Student shall select any one of the following course as Elective in Third semester)

List of Elective Courses

S. No.	Course Code	Name of the Course
1.	24FNP3DA	Instrumentation in Food Industry
2.	24FNP3DB	Food Packaging Techniques
3.	24FNP3DC	Food Microbiology

Semester IV (Elective IV)

(Student shall select any one of the following courses as Elective in fourthsemester)

List of Elective Courses

S. No.	Course Code	Name of the Course
1.	24FNP4DP	Food Quality Control
2.	24FNP4DQ	Nutrition in Health
3.	24FNP4DR	Food Fermentation Techniques

Self-study paper offered by the Department of Food Science and Nutrition

S. No.	Semester	Course Code	Course Name
1	III	24FNPSSA	Composite Home science
2	III	24FNPSSB	Diet Counseling

Semester – I

CORE - I: ADVANCED FOOD SCIENCE

Semester	Course Code	Course Name	Category	L	T	P	Credits
I	24FNP1CA	ADVANCED FOOD SCIENCE	CORE	48	12	12	4

Preamble	This course has been designed for students to learn and understand • the structure, classification and nutrient composition of foods • identify what foods are good sources for what nutrients • appropriate sensory evaluation tests to answer specific questions regarding food attributes or consumer preferences
Prerequisite	Knowledge on advanced food science concepts

Course Outcomes (COs)

CO Number	Course Outcomes (COs) Statement	Bloom's Taxonomy Knowledge Level
CO1	Analyze the structure of foods and compare the nutrient composition of foods	K2
CO2	Classify foods based on food processing and explain the methods of processing different foods	K3
CO3	Interpret the factors which affects the nutritive value of foods, classify the methods of cooking	K3
CO4	Examine the postmortem changes in meat, criticize the food quality, analyze the medicinal value of foods	K3
CO5	Choose foods based on quality, decide storage condition, subjective and objective evaluation of foods	K3

Mapping with Program Outcomes:

COs / POs	PO1	PO2	PO3	PO4	PO5
CO1	✓	✓	✓		
CO2		✓	✓		
CO3	✓		✓	✓	✓
CO4		✓		✓	
CO5	✓		✓		✓

Syllabus

Unit	Content	Hours	E-Contents / Resources
I	Cereals Rice - Structure, Composition and nutritive value, Cereal cookery Wheat - Structure, composition and nutritive value. Wheat flour — types, functionality of components, baking qualities, manufacture of bread, pastries and cakes Millets- Jowar, Bajra, Maize and Ragi, Composition and nutritive value and Products	14	Text Book
II	Pulses, Fats & Oils Pulses - Composition and nutritive value, methods of processing – dry and wet processing, vegetable protein mixes, Anti nutritional factors and eliminations Nuts and Oilseeds- Composition and nutritive value, nutritious food mixes from oil seeds, toxins Fats and Oil - Nutritional importance of oil and fats, Functions of oil and fats in foods, Sources, nutritional composition, rancidity — types and prevention, role of fat / oil in food preparations	15	Text book
III	Fruits & Vegetables Classification, Composition and nutritive value, selection, storage, pigments, browning reactions (Enzymatic and Non-Enzymatic), pectic substances, ripening of fruits, changes on cooking Beverages – Classification. Milk and fruit-based beverages, carbonated nonalcoholic beverages Spices and condiments – Type, uses and adulteration, role in cookery and medicinal uses Evaluation of foods - Subjective and objective evaluation of foods. Study of proximate constituents	14	Text Book
IV	Milk and milk products & egg Composition, physical and chemical properties - effects of heat, acid and enzymes, processing of milk – pasteurization, homogenization, types of milk. Milk products – Butter, curd, yogurt, butter milk, cheese, milk powder, khoa, ice cream Egg - Structure, composition, grading and selection, effects of heat on egg protein, egg foam (factors affecting foam formation) and role in cookery	14	Reference book

V	Meat, poultry & fish Meat - Structure, composition, postmortem changes, Rigor mortis, Aging and Tenderization of meat, color of meat, changes of meat in cookery and methods of cooking, meat analogues Poultry - Classification, composition, market forms, selection factors and methods of cooking Fish - Classification, composition, kinds of fish, characteristics of fresh fish, fish products and methods of cooking	15	Text Book
	Total	72	

Text Books	**1.**	Srilakshmi, B 2015, "Food Science," 8th Edition, New Age International Private Ltd., New Delhi.
	2.	Manay & Shadaksharaswamy, S.N & M, 2008, "Food facts and Principles", New Age International Private Ltd. New Delhi.
Reference Books	**1.**	Potter. N. N and Hotchkiss, 1996, "Food Science", CBS Publication, New Delhi.
	2.	Sunetra Roday, I. N. 2015, — "Food Science and Nutrition" Oxford Publishers New Delhi

Journal and Magazines	https://link.springer.com/journal/13197
E-Resources and Website	https://ifst.onlinelibrary.wiley.com/journal/13652621

Learning Method	Chalk and Talk/Assignment/ Seminar/ Interactive session

Focus of the Course	Skill Development / Employability / Innovation and Entrepreneurship

Semester – I

CORE II: NUTRITION THROUGH LIFE CYCLE

Semester	Course Code	Course Name	Category	L	T	P	Credits
I	24FNP1CB	NUTRITION THROUGH LIFE CYCLE	CORE	48	12	12	4

Preamble	This course has been designed for students to learn and understand • The role of adequate nutrition in stages of life cycle • The role of nutrition in the growth & development of human body • The importance of proper dietary pattern and its health effects
Prerequisite	Knowledge about nutritional requirements for various stages of life

Course Outcomes (COs)

CO Number	Course Outcomes (COs) Statement	Bloom's Taxonomy Knowledge Level
CO1	Plan diet for the stages of the life span. Learning nutritional requirements of preconception & pregnancy.	K2
CO2	Analyze specific dietary practices during lactation complementary and weaning foods for infants.	K3
CO3	Illustrate the nutrition for toddlers, school children - physiological & cognitive development.	K3
CO4	Evaluate physical growth, eating disorders, physiological changes among adolescence, adulthood and old age.	K4
CO5	Examine the nutritional requirements for sports, exercise and special condition.	K4

Mapping with Program Outcomes:

COs / POs	PO1	PO2	PO3	PO4	PO5
CO1	✓				✓
CO2		✓	✓		
CO3	✓		✓	✓	✓
CO4		✓		✓	
CO5	✓		✓		✓

Syllabus

Unit	Content	Hours	E-Contents / Resources
I	Nutrition in Preconception and Pregnancy Nutrition in Preconception-Introduction, premenstrual syndrome, obesity and fertility, eating disorder and fertility, polycystic ovary syndrome, nutrient intake for pre-conceptual women, factors contributing infertility in female. Nutrition in pregnancy - Stages of gestation, maternal physiological adjustments, weight gain during pregnancy and nutritional requirements for pregnancy, miscarriage, preterm delivery, multi fetal pregnancies, eating disorders and complications of pregnancy.	13	Text Book
II	Nutrition in Lactation and Infancy Nutrition in Lactation - Physiological adjustments during lactation, Physiology of milk Production - hormonal controls and reflex action, lactation in relation to growth and health of infants, Breast feeding and problems of breast feeding, nutritional composition of colostrum and mature milk, special foods during lactation, nutritional requirements during lactation. Expressing and storing breast milk, Breast feeding promotion network of India. Nutrition in Infancy - Rate of growth, weight as the indicator, premature infant, feeding premature infants, low birth weight, breast vs. bottle feeding, nutritional allowances, complementary feeding, and weaning foods.	16	Reference Book
III	Nutrition for Toddlers and School age Nutrition in Toddlers-Physiological and Cognitive development, feeding skill and behavior, common nutrition problems. Nutrition in Preschool Children - Growth and development of preschool children, food habits, nutritional requirements, supplementary foods. Nutrition in School Age – Early and middle childhood, physiological development, nutritional requirements and feeding, packed lunches, post school snacks, physical activity and nutrition.	12	Text Book
IV	Nutrition During Adolescence, Adulthood and Old age Nutrition During Adolescence - Physical growth, physiological and psychological changes associated with puberty (menarche and menstruation in girls), nutritional needs, eating disorders - anorexia nervosa, bulimia nervosa, physiological and nutritional problems in	16	Text Book

	adolescent pregnancy and its requirements and complications, physical activity and nutrition. Nutrition during Adulthood — Physiological changes of adulthood Nutrition and work efficiency for maintenance of health, RDA Nutrition for Old Age – senescence and sarcopenia - theories of ageing, physiological changes, Socio economic and psychological factors — geriatric foods and nutritional requirements, factors affecting food intake, institutionalized changes in old age.		
V	Nutrition for Sports and Special Condition Sports and Exercise Fitness - Physical fitness assessment — cardio respiratory fitness, assessment of body composition. Role of carbohydrate, fat and protein as a fuel for exercise, fluid and electrolyte balance during prolonged exercise, nutritional requirements in sports, dietary intake before, during and after exercise. Concept of aerobic and anaerobic exercises, Nutrition for higher altitudes, Nutrition for expeditions and space voyage, Nutrition for armed forces, Nutrition for special children-ADHD and ASD.	15	Text Book
	Total	**72**	

Text Books	**1.**	Srilakshmi.B, 2010 "Dietetics", 7thedition., New Age International Pvt. Ltd, New Delhi
	2.	Ravinder Chandha, Pulkit Mathur, "Nutrition-A lifecycle approach" Orient Blackswan
Reference Books	**1.**	Brown, J.E, 2011, "Nutrition Through The Lifecycle",4th edition Wadsworth Cengage Learning, USA
	2.	Mahan and Escott ,K & S, 2004, "Food Nutrition and Diet Therapy", 11th Edn., W.S. Saunder's Company, USA

Journal and Magazines	https://www.cambridge.org/core/journals/journal-of-nutritional-science
E-Resources and Website	https://www.nutritionsociety.org/journal-nutritional-science

Learning Method	Chalk and Talk / Assignment / Interactive session

Focus of the Course	Skill Development/ Employability

Semester – I

CORE - III: NUTRITIONAL BIOCHEMISTRY

Semester	Course Code	Course Name	Category	L	T	P	Credits
I	24FNP1CC	NUTRITIONAL BIOCHEMISTRY	CORE	48	-	-	4

Preamble	This course has been designed for students to learn and understand • The application of biochemistry in the field of Food and Nutrition • The on-assay techniques and instrumentation • The role of nutrients in the body
Prerequisite	Knowledge on metabolic process in human body

Course Outcomes (COs)

CO Number	Course Outcomes (COs) Statement	Bloom's Taxonomy Knowledge Level
CO1	Infer on carbohydrate metabolism	K2
CO2	Illustrate the cholesterol metabolism and the inborn errors of fat metabolism	K3
CO3	Explain the biosynthesis and importance of protein metabolism in biochemical analysis	K3
CO4	Interpret the significance of nucleic acids in the field of biochemistry	K3
CO5	Editorialize the principle and techniques involved in the field of biochemistry	K3

Mapping with Program Outcomes:

COs / POs	PO1	PO2	PO3	PO4	PO5
CO1	✓	✓	✓		
CO2		✓	✓		
CO3	✓		✓	✓	✓
CO4		✓		✓	
CO5	✓		✓		✓

Syllabus

Unit	Content	Hours	E-Contents / Resources
I	Carbohydrates Carbohydrates – classification, functions. Glycolysis, TCA Cycle, HMP Shunt and Energy Production, Glycogenesis, Gluconeogenesis. Renal threshold for Glucose. Inborn Error of Carbohydrate Metabolism – Lactose Intolerance, fructosuria, Galactosemia.	10	Text Book
II	Fatty Acids Fatty Acids - Classification, Functions and Oxidation of Saturated and Unsaturated Fatty Acids, Biosynthesis of Cholesterol, Structure and Functions of Lecithin, Cephalin. Inborn errors of Fat Metabolism – Niemann-Pick Disease, Gouchers Disease	10	Text Book
III	Protein Protein- Classification, Function & Metabolism of Protein, Denaturation, Transamination, Deamination, Decarboxylation, Urea Formation and Protein Synthesis. Amino acids – Classification, Function & Metabolism of Amino acids, phenylalanine, leucine, methionine and tryptophane. Inborn errors of Amino acids – maple syrup urine disease, phenyl ketonuria.	08	Reference Book
IV	Nucleic acids Nucleic acids – structure, function and properties of DNA and RNA. Biosynthesis and breakdown of purine and pyrimidine nucleotides. Assay Techniques: Bioassay techniques, molecular cloning, microbiological assay of vitamins. ELISA.	10	Text Book
V	Techniques in nutritional biochemistry in nutritional biochemistry- Separation of sugars and amino acids by chromatography. Electrophoresis separation of proteins. Colorimetry and spectrophotometer - principle and procedures. pH meter – working and application. Principle and procedure of operation of GC, HPLC and HPTLC. Elemental analysis by atomic absorption spectroscopy and flame photometry	10	Text Book
	Total	**48**	

Text Books	**1.**	Lehininger A.L, 2000, "Biochemistry". 7Edition, Worth Publishers Inc., New York.
	2.	Deb A.C, 2004, "Fundamentals of Biochemistry", 8 Edition New Central Book Agency Pvt Ltd., Kolkata –India.
Reference Books	**1.**	Shanmugam. A, 2004, "Fundamentals of Biochemistry for Medical Students", 7th Edition Karthik Printers, India.
	2.	Sathyanarayana. U and Chakrapani. U, 2004, "Biochemistry". 3rd Edition Books and Allied Publication, Kolkata, India.
	3.	Tom Brody, 2007, "Nutritional Biochemistry", 2nd Edition Academic press, U.K.
	4.	Sharma. D and Devanshi Sharma. C ,2015, "Nutritional Biochemistry",2nd Edition CBS publishing pvt. Ltd., New Delhi.

Journal and Magazines	https://www.sciencedirect.com/journal/the-journal-of-nutritional-biochemistry
E-Resources and Website	https://www.sabapub.com/index.php/jcnb

Learning Method	Chalk and Talk /Assignment/ Seminar/ Interactive session

Focus of the Course	Skill Development/ Employability

Semester – I

CORE - IV: FOOD CHEMISTRY

Semester	Course Code	Course Name	Category	L	T	P	Credits
I	24FNP1CD	FOOD CHEMISTRY	CORE	48	12	12	4

Preamble	This course has been designed for students to learn and understand • The gain insight into the chemistry of foods • The chemistry underlying the properties of various food components • Biochemical and enzymatic reactions that influence food quality with emphasis on food industry applications.
Prerequisite	

Course Outcomes (COs)

CO Number	Course Outcomes (COs) Statement	Bloom's Taxonomy Knowledge Level
CO1	Elaborate the structure and properties of water and ice, Elucidate the structure, permanence and Emulsions	K2
CO2	Explicate the chemistry of mono and oligosaccharides, Use of Polysaccharides in gelatinization, retrogradation.	K3
CO3	Illustrate the structure, physicochemical properties, functional properties of amino acids.	K3
CO4	Explicate the classification, sources, composition, and properties, role of lipids in food flavor.	K3
CO5	Illuminate the chemistry of Individual aroma compounds-vegetable, fruit and spice and condiment.	K3

Mapping with Program Outcomes:

COs / POs	PO1	PO2	PO3	PO4	PO5
CO1	✓	✓	✓		
CO2		✓	✓		
CO3	✓		✓	✓	✓
CO4		✓		✓	
CO5	✓		✓		✓

Syllabus

Unit	Content	Hours	E-Contents / Resources
I	Physico-chemical properties of water and foods Structure and properties of water and ice, types of water, concept of water activity and Food spoilage, Sorption phenomena. Gels: Structure, formation, strength, types and permanence Emulsions: formation, stability, surfactants and emulsifiers, Foams: Structure, formation and stabilization.	14	Text Book
II	Chemistry of Starch and Sugars Applications of polysaccharides in foods: non-starch polysaccharides: cellulose, hemicelluloses, pectins, gums (gum arabic, guar gum, xanthan gum), agar, alginates, carrageenan Starch: structure, properties of amylose and amylopectin, effect of processing gelatinization, Characteristics of some food starches. Effects of ingredients and conditions on gelatinization- retrogradation, polysaccharide hydrolysis.	14	Text Book
III	Chemistry of Proteins Amino acids, peptides and proteins - structure, physicochemical properties, functional properties, chemical and enzymatic modifications - denaturation, nonenzymatic browning, and other chemical changes, processing induced physical, chemical and nutritional changes, texturized proteins, protein isolates, concentrates, protein hydrolysate	15	Reference Book
IV	Chemistry of Fats and Oils Classification, distribution, composition, physical and chemical properties. Effect of processing on chemical structure and physical properties; functional properties of fat and uses in food preparations, inter-esterification of fats. Lipids exposed to frying conditions and hydrogenated fat. Lipid-protein complexes, emulsions. Fat deterioration and antioxidants and fat substitutes.	14	You Tube Videos
V	Chemistry of Pectic Substances, Plant Pigments, Spices and Condiments Pectins, phenolic components, enzymatic browning in fruits and vegetables, volatile compounds from vegetables during cooking, chemical properties of plant pigments –	15	Text Book

	water and fat soluble pigments, properties and active principles in spices and condiments.		
	Total	**72**	

Text Books	**1.**	Shakuntala Manay, Shadaksharaswamy,M, 2000, "Foods, Facts and Principles', 2th Edition, New Age International Pvt Ltd Publishers, Delhi.
	2.	Chandrasekhar, U., 2002, "Food Science and applications in Indian Cookery ",10 Edition, Phoenix Publishing House, New Delhi.
Reference Books	**1.**	Swaminathan, M. 2005, "Food Science, Chemistry and Experimental Foods", Bappco Publishers, Bangalore.
	2.	Meyer,L.H, 2004,"Food Chemistry and Distributors", 4th Edition, CBS Publishers.
	3.	Paul, and Palmer, P.C, 2000, "Food Theory and Applications", John Wiley and Sons, New York.
	4.	Chopra and Panesar, H.K, 2010, "Food Chemistry", New Narosa Publishing House, Delhi.

Journal and Magazines	http://foodb.ca/
E-Resources and Website	https://pubs.acs.org/journal/jafcau

Learning Method	Chalk and Talk/Assignment / Interactive session

Focus of the Course	Skill Development/ Employability

24FNP1CP	FOOD SCIENCE AND FOOD CHEMISTRY	SEMESTER I

Total Credits: 2
Total Instructions Hours: 48 h

S.No.	Contents
1	Dextrinization, Gelatinization of Starch, Retrogradation and Syneresis, Malting of cereals.
2	Microscopic examination of uncooked and gelatinized starch
3	Gluten Formation
4	Effect of Soaking, germination and fermentation of Pulses
5	Enzymatic Browning and Methods of Prevention
6	Effect of acids, alkali and heat on water soluble and fat-soluble pigments
7	Scum formation, boiling over and scorching of milk Coagulation and precipitation of milk proteins
8	Testing freshness of egg- Coagulation of egg white and egg yolk, Boiled Egg, Poached Egg, Omelets, Custards, Cake and Mayonnaise
9	Changes observed in cooking meat, fish and poultry, testing the tenderness of meat
10	Smoking Temperature of different fats, Factors affecting absorption of fats
11	Stages of Sugar Cookery, Preparation of Fondant, Fudge, Caramel and Toffee
12	Sensory Evaluation of Food

Note: Out of 12 – 10 Mandatory

Reference Books	**1.**	Mohini Sethi, Eram. S. Rao, 2021, "Food Science - Experiments and Applications," CBS Publishers, India.

Semester – I

DSE - I: FUNCTIONAL FOODS AND NUTRACEUTICALS

Semester	Course Code	Course Name	Category	L	T	P	Credits
I	24FNP1DA	FUNCTIONAL FOODS AND NUTRACEUTICALS	DSE	48	-	-	3

Preamble	This course has been designed for students to learn and understand • Medicinal benefits of natural, nutraceuticals belong to different phytochemical categories. • The functional foods and their role in the human health and well-being. • The role of diet and dietary components in chronic diseases
Prerequisite	It deals with the functional foods and nutraceuticals (FFN) products and their bio availability and health benefits.

Course Outcomes (COs)

CO Number	Course Outcomes (COs) Statement	Bloom's Taxonomy Knowledge Level
CO1	Analyze and examine the basics and importance of nutraceuticals. and functional foods	K5
CO2	Determine the various properties and structure of nutraceuticals	K5
CO3	Inspect nutraceuticals of plant, animal and microbial origin Appreciate the Importance of nutraceuticals in field of medicine.	K5
CO4	Distinguish between functional foods and nutraceuticals. Explain role of fibers and syn-biotic with respect to health	K5
CO5	Design the role of nutraceuticals as food remedies in the field of functional food industry.	K5

Mapping with Program Outcomes:

COs / POs	PO1	PO2	PO3	PO4	PO5
CO1		✓		✓	✓
CO2	✓	✓		✓	✓
CO3	✓	✓		✓	✓
CO4	✓	✓		✓	✓
CO5	✓	✓		✓	✓

Syllabus

Unit	Content	Hours	E-Contents / Resources
I	Introduction to Nutraceuticals and Functional Foods Nutraceutical- Definition, Classification - Dietary supplements, Functional foods, Historical perspective, scope and future prospects, applied aspects of the Nutraceutical Science, Sources of Nutraceuticals	9	Textbook
II	Properties, structure and functions of various Nutraceuticals Glycosides, Isoprenoid derivaties, Glucosamine, Octacosanol, Flavonoids, Carotenoids, Polyunsaturated fatty acids, Lecithin, Choline and Spingolipids, Phosphoilipids, Lycopene, Carnitine, Resveratol, Curcumin, Ellagic acid, Astaxanthin, Zeaxanthin, Cholorogenic acid, Gingerol and Ornithine alpha ketoglutarate, Phytoestrogens, Organosulphur compounds as neutraceuticals.	9	Textbook
III	Nutraceuticals of plant, animal and microbial origin Plant secondary metabolites, classification and sub-classification - Alkaloids, phenols, Terpenoids, extraction and purification, applications, Concept of Animal metabolites - Sources and extraction of nutraceuticals of animal origin, Examples: chitin, chitosan, glucosamine, chondroitin sulphate, Essential Fatty acids - EPA, DHA, CLA and other polysaccharides of animal origin, Nutraceuticals of microbial origin, uses and applications in preventive medicine and treatment.	10	Textbook
IV	Functional Foods and its applications Definition, Relation of functional foods and Nutraceutical (FFN) to foods and drugs, applications of herbs to functional foods, Concept of free radicals and antioxidants; Nutritive and Non-nutritive food components with potential health effects, Soy proteins and soy isoflavones in human health; Role of nuts in prevention of cardiovascular disease. Functional foods from wheat and rice and their health effects. Role of Dietary fibers in disease prevention; Vegetables, Cereals, milk and dairy products as Functional foods, Health effects of prebiotics, probiotic and synbiotic foods and effects.	11	Textbook

V	Food as remedies Nutraceuticals in treatment for cognitive decline, Arthritis, Neurological disorders, circulatory problems, hypoglycemia, Nephrological disorders, Liver disorders, Osteoporosis and Ulcers etc, Nutraceutical rich supplements e.g. Bee pollen, Caffeine, Green tea, Lecithin, Mushroom extract, Chlorophyll, Kelp and Spirulina. Nutrigenomics - concept of personalized and precision nutrition. Use of Nanotechnology in functional food industry.	9	Textbook
	Total	**48**	

Text Books	**1.**	Wildman,R.E, 2000, "Handbook of Nutraceuticals and Functional Foods" CRC Press, Boca Raton.
	2.	Perkins Muredzi, 2013, "Food is Medicine - An Introdcution to Nutraceuticals", Lambert Academic Publishing, Europe.
Reference Books	**1.**	Jeffery, H. W. 2002, "Methods of Analysis for Functional Foods and Neutraceuticals", 1st Edition, CRC Press, New York.
	2.	Mahan.K and Escott.S., 2004, "Food Nutrition and Diet Therapy" 11th Edition, W.S. Saunder's Company, USA .
	3.	Murray Robert, 2018, "Harper`s Biochemistry", 31st Edition, Prentice Hall International UK Ltd , UK.
	4.	Degbasis Bagchi, 2010, "Biotechnology in functional foods and nutraceuticals", 10 Edition, CRC press Taylor, Francis group, London.

Journal and Magazines	www.ijird.com.
E-Resources and Website	https://www.sciencedirect.com/journal/journal-of-functional-foods

Learning Method	Chalk and Talk / Seminar/ Interactive session/ Assignment

Focus of the Course	Skill Development/ Employability/ Entrepreneurial Development

Semester – I

DSE - I : FOOD PRODUCT DEVELOPMENT

Semester	Course Code	Course Name	Category	L	T	P	Credits
I	24FNP1DB	FOOD PRODUCT DEVELOPMENT	DSE	48	-	-	3

Preamble	This course has been designed for students to learn and understand • The various aspects of food product develop food science and technology, packaging, nutrition values and marketing • Modern aspects of nutritional science and novel food usage • Recognize the potential for entrepreneurship through marketing
Prerequisite	To learn the different stages of product development

Course Outcomes (COs)

CO Number	Course Outcomes (COs) Statement	Bloom's Taxonomy Knowledge Level
CO1	Choose raw materials, standardizations for products. use of the technology and marketing on health concerns.	K3
CO2	Categorize the products for the development to the community.	K4
CO3	Examine sensory and objective evaluation test, score card designing and Instruments used for texture evaluation.	K4
CO4	Select the types of food packing materials	K5
CO5	Build the marketing structure and integration Improve the marketing efficiency	K6

Mapping with Program Outcomes:

COs / POs	PO1	PO2	PO3	PO4	PO5
CO1		✓	✓	✓	✓
CO2	✓	✓	✓	✓	✓
CO3	✓	✓	✓	✓	✓
CO4	✓	✓	✓	✓	✓
CO5	✓	✓	✓	✓	✓

Syllabus

Unit	Content	Hours	E-Contents / Resources
I	New product development Definition and classification, characterization and factors shaping new product development. Food product development and technologies, Marketplace influence. Measures of Food Product Success-Production, Market, Customer, New product development – patent, patent laws, international code for Intellectual property rights (IPR)	11	Textbook
II	Phases of product development Food product development- stages in product development, Level of Innovation-New product categories. FSSAI Regulations	8	Textbook
III	Sensory Evaluation Establishing sensory panels – Designing testing facilities – Analytical Test – Conduct a sensory Evaluation Test – Designing score card, objective evaluation, Instruments used for texture evaluation.	9	Textbook
IV	Formulation of new product development Formulation of product for infants, preschool, elderly, sports person - Selection of raw materials, portion size, standardization methods, calculation of nutritive values, cost- Suggested Retail Price (SRP), shelf life.	9	Textbook
V	Packaging and Marketing Packaging – Types of packing materials, Labelling. Concept of market and marketing – Approaches to study marketing functions, market structure, market efficiency and market integration. Role of government in promoting agricultural marketing. GST for newly developed product.	11	Textbook
	Total	**48**	

Text Books	**1.**	Sharma A.2018, "Food Product Development" CBS Publishers and Distributors Private Ltd., New Delhi.
	2.	Fuller. G. W 2008, "New Food Product Development from Concept to Marketplace", New Age International Private Ltd, New Delhi.

Reference Books	**1.**	Earle, R., and Anderson, A, 2001, "Food product development: Maximizing success", CRC press,England.
	2.	Sivarama Prasad ,A., 1985, "Agricultural marketing in India", Mittal Publication, New Delhi.
	3.	Aaron, Brody, Joha Lord,L and B., 2005, "New Food Product for a changing Market place", 2nd Edition.
	4.	Baker, R.C 1988, " Fundamentals of New Food Product Development", 8th Edition, New Age International Private Ltd. New Delhi.

Journal and Magazines	https://www.researchgate.net/publication/259054153_New_Food_Product_Development
E-Resources and Website	https://www.cbspd.co.in/food-product-development-pb-2018

Learning Method	Chalk and Talk/Assignment/ Seminar

Focus of the Course	Skill Development/ Employability/ Entrepreneurial Development

Semester – I

DSE - I: HARVEST TECHNOLOGY OF AGRICULTURAL PRODUCE

Semester	Course Code	Course Name	Category	L	T	P	Credits
I	24FNP1DC	HARVEST TECHNOLOGY OF AGRICULTURAL PRODUCE	DSE	48	-	-	3

Preamble	This course has been designed for students to learn and understand • The safety control measures in handling foods from harvest to consumption agencies of control. • Good agricultural and horticultural practices for food safety management. • Importance of pre-harvest physiology for the long term storage of horticultural crops.
Prerequisite	To learn the concepts of post harvest handling of foods.

Course Outcomes (COs)

CO Number	Course Outcomes (COs) Statement	Bloom's Taxonomy Knowledge Level
CO1	Identify the role of Post Harvest Technology in combating malnutrition in India.	K1
CO2	Categorize the agents causes food spoilage.	K2
CO3	Examine the physical and chemical methods to control insects and rodents.	K3
CO4	Prioritize the Importance of storage structures for food grains. Explain the agencies that control food losses.	K4
CO5	Improve the product-process efficiency of food grain.	K5

Mapping with Program Outcomes:

COs / POs	PO1	PO2	PO3	PO4	PO5
CO1	✓		✓	✓	
CO2		✓			✓
CO3				✓	
CO4	✓			✓	
CO5	✓	✓			

Syllabus

Unit	Content	Hours	E-Contents / Resources
I	Post harvest Technology Introduction to Post Harvest Technology - Definition, importance. Post harvest handling of perishables. Governmental measures to augment food production-need for food conservation. Food loss in the post harvest period, extent of losses, loss in the field, threshing yard, storage, marketing loss Role of Post Harvest Technology in combating malnutrition in India	9	Textbook
II	Agent causing food loss Agents Causing Food Losses - Physical agents (moisture, temperature), Chemical losses, biological losses- insects-insects attacking food grains - types and life cycle,damage caused to food grains and detection of insect infestation, rats and rodents, birds, animals- Nature of damage, identification	10	Textbook
III	Spoiling Agents Control of Spoilage Agents - Importance and methods of sanitary handling, physical, chemical, biological and other means of control of insects, rats and rodents and birds Insect control methods- Physical methods and chemical methods including fumigation techniques Handling and Transport of Food Commodities - Traditional and improved methods, Nutrient losses in spoiled grains and National program to save grains	10	Textbook
IV	Storage and grains Storage of Grains - Importance of storage structures-requirements, traditional and modern and underground and above ground storage and their improvements, PDS.	11	Textbook
V	Food Processing Food Processing of Selected Food Items – wheat, rice, breakfast cereals, pulses,oilseeds. Agencies Controlling Food Losses - Role of SGC, FCI, CWC, EPA SWC, IGSI in controlling food losses	8	Textbook
	Total	**48**	

Text Books	**1.**	Potter ,N.W 1973. "Food Science". 8th Edn. The A VI Publishing Co. the Westport.
	2.	Chakravarthy ,A 1981 "Post Harvest Technology of Cereals, Pulses and Oilseeds"., 1st Edn., Oxford and IBH. NewDelhi.
Reference Books	**1.**	Boumans,G 2012. " Grain Handling and Storage ". 4th Edn. Elsevier Science Publishing

Journal and Magazines	https://www.frontiersin.org/journals/sustainable-food-systems http://jpht.in/ https://www.inderscience.com/jhome.php?jcode=ijpti
E-Resources and Website	https://fmipa.umri.ac.id/wp-content/uploads/2016/03/Amalendu_Chakraverty_Arun_S._Mujumdar_HosahalliBookFi.org_.pdf

Learning Method	Chalk and Talk/Assignment/ Seminar

Focus of the Course	Skill Development/ Employability/ Entrepreneurial Development

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Dr.N.G.P. Arts and Science College
APPROVED
BoS- 17th 05-04-24 | AC - 17th 17-04-24 | GB -

Academic Council * CHAIRMAN * Dr.N.G.P. Arts and Science College

Semester – II CORE: FOOD PROCESSING							
Semester	**Course Code**	**Course Name**	**Category**	**L**	**T**	**P**	**Credits**
II	**24FNP2CA**	**FOOD PROCESSING**	**CORE**	**48**	**-**	**12**	**4**

Preamble	This course has been designed for students to learn and understand • about food processing sectors and strategies • the latest techniques involved in processing of food groups • the method of preservation and packaging
Prerequisite	To learn the various processing techniques of foods.

Course Outcomes (COs)

CO Number	Course Outcomes (COs) Statement	Bloom's Taxonomy Knowledge Level
CO1	Illustrate the different types of food commodities used for processing.	K3
CO2	Choose the processing method of cereals and millets to reduce the Nutrient loss.	K3
CO3	Compare the different processing techniques and fortification of Legumes and oil seeds.	K4
CO4	Integrate the processing methods of animal-based products and its by-products.	K4
CO5	Summarize to impart knowledge of various areas related to food processing and packaging technology.	K5

Mapping with Program Outcomes:

COs / POs	PO1	PO2	PO3	PO4	PO5
CO1	✓	✓		✓	✓
CO2	✓	✓	✓		
CO3		✓	✓		✓
CO4	✓	✓	✓	✓	✓
CO5	✓		✓		✓

24FNP2CA	CORE: FOOD PROCESSING

Syllabus

Unit	Content	Hrs	Resources
I	**Food Processing Sector** Food processing: Importance of food processing, Types of processed foods, and its effect on nutritional properties of foods. Food processing sector –vision and mission, opportunities, strategies in the Indian food processing sector. Strengths, Weakness, Opportunities and Challenges of food processing operations. Role of Governmental organizations in up gradation of food industries.	11	Text Book
II	**Cereals and Millets Processing** Rice – Parboiling, milling, by products of milling and processed products-Rice flakes, puffed rice, popped rice, rice cakes, rice paper, instant rice and rice flour. Wheat - Milling, by products of milling and processed products - whole wheat flour, refined flour, semolina, popped and puffed wheat. Millets – Milling of millet and by products of milling. processed products - vermicelli and pasta. Methods to eliminate anti-nutritional factors, fortified and enriched cereals and millets.	13	Text Book
III	**Legumes and Oil seeds** Pulses and Legumes - Modern methods of milling and by products, process to eliminate the anti-nutritional factors. Processing of pulse-based products. Nuts and Oil Seeds – Milling and it's by products, extraction of oil - Lemon and moringa seed oil, preparation of hydrogenated fats, industrial fats, and low-fat spreads and virgin oil, Fortification of fats and oils. Processing of fat substitutes and fat replacers. Mayonnaise concentration and isolation - peanut, soybean and coconut and other fortified and enriched foods.	12	Text Book
IV	**Milk and Meat Processing** Milk and Milk products- Processing, Flavored milk, Condensed and Toned milk, by product of Cream- Butter, Buttermilk and ghee. Fermented (Cheese, yoghurt, and kefir) and non- fermented (skim milk powder, paneer, gelato and ice cream) milk products. Milk analogue, Vegan milk - almond and soy milk.	12	Text Book

	Meat and poultry- Slaughtering, processing and Preservation -chilled, frozen, cured and smoked meat. Processing of meat-based products-sausage and Nuggets Fish - Processing and by products of fish- fermented fish, fish liver oil, fish meal, fish protein concentrate, fish crackers. Egg- Preparation of egg white and egg yolk powder.		
V	**Fruits and Vegetable Processing Technologies** Fruits and vegetable processing- Drying and dehydration- Drum drying, tunnel, spray drying, freeze drying, solar drying and fluidized bed drying. Thermal processing (canning, blanching, sterilization and irradiation) and non-thermal processing (High Pressure Processing, Ozone and Pulse Electric Field Technology, Hurdle Technology and Cold Plasma Technology.), Minimal Processing. Mushroom - Production and processing of beverages - Cocoa. Processing of spices - Onion, garlic, ginger and masala powder. Extraction of volatile oil in spices-oleoresin. Recent trends in packaging technology: Modified Atmospheric Packaging and Controlled Atmospheric Packaging, Edible and Smart Packaging, Single Use Plastic Packaging Intelligent and Nano Active Packaging.	12	Text Book
	Total	**60**	

Text Books	**1.**	DS Warris, 2020, "Food Processing and Preservation" (Volume -I), CBS Publishers and Distributors, New Delhi.
	2.	Subulakshmi.G and Shoba A Udipi V.K, 2017, "Food Processing and Preservation"(volume –I Edn.), New age International publishers, New Delhi.
Reference Books	**1.**	Avantina Sharma, 2010, "Text Book of Food Science and Technology", 2nd Edn. IBDC Publishers, Lucknow.
	2.	Fellows.P.J., 2009,"Food Processing Technology- principle and practice", Wood head Publishing Ltd, Cambridge.

Journal and Magazines	http://www.fao.org/food/food-processing/en/ https://www.foodprocessing.com/
E-Resources and Website	https://www.sciencedirect.com/journal/food-science-and-technology

Learning Method	Chalk and Talk/ Assignment / Seminar / Interactive session / Videos / Product Formulation

Focus of the Course	Skill Development/ Employability / Entrepreneur / IPR

Semester – II CORE: APPLIED PHYSIOLOGY							
Semester	**Course Code**	**Course Name**	**Category**	**L**	**T**	**P**	**Credits**
II	**24FNP2CB**	**APPLIED PHYSIOLOGY**	**CORE**	**48**	**-**	**-**	**4**

Preamble	This course has been designed for students to learn and understand • the structure and functions of various systems in human body • the functions of all the systems and its disease conditions • the physiological aspects of hormones, drugs and nutrient interactions
Prerequisite	Learn the structure and functions of the human body

Course Outcomes (COs)

CO Number	Course Outcomes (COs) Statement	Bloom's Taxonomy Knowledge Level
CO1	Identify the features of the blood and immunology	K2
CO2	Infer the role of digestive system and circulatory system in human health	K3
CO3	Construct the role of respiratory system and excretory system in maintaining homeostasis.	K4
CO4	Sequence the role of endocrine system and enzymes activity in human physiology	K4
CO5	Illustrate various function tests involved and elaborate on drug and nutrient interaction	K5

Mapping with Program Outcomes:

COs / POs	PO1	PO2	PO3	PO4	PO5
CO1	✓	✓	✓	✓	✓
CO2		✓	✓	✓	✓
CO3	✓		✓	✓	✓
CO4	✓	✓	✓		
CO5	✓	✓	✓		✓

24FNP2CB	CORE: APPLIED PHYSIOLOGY

Syllabus

Unit	Content	Hrs	Resources
I	**Blood and Immunology** Blood - Composition, cellular elements of blood — RBC, WBC, platelets, serum and plasma proteins-functions. Hemoglobin- structure and function. Blood coagulation and disorders of blood coagulation. Immunology-Types of immunity - Innate immunity and Acquired immunity, Immune responses -Cell mediated and Humoral immunity, Antigens and its functions, antigen - antibody reactions, auto-immunity and hypersensitivity.	10	Text Book
II	**Circulatory and Digestive System** Circulatory System- Origin and spread of cardic impulse, cardiac cycle, heart sounds, electro cardiogram, heart rate, regulation of cardiac output and blood pressure. Circadian rhythm - Circadian rhythm in human health. Digestive System- Hormones and enzymes of digestive system-different sources of secretions and action. Metabolism (Digestion, absorption and transport of food). Role of enzymes in digestion and role of prebiotics and probiotics in the maintenance of health of digestive system. Gastric function test. Regulation of food intake – hunger, appetite and satiety.	9	Text Book
III	**Respiratory and Excretory System** Respiratory System-Transport and exchange of oxygen and carbon di oxide, Role of haemoglobin and buffer systems. Excretory System- Structure and function of Nephron, Urine formation, Role of kidney in maintaining pH of blood, Electrolyte and acid base balance. Renal function test	10	Text Book
IV	**Endocrine system and Enzymes** Endocrine system- Structure, function, role of hormones, regulation of hormone secretion and disorders – pituitary, thyroid, adrenal, pancreas and parathyroid glands. Endocrine function test Enzyme-Introduction, classifications and biological functions of enzymes, enzyme activation, properties of enzymes. Enzymes in medical diagnosis (Liver disorders,	9	Text Book

	heart disorders, muscle disorders, skeletal disorders and cancer). Liver function test.		
V	**Drug and Nutrient Interaction** Nutrient interaction – Nutrient - Nutrient interaction, Nutrient-Drug Interaction- Introduction, absorption, route of drug administration, excretion, basic concept, effect of nutrition on drugs, Effect of drugs on nutritional status, clinical significance and risk factors for drug nutrient interaction.	10	Text Book
	Total	**48**	

Text Books	**1.**	Sarada Subramanyam, Madhavankutty. K and Singh .H.D., 2020. "Textbook of Human Physiology, S.Chand & company Ltd, New Delhi.
	2.	Sembulingam K&P., 2013, "Essentials of Medical Physiology", 6th Edn., JAYPEE Brothers, Medical Publishers, New Delhi
	3.	Sembulingam, 2019, "Essentials of Medical Physiology" 8th Edition, Jaypee Brothers Medical Publishers (P) Ltd, New Delhi.
	4.	K.R.Joshi and N.O.Osamo, 2012, "Immunology" 5th Edition Agrobios (India), Jothpur.
	5.	R.K.Marya, 2008, "Medical Physiology", 4th Edition, CBS Publishers and Distributors Pvt Ltd.
Reference Books	**1.**	Subrahmanyam S., 2007, "Text Book of Human Physiology", S.Chand Publications, New Delhi, India.
	2.	Guyton, Hall, A.G. and J.B., 1996, "Text Book of Medical Physiology" 9th Edn., W.B. Sanders Company, Prism Books (Pvt.) Ltd. Bangalore.
	3.	Stites .D.P., Terr.A.I., and Parsiow. T.G., 1994, "Basic and Clinical Immunology", 10th Edition., Prentice Hall International Inc., New Jersey.
	4.	D.M.Vasudevan, 2011, "Text book of Biochemistry for Medical Students", Jaypee Brothers Medical Publishers (P) Ltd, New Delhi.

Journal and Magazines	https://journals.physiology.org/journal/jappl
E-Resources and Website	https://usiu-ke.libguides.com/c.php?g=943297&p=6799420 https://ia601608.us.archive.org/13/items/appliedphysiolog00hutcuoft/appliedphysiolog00hutcuoft.pdf

Learning Method	Chalk and Talk/ Assignment/Seminar/ Interactive session

Focus of the Course	Skill Development/ Employability

Semester – II CORE: THERAPEUTIC NUTRITION – LIFESTYLE DISORDERS							
Semester	**Course Code**	**Course Name**	**Category**	**L**	**T**	**P**	**Credits**
II	**24FNP2CC**	**THERAPEUTIC NUTRITION–LIFESTYLE DISORDERS**	**CORE**	**48**	**-**	**-**	**4**

Preamble	This course has been designed for students to learn and understand • the essential concepts of therapeutic nutrition and diet therapy • the necessary skills to apply nutritional principles in clinical practice • the relationship between nutrition and disease, and develop competencies in planning, modifying, and delivering therapeutic diets
Prerequisite	Basic comprehension of Dietetics and Nutrition

Course Outcomes (COs)

CO Number	Course Outcomes (COs) Statement	Bloom's Taxonomy Knowledge Level
CO1	Understand and apply the principles of therapeutic nutrition	K2
CO2	Analyze and manage energy imbalance and obesity	K4
CO3	Identify and manage diabetes mellitus	K3
CO4	Implement diabetes management techniques	K4
CO5	Design dietary management strategies for cardiovascular diseases	K5

Mapping with Program Outcomes:

COs / POs	PO1	PO2	PO3	PO4	PO5
CO1	✓	✓	✓		
CO2		✓	✓		
CO3	✓		✓	✓	✓
CO4		✓		✓	
CO5	✓		✓		✓

24FNP2CC	CORE: THERAPEUTIC NUTRITION – LIFESTYLE DISORDERS

Syllabus

Unit	Content	Hrs	Resources
I	**Introduction to Therapeutic Nutrition** Diet therapy and types of therapeutic diet. Indications of therapeutic diet requirement. Hospital diets and progressive modifications. Additional modifications in texture and consistency. Modifications of a normal diet during illness and convalescence. Determining Energy, Carbohydrates, Protein, and Fat Requirements for hospitalized patients. Fluid requirements for hospitalized patients (Body Weight-Based Formula, Age-Based Holliday-Segar Method, Energy-Based Method). Food Exchange List in menu planning and calculation of macronutrients.	10	Text Book
II	**Diet during Energy Imbalance** Energy balance - Energy Intake Versus Energy Expenditure. Definition, types, causes of obesity. BMI Classification for Asians (as per WHO Asia-Pacific guidelines). Waist Circumference Criteria (Additional Metric for Asians). Metabolic Syndrome and Diabesity. Factors responsible for obesity. Measurement of obesity. Diet during obesity - determination of energy needs, calorie adjustment required for weight loss. Dietary management. Maintenance diet. Definition, classification of underweight. Diet for an underweight person - dietary modification.	10	Text Book
III	**Diabetes Mellitus** Definition, causes of diabetes mellitus. Factors predisposing diabetes. Classification of diabetes - The Juvenile-Onset type, The Maturity-Onset type, Clinical classes. Clinical presentation, blood glucose levels, renal threshold for glucose. Symptoms of diabetes. Tests for diabetes - OGTT, HbA1C. Non-indications for diagnosis of diabetes with HbA1C. Acute complications of diabetes - Hypoglycaemia, Diabetic Acidosis and Coma. Chronic complications of diabetes - Diabetic Eye Disease, Kidney Diseases, Diabetic Neuropathy, Cardio-Vascular diseases, The Diabetic Foot, Gastroparesis.	9	Text Book
IV	**Management of Diabetes Mellitus** Patient Education for management of diabetes. Types of insulin preparations - Short-acting, Intermediate acting and Long-acting. Oral Hypoglycaemic Drugs-mechanism of action and side-effects. Objectives of	9	Text Book

	diabetes management. Methods of treatment - Diet Alone, Diet and oral hypoglycemic drugs, and Diet and insulin. Glycemic Index, Glycemic Load and Carbohydrate counting in diabetes management.		
V	**Diet for Cardiovascular Diseases** Types of Cardiac Disorders, multiple risk factors in cardiovascular diseases. Etiology and classification of High Blood Pressure. Measurement of blood pressure - Systolic pressure and Diastolic pressure. Salt and blood pressure. Control of blood pressure. Definition and development of Atherosclerosis. Blood profile related to Coronary Heart Disease - Lipoproteinemia's (primary, secondary, insulin resistance). Drugs used in the treatment of cardiovascular diseases. Dietary management of Atherosclerosis and hyperlipidemia. Low and Modified Fat diet for Atherosclerotic conditions and nutrition education. Dietary management of acute heart disease. Dangers of a sodium-restricted diet and symptoms of sodium depletion.	10	Text Book
	Total	48	

Note	Case Studies on Anthropometric, Biochemical data, Clinical and dietary problems have to be given for case study: Underweight, Obesity, Type 1 DM, Type 2 DM, GDM. Atherosclerosis, Hyperlipidemia, Hypertension and Acute Cardiovascular disease (CVD). Analyze the case histories critically, and formulate nutritional requirements and plan a day's menu to suit patient needs. 15 Days Hospital Internship is mandatory.

Text Books	**1.**	Shubhangini, A Joshi., 2021, "Nutrition and Dietetics" (5th Edn.) McGraw Hill Education, Chennai, India.
	2.	Mahan L. K. and Escott-Stump S., 2021, "Krause's Food and Nutrition Therapy" (15th Edn.) Elsevier, USA.
	3.	Kane K. and Prelack K., 2019, "Advanced Medical Nutrition therapy" (1st Edn.) Jones and Bartlett Learning, USA.
	4.	Srilakshmi B., 2023, "Dietetics", (9th Edn.) New Age International Publishers, India.
	5.	Nix S. Williams S. R. and Mowry L, 2022, "Williams and Basic Nutrition And Diet Therapy", (16th Edn.) Elsevier, USA.
Reference Books	**1.**	Janice L. Raymond and Kelly Morrow, 2022, "Krause and Mahan's Food and the Nutrition Care Process", (16th Edn.) Elsevier, USA.)
	2.	Paul S., 2018, "A Textbook of Bio-Nutrition - Curing Diseases Through Diet", (1st Edn.) CBS Publishers, Delhi, India.
	3.	Avantina S., 2017, "Principles of Therapeutic Nutrition and Dietetics", (1st Edn.) CBS Publishers, Delhi, India.

	4.	Whitney E. N. Rolfes S. R. Crowe T. and Walsh A., 2023, "Understanding nutrition" (5th Edn), Cengage Learning, Australia.

Journal and Magazines	https://academic.oup.com/journals
E-Resources and Website	https://www.cambridgeenglish.org/learning-english/activities-for-learners/

Learning Method	Chalk and Talk/Assignment/Seminar/Interactive session

Focus of the Course	Skill Development/Employability

Semester – II CORE: MACRONUTRIENTS							
Semester	**Course Code**	**Course Name**	**Category**	**L**	**T**	**P**	**Credits**
II	**24FNP2CD**	**MACRONUTRIENTS**	**CORE**	**48**	**-**	**-**	**4**

Preamble	This course has been designed for students to learn and understand • the classification, and nutrient composition of foods • the food sources and requirements for macronutrients • the absorption and metabolism of macronutrients
Prerequisite	Basic understanding of nutrients, metabolism, and the roles of carbohydrates, proteins, and fats in energy and body function.

Course Outcomes (COs)

CO Number	Course Outcomes (COs) Statement	Bloom's Taxonomy Knowledge Level
CO1	Interpret the utilization of energy, basal metabolism, and energy requirement.	K4
CO2	Explain the digestion, absorption and metabolism of carbohydrates and dietary fiber	K4
CO3	Summarize the protein digestion, absorption, metabolism, and its requirements	K5
CO4	Illustrate dietary fat, brown fat thermogenesis and therapeutic inhibition of fat absorption	K5
CO5	Ensure the importance of water and electrolyte balance	K5

Mapping with Program Outcomes:

COs / POs	PO1	PO2	PO3	PO4	PO5
CO1	✓		✓	✓	✓
CO2	✓		✓	✓	✓
CO3	✓		✓	✓	✓
CO4	✓		✓	✓	
CO5	✓		✓	✓	✓

24FNP2CD	CORE: MACRONUTRIENTS

Syllabus

Unit	Content	Hrs	Resources
I	**Energy** Energy - Definition, Units, Components of energy requirement, Determination of Energy Value of Food, Total energy Requirement, Basal Metabolic Rate and its measurements, Factors Affecting Basal Metabolic Rate, Thermic Effect of food, Factors Affecting, Energy requirement during work, Resting Energy Expenditure, TEE, Specific dynamic actions, Recommended Dietary Allowances, Deficiency.	10	Text Book
II	**Carbohydrates** Carbohydrates- Classification, Functions, Digestion, Absorption, Metabolism, Maintenance of Blood Glucose Levels, Hormonal control of blood sugar levels, Glycemic index- factors affecting GI of foods. Dietary Fiber- Classification of dietary fiber, physiological and metabolic effects of fiber, role of fiber in the prevention of disease. Recommended dietary allowances and sources.	10	Text Book
III	**Proteins** Proteins and Amino acids – Functions, classification, sources, Digestion, absorption, metabolism, utilization and factors affecting, storage, assessment of quality of proteins, complimentary and supplementary value of proteins and requirements. Factorial estimation for arriving at RDA of proteins for Indians, Deficiency.	10	Text Book
IV	**Lipids** Lipids- Classification, Fats in the Body and Food, Functions, Digestion and Absorption, Transport and Metabolism, Essential Fatty Acids, Brown Fat Thermogenesis, Therapeutic Inhibition of Fat Absorption and Sources. Fatty acid- types, Functions, requirements, Food source and deficiency	08	Text Book

	Water and Electrolytes		
V	Water- Definition, Distribution, Functions, Water Balance, Maintenance of Fluid /Water Balance, Water Depletion, Water Excess (Water Intoxication), Distribution of Electrolytes, Maintenance of Electrolyte balance, Acid Base Balance- The Control of Hydrogen Ion Concentration, Acid Base Buffers, Respiratory Regulation of pH, Renal Regulation of pH.	10	Text Book
	Total	**48**	

Text Books	**1.**	Srilakshmi B., 2020, " Nutrition Science", 6th Edition., New Age International Private Ltd., New Delhi.
	2.	Groffer.S.S, Smith.J.L and Groff.J.L., 2009, " Advanced Nutrition and Human Metabolism", 5th Edition, Wadsworth, USA.
Reference Books	**1.**	Nicola Anderson and Claire Thomson, 2016, "Food and Nutrition" 1st Edition, Hodder Education, London.
	2.	Berdainer.C.D and Zempleni, 2009, "Advanced Nutrition Macronutrients, Micronutrients and Metabolism", CRC Press, Taylor and Francis Group, USA

Journal and Magazines	American Journal of Clinical Nutrition (AJCN) https://pubmed.ncbi.nlm.nih.gov/
E-Resources and Website	https://open.umn.edu/opentextbooks/subjects/nutrition https://ods.od.nih.gov/

Learning Method	Chalk and Talk/ Assignment/Seminar/ Interactive session / GD

Focus of the Course	Skill Development/ Employability

Semester – II CORE PRACTICAL: FOOD ANALYSIS							
Semester	**Corse Code**	**Course Name**	**Category**	**L**	**T**	**P**	**Credits**
II	**24FNP2CP**	**FOOD ANALYSIS**	**CORE PRACTICAL**	**-**	**-**	**72**	**3**

Preamble	This course has been designed for students to learn and understand • The develop practical skills in food and nutritional analysis methods. • The nutritional quality of foods using analytical data. • Apply standard laboratory techniques to determine the composition of food samples.
Prerequisite	Knowledge on analysing food

Course Outcomes (Cos)		
CO Number	**Course Outcomes (COs) Statement**	**Bloom's Taxonomy Knowledge Level**
CO1	Determine moisture content, ash, and crude fiber, Carbohydrate, protein and lipid.	K4
CO2	Estimate the Iron, phosphorous and calcium content of the food	K4
CO3	Analyze the ascorbic acid, iodine number, acid number, saponification number	K4
CO4	Understand the techniques to analyse the fat, proteins and amino acids.	K4
CO5	Identify and analyse key phytochemical constituents.	K4

Mapping with Program Outcomes:					
Cos / POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1	✓			✓	✓
CO2	✓			✓	✓
CO3	✓			✓	✓
CO4	✓			✓	✓
CO5	✓			✓	✓

24FNP2CP | CORE PRACTICAL: FOOD ANALYSIS

Syllabus

S.No	Contents
1	Determination of moisture content, ash, crude fibre
2	Determination of carbohydrate by Anthrone method
3	Estimation of protein content of foods by Lowry's method
4	Estimation of lipid in egg yolk
5	Estimation of iron
6	Estimation of phosphorus
7	Estimation of calcium in milk and curd
8	Estimation of ascorbic acid in citrus fruits
9	Estimation of iodine number, acid number, saponification number
10	Estimation of amino acid by Sorensen's Formaldehyde titration method
11	Qualitative analysis of phytochemical constituents
12	Determination of protein by Micro Kjeldhal method
13	Demonstration of fat content by Soxhlet method
14	Demonstration of total antioxidant capacity
15	Determination of microbial growth by pure culture technique and microbial count by standard plate count method

Note: Out of 15- 13 mandatory

Manuals	1.	Morrisb Jacob, 1999, "The Chemical Analysis of Foods and Food Products", CBS Publishers and Distributors, New Delhi.
	2.	Mahindrus N, 1987, "Hand book of Food Analysis", Swan Publishers, Jalandhar.

Learning Method	Demonstration/ Hands on Experiments/ Group Trials

Focus of the Course	Skill Development/ Employability

Semester – II EDC: COMPUTER APPLICATION IN NUTRITION							
Semester	**Course Code**	**Course Name**	**Category**	**L**	**T**	**P**	**Credits**
II	**24FNP2CE**	**COMPUTER APPLICATION IN NUTRITION**	**EDC**	**48**	**-**	**-**	**4**

Preamble	This course has been designed for students to learn and understand • the use of computer applications and software in nutrition science • and utilize nutrition databases and tools for dietary analysis • ethical and practical implications of using technology in nutrition practice
Prerequisite	Develop skills in using technology for nutrition research and data analysis

Course Outcomes (COs)

CO Number	Course Outcomes (COs) Statement	Bloom's Taxonomy Knowledge Level
CO1	Understand the fundamental computer concepts and their applications in the nutrition field	K2
CO2	Comprehend dietary assessment software and develop skills for analyzing dietary data	K3
CO3	Explain the statistical analysis software and methods used in nutrition research	K3
CO4	Explore applications used for diet planning and monitoring nutrient intake	K3
CO5	Summarize the ethical considerations, privacy concerns, and the future role of technology in nutrition	K3

Mapping with Program Outcomes:

COs / POs	PO1	PO2	PO3	PO4	PO5
CO1	✓	✓	✓	✓	
CO2			✓		
CO3	✓		✓		✓
CO4		✓		✓	
CO5	✓	✓	✓		✓

24FNP2CE	EDC: COMPUTER APPLICATION IN NUTRITION

Syllabus

Unit	Content	Hrs	Resources
I	**Basics of computer applications in nutrition** Introduction to computers: hardware, software, types of computers, and operating systems. Computer applications in nutrition: overview of applications in dietary assessment, meal planning, and research. Nutrition software tools: introduction to popular nutrition software and tools used in dietetics and nutrition research.	10	Text Book
II	**Dietary assessment and analysis tools** Software for dietary analysis: introduction to applications like NutriSurvey, FoodWorks, and MyFitnessPal. Data collection and entry: methods for inputting and managing dietary data.	10	Text Book
III	**Data analysis and statistical tools in nutrition** Introduction to statistical software: overview of SPSS, R, and other statistical tools. Data analysis techniques: descriptive and inferential statistics in nutrition research.	10	Text Book
IV	**Diet planning and nutrient tracking applications** Diet planning tools: introduction to software like DietCal, Cronometer, and MyPlate. Personalized nutrition: customizing diet plans based on individual needs using software. Mobile applications for nutrient tracking: pros and cons of mobile-based applications in dietary assessment.	10	Text Book
V	**Ethics, privacy, and future trends in nutrition technology** Ethical use of nutrition technology: issues related to data privacy and informed consent. Future of digital health in nutrition: wearables, AI, and predictive analytics in personalized nutrition. Regulations and guidelines: standards and guidelines for using technology in dietetics.	08	Text Book
	Total	**48**	

Text Books	**1.**	Academy of Nutrition and Dietetics, 2020, "Using Technology in Nutrition Practice: A Guide for Dietetics Professionals", Elsevier, Netherlands.
	2.	Guthrie H. A. and Scheer J. C., 2019, "Research Methods in Nutrition and Dietetics", John Wiley and Sons, Ltd, New Jersey, USA.
Reference Books	**1.**	American Dietetic Association, 2021, "Nutrition Informatics: Practical Applications for Dietetics Professionals", Elsevier, Netherlands.
	2.	Buhr C. S. and Wood D. P., 2020, "Digital Health and Nutrition: Ethics and Practical Implications", Elsevier, USA.

Journal and Magazines	Ethics Committee of the Academy of Nutrition and Dietetics, 2022, "Code of Ethics in Nutrition and Dietetics"
E-Resources and Website	https://pubmed.ncbi.nlm.nih.gov/10278323/

Learning Method	Chalk and Talk/ Assignment/ Interactive session / Hands on Training/ICT Tools

Focus of the Course	Skill Development/ Employability/IPR/Entrepreneurship

Semester – II DSE: FOOD BIOTECHNOLOGY							
Semester	**Course Code**	**Course Name**	**Category**	**L**	**T**	**P**	**Credits**
II	**24FNP2DA**	**FOOD BIOTECHNOLOGY**	**DSE**	**36**	**-**	**-**	**3**

Preamble	This course has been designed for students to learn and understand • the application of biotechnology in the field of Food and Nutrition • the concepts of fermentation techniques and GM foods • the fundamentals of enzymes and carbon footprint
Prerequisite	To learn the role of biotechnology in food

Course Outcomes (COs)

CO Number	Course Outcomes (COs) Statement	Bloom's Taxonomy Knowledge Level
CO1	Understanding the principles in the nutrient composition of foods	K2
CO2	Interpret the fermentation techniques and emphasize the characteristics of probiotics	K3
CO3	Examine the characteristics regulations and ethical concerns of GM foods	K4
CO4	Justify the role of biotechnology in animal-based products processing	K4
CO5	Illustrate the effect of enzyme and the components of carbon footprint	K5

Mapping with Program Outcomes:

COs / POs	PO1	PO2	PO3	PO4	PO5
CO1	✓	✓	✓		
CO2	✓	✓	✓		
CO3	✓	✓	✓	✓	
CO4	✓	✓	✓	✓	
CO5	✓	✓	✓	✓	

24FNP2DA	DSE: FOOD BIOTECHNOLOGY

Syllabus

Unit	Content	Hrs	Resources
I	**Food Biotechnology and its applications** Food biotechnology-Introduction, methods, food production, regulatory, safety and socio-economic considerations, Safety of food biotechnology, ethical aspects of food and agricultural biotechnology, limitations, variety of changes shaping bioethics, GMP, GLP. Modern food biotechnology - definition, overview, potential benefits and risks.	7	Text Book
II	**Fermentation Biotechnology and Probiotics** Fermentation –Types of fermentation and fermenters, recovery and purification of products, fermentation and product recovery costs, factors affecting fermentation economics, concept of bio chips and bio sensors. Probiotics, Prebiotics, Synbiotics - Features and composition, characteristics of a good probiotics, factors affecting viability in foods probiotics products - quality assurance and regulatory issues, guidelines for the evaluation of probiotics in food.	7	Text Book
III	**Genetically modified foods and microbes in food industry** Genetically modified foods- Introduction, regulation and role of government, labeling, advantages of GM foods and assessment of the impact of GM foods on human health, social and ethical concerns and hazards of GM foods. Biofortification of Foods. Characteristics of Genetically modified cereals, fruits-apple, citrus, cherry, guava, papaya. Characteristics of Genetically modified vegetables - tomato, soya bean, carrot, potato. Microbes in food industry - single cell protein - spirulina, yeast biomass production and mushroom culture.	7	Text Book
IV	**Role of biotechnology in animal foods** Meat- Introduction, tenderization process. Poultry - Introduction, slaughtering and processing, poultry nutrition impact.	7	Text Book

	Fish- Introduction, genetically engineered fish, fish feed biotechnology, benefits and disadvantages. Milk- Natural components, milk processing operations, key products in dairy industry.		
V	**Enzyme Biotechnology and Carbon footprint** Enzymes-Introduction, sources, purification, formulation of the final enzyme product, enzyme recovery, future of industrial enzymes. Enzymes sources, mechanism, functions -amylase, pectic, lactase, protease. Carbon footprint- Introduction, ecological footprint of the global food system - primary components of footprint, Impact on other food system, minimizing carbon foot print.	8	Text Book
	Total	**36**	

Text Books	**1.**	Foster, G. N., 2020, "Food Biotechnology", 1st Edition, CBS Publishers and Distributors Pvt. Ltd, New delhi..
	2.	Dubey, R. C., 2006, "A Text book of Biotechnology", S. Chand and Company Ltd., New Delhi.
	3.	Sree Krishna V., 2017, "Bioethics and Biosafety in Biotechnology", New Age, International Publishers, New Delhi.
	4.	Green, P. J., 2002, "Introduction to Food Biotechnology", CRC Press, U.S.A.
	5.	Satyanarayana, U., 2008, "Biotechnology", Books and Allied Publishers Ltd., Kolkata.
Reference Books	**1.**	Jayanto Achrekar., 2007, "Fermentation Biotechnology", Dominant Publishers, USA.
	2.	Dietrich Knorr, 2017, Food Biotechnology, Marcel Dekker Inc., New york.
	3.	Byong H. Lee, 2014, "Fundamentals of Food Biotechnology", John Wiley and Sons Ltd, New York..

Journal and Magazines	R D. king, Food Biotechnology, Springer 2011
E-Resources and Website	https://www.ijfsab.com/index.php/fsab https://libguides.reading.ac.uk/food

Learning Method	Chalk and Talk/ Assignment/Seminar/ Interactive session

Focus of the Course	Skill Development/ Employability

Semester – II DSE: FOOD WASTE AND BY-PRODUCT UTILIZATION							
Semester	**Course Code**	**Course Name**	**Category**	**L**	**T**	**P**	**Credits**
II	**24FNP2DB**	**FOOD WASTE AND BY-PRODUCT UTILIZATION**	**DSE**	**36**	**-**	**-**	**3**

Preamble	This course has been designed for students to learn and understand • the food processing by-products and their utilization • the incorporation of by-products into various food products • the emerging technologies to extract valuable bioactive chemicals from food waste
Prerequisite	Comprehend the utilization of food waste and their by-products

Course Outcomes (COs)

CO Number	Course Outcomes (COs) Statement	Bloom's Taxonomy Knowledge Level
CO1	Elaborate on the waste related to food industry	K2
CO2	Illustrate the principles and applications of the food processing by products	K3
CO3	Summarize the valorization of fruit and vegetable waste and loss quantification after harvest	K3
CO4	Explain the use of food by-products in industrial sector	K4
CO5	Interpret the bio processing of meat waste to value-added bio-medical products	K4

Mapping with Program Outcomes:

COs / POs	PO1	PO2	PO3	PO4	PO5
CO1	✓	✓	✓	✓	
CO2			✓		
CO3	✓		✓		✓
CO4		✓		✓	
CO5	✓	✓	✓		✓

24FNP2DB	DSE: FOOD WASTE AND BY-PRODUCT UTILIZATION

Syllabus

Unit	Content	Hrs	Resources
I	**Industrial Food waste** Food waste: classification and properties, disposal and recycling in the context of change in the agricultural industry and emerging nutritional trends, origin of food waste, generated mass of the most important types of product-specific food waste. Possible mitigation measures for food processing wastes. Impact of waste disposal on environment and human health.	07	Text Book
II	**Cereals, Pulses and Sugar** Rice Processing Industries - Rice bran - Protein extraction method, rice hull and rice bran fiber. Soyabean - Major Soybean by-products, tofu whey and its uses, source of various enzymes and applications of important soybean products. Sugar Processing Industries - By-Products - flavorings and aromas, agglomerated product production from bagasse.	08	Text Book
III	**Fruit, Vegetables and Dietary Fiber** Fruit - Phenolic compounds as functional foods, fruit by-products sources and value-added products from fruit by-products. Vegetable - Valorization of vegetable wastes, reasons and overall prevention of wastes, loss quantification of fruits and vegetables after harvest. Dietary fiber - Dietary fiber from fruits, vegetables, cereals and pulses, utilization of dietary fiber in different food industries.	07	Text Book
IV	**Dairy and Pre – Biotics** Dairy - By-products from the dairy processing industries, proteins from dairy waste and advances in milk fractionation for value addition. Prebiotics from food processing by-products, oligosaccharides and polysaccharides from food processing and agricultural by-products.	07	Text Book
V	**Meat, Poultry and Seafood** Meat - By-Products and wastes generated during meat, beef and pork processing waste - collagen, gelatin.	07	Text Book

	Poultry - Proteins and peptides derived from chicken processing by-products and waste, valorization of egg waste. Seafood processing - By-Products, bio medicals – fish protein hydrolysate, peptides, chitin and chitosan.		
	Total	**36**	

Text Books	**1.**	Anil Kumar Anal., 2018, "Food Processing By-Products and their Utilization", John Wiley & Sons Ltd., New York.
	2.	Vassoreopoulou and Winfried Russ., 2007,"Utilization of By-Products and Treatment of Waste in the Food Industry", Springer, New York.
Reference Books	**1.**	Charis M. Galanakis., 2020, "Food Waste Recovery Processing Technologies Industrial Techniques and Applications", Elsevier Inc., Netherlands.
	2.	J. Saxena., 2011, "Food Processing Waste Management Treatment and Utilization Technology", New India Publishing Agency, New Delhi.
	3.	Keith Waldron., 2007, "Handbook of Waste Management and Co-Product Recovery in Food Processing", Elsevier Inc., Netherlands.

Journal and Magazines	https://www.newfoodmagazine.com/topic/food-waste/
E-Resources and Website	https://www.mdpi.com/2304-8158/12/3/456 https://link.springer.com/book/10.1007/978-0-387-35766-9

Learning Method	Chalk and Talk/ Assignment/ Interactive session/Videos/Product Formulations

Focus of the Course	Skill Development/ Employability/IPR/Social Considerations/Entrepreneurship

Semester – II DSE: FOOD TOXICOLOGY							
Semester	**Course Code**	**Course Name**	**Category**	**L**	**T**	**P**	**Credits**
II	**24FNP2DC**	**FOOD TOXICOLOGY**	**DSE**	**36**	**-**	**-**	**3**

Preamble	This course has been designed for students to learn and understand • the principles of toxicology • the clinical, emergency, environmental, medico-legal and occupational aspects of toxicology • to prevent the toxic substances in food products
Prerequisite	Basic comprehension of Language Skills

Course Outcomes (COs)

CO Number	Course Outcomes (COs) Statement	Bloom'sTaxonomy Knowledge Level
CO1	Editorialize the mechanism of toxicology and biotransformation	K3
CO2	Determination of toxicants in food and its effects	K3
CO3	Summarize the regulations for genetically modified foods and allergenicity	K3
CO4	Infer food contaminants and heavy metal contamination and radioactive contamination	K4
CO5	Speculate the application of food additives and its toxicological effects	K4

Mapping with Program Outcomes:

COs / POs	PO1	PO2	PO3	PO4	PO5
CO1	✓			✓	✓
CO2		✓		✓	✓
CO3	✓	✓	✓	✓	✓
CO4	✓	✓	✓	✓	✓
CO5	✓	✓	✓	✓	✓

24FNP2DC	DSE: FOOD TOXICOLOGY

Syllabus

Unit	Content	Hrs	Resources
I	**Toxicology** Introduction to Toxicology – Definition, scope, history, principles, classification of toxic agents, characteristics of toxic exposure, interaction and tolerance, biotransformation. Mutagenesis, Mechanism of toxicity-Oncogenesis, Teratogenesis.	7	Text Book
II	**Food Toxins** Food Toxins – Natural and synthetic toxicants in foods, importance of natural toxins in food, toxicants of plant and animal origin. Microbial toxins (e.g. Algal toxins, bacterial toxins and fungal toxins). Food poisoning, toxin determination in foods and their management. Toxicity of macro and micro nutrient.	7	Text Book
III	**Food allergies and allergens** Food allergies and allergens: Natural sources and chemistry of food allergens; true/untrue food allergies, handling of food allergies. Safety of Genetically Modified food: potential toxicity and allergenicity of GM foods. Manifestations of organ toxicity – neurotoxicity, hepatotoxicity, nephrotoxicity, hematotocicity and immunotoxicity.	8	Text Book
IV	**Contaminants in Food** Contaminants in Food: heavy metal contamination in food (mercury, arsenic lead, cadmium, chromium and aluminum) and their health impacts. Radioactive contamination of food. Drug Residues in food: Fungicide and pesticide residues in foods, use of veterinary drugs.	7	Text Book
V	**Food Additives and Adulterants** Food Additives: Classification, functional role, limitations and toxicological effects of food additives; food processing generated toxicants: nitroso compounds, heterocyclic amines. Food adulteration and potential toxicity of food adulterants. Agencies and statutes involved in regulation of toxic chemicals in India.	7	Text Book
	Total	**36**	

Text Books	**1.**	T. Shibamoto & L. Bjeldanes. 2009, "Introduction to Food Toxicology", (2nd Edn.) Elsevier Inc., Burlington.
	2.	W. Helferich, and C K. Winter, 2001, "Food Toxicology", CRC Press, New Delhi.
Reference Books	**1.**	Ernets Hodson, 2010, "A Text book of Modern Toxicology", A John Wiley & sons Inc, New York.
	2.	K.E. Stine and T.M. Brown, 2006, "Principles of Toxicology", (2nd Edn.) CRC Press, New Delhi.
	3.	J.H. Duffus and H.G.J. Worth, 2006, "Fundamental Toxicology", The Royal Society of Chemistry, New Delhi.

Journal and Magazines	https://www.longdom.org/scholarly/food-toxicology-journals-articles-ppts-list-2982.html
E-Resources and Website	http://ecoursesonline.iasri.res.in/course/view.php?id=186 https://pmc.ncbi.nlm.nih.gov/articles/PMC9777875/

Learning Method	Chalk and Talk/ Assignment/Seminar/ Interactive session

Focus of the Course	Skill Development/ Employability

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APPROVED
BoS- 18th 8/11/24 | AC - 18th 26/11/24 | GB -

Academic Council * CHAIRMAN * Dr.N.G.P. Arts and Science College

Semester – III CORE - IX: MICRONUTRIENTS							
Semester	**Course Code**	**Course Name**	**Category**	**L**	**T**	**P**	**Credits**
III	24FNP3CA	MICRONUTRIENTS	CORE	48	-	-	4

Preamble	This course has been designed for students to learn and understand • The Physiological and metabolic role of micro nutrients and its role in maintaining the human body • The bio availability of vitamins and minerals and their inter relationship • The importance of pseudo vitamins and antioxidants for maintenance of human health
Prerequisite	Basic knowledge of nutrition and human physiology

Course Outcomes (COs)

CO Number	Course Outcomes (COs) Statement	Bloom's Taxonomy Knowledge Level
CO1	Understand functions, digestion, absorption, metabolism, deficiency of Fat-soluble vitamins.	K3
CO2	Learn the functions, metabolism, requirement and deficiency of water-soluble vitamins	K3
CO3	Get to know the functions, absorption, metabolism, deficiency, toxicity, sources and requirements of macro minerals.	K4
CO4	Acquire skills about the functions, intake, requirement of microminerals and trace elements.	K4
CO5	Acquire knowledge about the functions and Sources of the pseudo vitamins and role of antioxidants in maintaining human health	K5

Mapping with Program Outcomes:

COs / POs	PO1	PO2	PO3	PO4	PO5
CO1	✓	✓			✓
CO2	✓	✓			✓
CO3	✓	✓			✓
CO4	✓	✓			
CO5	✓	✓			✓

24FNP3CA	CORE - IX: MICRONUTRIENTS

Syllabus

Unit	Content	Hours	E-Contents / Resources
I	Vitamins - Introduction, Types of vitamins, Factors Influencing the Utilization of Vitamins. Fat Soluble Vitamins - Vitamin A, D, E and K, Functions, Digestion, absorption, metabolism, dietary sources, recommended requirement, deficiency and hypervitaminosis.	10	Text Book
II	Water Soluble Vitamins-Thiamine, riboflavin, niacin, vitamin B12, folic acid, pyridoxine, pantothenic acid, biotin and ascorbic acid - Functions, Digestion, absorption, metabolism, dietary sources, Recommended Intakes, deficiency and hypervitaminosis.	10	Text Book
III	Macro Minerals- Calcium – Distribution of calcium in the body, functions, absorption, metabolism, sources and requirements, deficiency, toxicity and requirements. Regulation of calcium (Calcium Balance). Phosphorus - Concentration in the body, functions, absorption, metabolism, sources and requirements. deficiency, toxicity, Calcium -phosphorus ratio. Inter relationship between Calcium, Phosphorus. Sodium, Potassium, Magnesium and Sulphur - Distribution, functions, absorption, metabolism, sources and requirements, deficiency, toxicity, Sodium and Potassium Balance.	10	Text Book
IV	Micro Minerals Iron - Distribution, functions, absorption, metabolism, Sources, requirements, deficiency, toxicity, bio availability of iron, Iron Turnover. Iodine, Fluorine and Zinc - Functions, absorption, metabolism, sources, requirements, deficiency and toxicity. Trace Elements - Functions, sources, requirements, deficiency and toxicity of copper, cobalt,	10	Text Book

	molybdenum, manganese, selenium, boron, chromium.		
V	Pseudo Vitamins and Antioxidants-Choline, carnitine, inositol, taurine, flavonoid, pangamate - functions, and Sources. Antioxidants - functions and sources of antioxidant, role of antioxidant in human wellness.	8	Text Book
	Total	48	

Text Books	**1.**	Srilakshmi, E. 2021, "Nutrition Science", New Age International Publishers, New Delhi.
	2.	Swaminathan, M. 2000, "Advanced Text Book foods Nutrition", Vol.1., Bappco Publication, Bangalore, India.
Reference Books	**1.**	Mahan, Kathleen L. Krause 's, 2004, "Food, Nutrition and Diet Therapy", 11th edition, Elsevier Publishers, USA.
	2.	Mahtab S. Bamji, Prahalad Rao. N and Vinodhini Reddy, 2004," Text Book of Human Nutrition", Oxford IBH Publishing Co Pvt Ltd., USA.
	3.	Swaminathan, M. 2000, "Essentials of Foods and Nutrition", Volume I and II, Ganesh and Co., Madras, India.
	4.	Williams. S.R. 2013, "Nutrition and Diet Therapy", Times Mirror Masby College Publishing St. Laws, Toronto, Boston.

Journal and Magazines	https://academic.oup.com/journals
E-Resources and Website	https://learnenglish.britishcouncil.org/ https://www.cambridgeenglish.org/learning-english/activities-for-learners/

Learning Method	Chalk and Talk/ Assignment/Seminar/ Interactive session

Focus of the Course	Skill Development/ Employability

Semester – III CORE - X: THERAPEUTIC NUTRITION – SYSTEMIC DISORDERS							
Semester	Course Code	Course Name	Category	L	T	P	Credits
III	24FNP3CB	THERAPEUTIC NUTRITION – SYSTEMIC DISORDERS	CORE	48	-	-	4

Preamble	This course has been designed for students to learn and understand • the disease conditions and their dietary implications • the clinical signs, lab values, and plan medical nutrition therapy by interpretation • the evidence-based nutrition care plans.
Prerequisite	Knowledge on dietetics

Course Outcomes (Cos)		
CO Number	**Course Outcomes (COs) Statement**	**Bloom's Taxonomy Knowledge Level**
CO1	Explain the etiology, symptoms, and dietary management for gastrointestinal disorders.	K2
CO2	Plan suitable therapeutic diets for liver and pancreatic conditions.	K3
CO3	Classify renal disorders and plan appropriate nutrition therapy and fluid balance.	K4
CO4	Explain dietary management for musculoskeletal and endocrine disorders.	K2
CO5	Plan nutritional strategies in managing cancer, burns, and perioperative care.	K3

Mapping with Program Outcomes:					
Cos / POs	PO1	PO2	PO3	PO4	PO5
CO1	✓	✓	✓		✓
CO2		✓		✓	✓
CO3			✓	✓	✓
CO4	✓	✓		✓	✓
CO5	✓	✓	✓		✓

24FNP3CB	CORE – X: THERAPEUTIC NUTRITION – SYSTEMIC DISORDERS

Syllabus

Unit	Content	Hrs	Resources
I	**Diet for Gastrointestinal Disorders** Etiology, clinical manifestations, normal blood values, dietary management (dietary principles, foods to be included and avoided) for Esophagitis, Hiatal hernia, Dysphagia, Acid Peptic Disorders (Gastroesophageal Reflux Disease, Gastritis, Peptic Ulcer Disease, Zollinger-Ellison syndrome), Constipation, Diarrhea, Ulcerative colitis, Inflammatory Bowel Disease, Lactose intolerance.	12	Text Book
II	**Diet for Hepatobiliary and Pancreatic Disorders** Etiology, clinical manifestations, blood test normal values, dietary management (dietary principles, foods to be included and avoided) for Hepatitis, Cholangitis, Fatty Liver Disease, Cholelithiasis, Choledocholithiasis, Cholecystitis, Pancreatitis.	10	Text Book
III	**Diet for Renal Disorders** Etiology, clinical manifestations, normal blood values and urine tests, dietary management (dietary principles, foods to be included and avoided) for Nephritis, Nephrosis, Nephritic Syndrome, Urinary calculi, Chronic Kidney Disease, End Stage Renal Disease. Dialysis – types and dietary management.	9	Text Book
IV	**Diet for musculoskeletal and thyroid disorders** Etiology, clinical manifestations, blood and urine test normal values, dietary management (dietary principles, foods to be included and avoided) for Osteoarthritis, Rheumatoid arthritis, Gout, Osteoporosis, Hypothyroidism, Hyperthyroidism.	8	Text Book
V	**Diet for Cancer and Critical illnesses** Etiology, dietary management (dietary principles, foods to be included and avoided) for cancer. Nutritional manifestations associated with cancer. Feeding problems related to cancer therapy (surgery, radiation therapy and chemotherapy). Burns – types and complications, Dietary management. Pre- and post- operative nutrition.	9	Text Book
	Total	**48**	

	Note: Case studies related to the above topics to be discussed (Examined Internal only)

Text book	1.	Mahan L. K. and Escott-Stump S, 2021, "Krause's Food and Nutrition therapy", 16th Edn, Saunders/Elsevier, USA.
	2.	Kane K. and Prelack K, 2019, "Advanced medical nutrition therapy", 1st Edn, Jones & Bartlett Learning, USA.

Reference Books	1.	Judith E. Tintinalli, J. Stephan Stapczynski, O. John Ma, David M. Cline, Garth D. Meckler, 2016, "Tintinalli's Emergency Medicine: A Comprehensive Study Guide", 8th edn, McGraw Hill, New Delhi.
	2.	Srilakshmi B, 2023, "Dietetics", 9th Edn, New Age International Publishers, New Delhi.
	3.	Shubhangini, A Joshi, 2021, "Nutrition and dietetics", 5th Edn, McGraw Hill, New Delhi.
	4.	Nix S. Williams S. R. & Mowry L, 2022, "Williams' basic nutrition and diet therapy", 16th Edn, Elsevier, USA.

Journal and Magazines	Clinical Gastroenterology and Hepatology https://www.cghjournal.org/
E-Resources and Website	IAPEN - https://jnutres.com/ Academy of Nutrition and Dietetics https://www.eatright.org/

Learning Method	Chalk and Talk/Assignment/Group Discussion/Case Study

Focus of the Course	Skill Development/ Employability/ Entrepreneurial Development

Semester – III CORE - XI: RESEARCH METHODOLOGY AND STATISTICS							
Semester	**Course Code**	**Course Name**	**Category**	**L**	**T**	**P**	**Credits**
III	24FNP3CC	RESEARCH METHODOLOGY AND STATISTICS	CORE	48	12	-	4

Preamble	This course has been designed for students to learn and understand • The details of sampling designs and methods of data collection. • The procedure of interpretation and writing research reports. • Application of statistical procedure in numerical data analyzes to draw inferences.
Prerequisite	Knowledge on research and statistical techniques

Course Outcomes (COs)

CO Number	Course Outcomes (COs) Statement	Bloom's Taxonomy Knowledge Level
CO1	Classify research and choose a hypothesis to plan research along with sampling techniques.	K2
CO2	Choose and simplify the data collection methods. Organize and analyze the data.	K3
CO3	Comparison and contrast the results obtained from the data.	K5
CO4	Statistically analyze the acquired data and explain the results. Measure the reliability of the research data.	K4
CO5	Justify the results using the test of significance. Provide a theoretical conclusion from the obtained data.	K3

Mapping with Program Outcomes:

COs / POs	PO1	PO2	PO3	PO4	PO5
CO1	✓	✓	✓		✓
CO2		✓	✓	✓	✓
CO3	✓	✓		✓	✓
CO4	✓	✓			
CO5	✓	✓			✓

24FNP3CC	CORE - XI: RESEARCH METHODOLOGY AND STATISTICS

Syllabus

Unit	Content	Hours	E-Contents/ Resources
I	**Fundamentals of Research** Meaning of research, objectives of research, types of research and their application, selection and formulation of research problems- hypothesis, research design, sampling methods – random sampling methods and non-random sampling methods, sampling errors & sample size calculation.	12	Text Book
II	**Collection and Organization of data** Primary Data collection methods - Questionnaire, schedule method, interview method, case study method & experimentation method, sources of secondary data, precautions while using secondary data. Editing and Coding the Data Organization of Data - classification of data, formation of discrete and continuous frequency distribution, tabulation - role, general rules of tabulation, types of tables.	12	Text Book
III	**Report Writing** Representation of Data - Diagrammatic and graphical representation - significance of diagrams, graphs and charts- general rules for constructing diagrams - types of diagrams. Interpretation and Report Writing - Meaning of interpretation and precautions, Format of thesis writing - front page, main text, bibliographical citations and appendices. Publishing the research work - writing of abstract and article- content, style, grammar, reference citation. Plagiarism - Definition, types, importance and examples of plagiarism.	12	Text Book

IV	**Measures of Central Tendency** Measures of Central Tendency - Mean, median, mode, their relative advantages and disadvantages. Measures of dispersion — mean, standard deviation, quartile deviation. Co-efficient of variation, percentile and percentile ranks. Association of attributes and contingency tables.	12	Reference Book
V	**Tests of significance** Tests of significance – large and small sample- t'and F'test, tests for independence using chi-square test. Analysis of variance- one-way and two-way classifications, Correlation, coefficient of correlation and its interpretation, rank correlation, regression equations and predictions	12	Reference Book
	Total	60	

Text Books	**1.**	C.R. Kothari , Gaurav Garg, 2019, "Research Methodology, Methods and Techniques", 4th Edition, New Age International Publishers, New Delhi.
	2.	Gupta, S.P., 2017, "Statistical Methods", Sultan Chand & Sons Publication, New Delhi.
Reference Books	**1.**	Pillai .R.S.N., Bagavathi .V., 2019, "Statistics (Theory & Practice)", 8th Edition, S Chand Publishing Company, New Delhi.
	2.	Ravindra Bhaskar Gawali, 2023, "Research Methodology and Statistical Methods", AG Publishing House, India.
	3.	Ramakrishnan, P., 2019, "Biostatistics", Sara Publication, India.
	4.	Singh Y.K. 2006, "Fundamental of Research Methodology and Statistic", Ist Edition, New Age International Publishers, New Delhi.

Journal and Magazines	https://link.springer.com/rwe/10.1007/978-3-030-51366-5_55 https://www.sciencedirect.com/journal/statistical-methodology
E-Resources and Website	https://onlinecourses.swayam2.ac.in/nou21_cm03/preview https://onlinecourses.nptel.ac.in/noc23_ge36/preview

Learning Method	Chalk and Talk/Assignment / Interactive session

Focus of the Course	Skill Development/ Employability

Semester – III CORE – XII: FOOD ADDITIVES AND CONTAMINANTS							
Semester	**Course Code**	**Course Name**	**Category**	**L**	**T**	**P**	**Credits**
III	24FNP3CD	FOOD ADDITIVES AND CONTAMINANTS	CORE	48	-	-	4

Preamble	This course has been designed for students to learn and understand • Gain insight about the food additives • The significance of food additives • The impact of contaminants on human health
Prerequisite	Learn the various standards of food additives and its impact

Course Outcomes (COs)

CO Number	Course Outcomes (COs) Statement	Bloom's Taxonomy Knowledge Level
CO1	Elaborate the role of Food additives	K2
CO2	Explicate the regulatory aspects of food additives	K3
CO3	Illustrate the principle and applications of food additives in food processing sectors	K4
CO4	Summarize the importance of flavors in foods and its significance as food additives	K4
CO5	Illuminate the harmness of adulteration and contaminants and explicate the Consumer Protection Act	K5

Mapping with Program Outcomes:

COs / POs	PO1	PO2	PO3	PO4	PO5
CO1	✓	✓	✓	✓	✓
CO2		✓	✓	✓	✓
CO3	✓	✓	✓	✓	✓
CO4	✓	✓	✓		
CO5	✓	✓	✓		✓

24FNP3CD	CORE - XII: FOOD ADDITIVES AND CONTAMINANTS

Syllabus

Unit	Content	Hours	E-Contents / Resources
I	**Food additives** Definitions, classification and functions, preservatives, antioxidants, colours and flavors, emulsifiers, sequesterants, humectants, hydrocolloids, sweeteners, acidulents, buffering salts, anticaking agents – chemistry, food uses and functions in formulations, indirect food additives. Proteins, starches and lipids as functional ingredient; isolation, modification, specifications, functional properties and applications in foods.	10	Text Book
II	**Functionality of food additives** Sensory properties of foods, additives of natural origin, synthetic additives. Health and safety aspects of food additives. Present status of various food additives. Controversial food additives Saccharin, history, function, controversy status, aspartame, nitrite and nitrate compounds, nitrosamines.	08	Text Book
III	**Additives to improve acceptability** Permitted food colors, natural and artificial, food flavours, natural and artificial, sweeteners natural and artificial, antimicrobials, aerating agents, antistaling agents, bodying agents, clouding agents, curing agents clarifiers, dietary supplements, dietary fiber, emulsifiers, enzymes, fat replacers, gelling agents, leavening agents, stabilizers, surfactants, tenderizers, texturizers, thickeners, vitamins, nutraceuticals, viscosity modifiers, whipping agents	10	Text Book
IV	**Flavor technology** Types of flavours, flavours generated during processing – reaction flavours, flavor composites, stability of flavours during food processing, analysis of flavours, extraction techniques of flavours, flavours emulsions; essential oils and oleoresins.	10	Text Book

V	**Food adulteration** Food adulteration, definition, methods of adulteration, and methods of detection. Consumer's responsibilities, consumer organizations. The prevention of food adulteration Act, 1954. The consumer protection Act 1986, normal food adulterants in coffee, tea leaves, edible oil, milk, spice powders.	10	Text Book
	Total	48	

Text Books	1.	Gerorge, A.B., 2006, "Encyclopedia of Food and Color Additives" Vol. III. CRC Press, United States.
	2.	Branen, A.L., Davidson PM & Salminen S, 2001, "Food Additives", 2nd Ed.Marcel Dekker, New York.
Reference Books	1.	Madhavi, D.L., Deshpande, S.S & Salunkhe, D.K, 2006, "Food Antioxidants: Technological, toxicological and Health Perspective", Marcel Dekker, New York.
	2.	Nakai S & Modler HW., 2000. "Food Proteins and Processing Applications" Wiley VCH, New Jersey.

Journal and Magazines	https://www.tandfonline.com/toc/tfac20/current https://meridian.allenpress.com/jfp
E-Resources and Website	https://www.fssai.gov.in https://www.fao.org/fao-who-codexalimentarius

Learning Method	Chalk and Talk/ Assignment/Seminar/ Interactive session

Focus of the Course	Skill Development/ Employability

Semester – III CORE PRACTICAL – III: FOOD ANALYTICAL TECHNIQUES							
Semester	**Course Code**	**Course Name**	**Category**	**L**	**T**	**P**	**Credits**
III	24FNP3CP	FOOD ANALYTICAL TECHNIQUES	CORE	-	-	72	3

Preamble	This course has been designed for students to learn and understand • These methods help in food testing, product development, and ensuring legal standards. • These techniques are used to test ingredients, detect harmful substances • Learning these techniques helps students and professionals understand how to analyse and improve food.
Prerequisite	Practical knowledge on food analysis

Course Outcomes (Cos)		
CO Number	**Course Outcomes (COs) Statement**	**Bloom's Taxonomy Knowledge Level**
CO1	Understand and apply various techniques in estimation of various nutrients and constituents.	K4
CO2	Apply different Extraction methods in plant sample	K4
CO3	Determine key plant pigments and structural components such as chlorophyll, cellulose, and amylose using quantitative methods.	K4
CO4	Analyze anti-nutritional factors (trypsin inhibitors, phytic acid) in pulses and millets.	K4
CO5	Demonstrate the ability to assess antioxidant activity in food samples.	K5

Mapping with Program Outcomes:					
Cos / POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1	✓	✓	✓	✓	
CO2	✓	✓	✓		✓
CO3		✓	✓	✓	✓
CO4				✓	✓
CO5	✓	✓	✓	✓	✓

24FNP3CP	CORE PRACTICAL - III: FOOD ANALYTICAL TECHNIQUES

Syllabus

S.No	Contents
1	Different plant sample extraction methods
2	Qualitative phytochemical analysis in various plant samples
3	Estimation of chlorophyll
4	Estimation of curcumin in turmeric
5	Estimation of total phenol content present in fresh fruits
6	Estimation of capsaicin in calorimetric method
7	Determination of trypsin inhibitor in pulses
8	Determination of tannin content
9	Determination of phytic acid in millets
10	Determination of Gossypol
11	Determination of Cyanogen
12	Estimation of Cellulose in plant material
13	Invitro Protein Digestibility
14	Determination of Amylose
15	Estimation of alkaloids (Quantitative test)

Manuals	1.	Sadasivam. S., and Manickam. A., 2008, "Biochemical Methods", 3rd Edition, New Age International Publishers, New Delhi.
	2.	AOAC International, 2005, "Official Methods of Food Analysis", 18th Edition, Maryland.

Learning Method	Demonstration/ Hands on Experiments/ Group Trials

Focus of the Course	Skill Development/ Employability/ Entrepreneurial Development/ Innovations

Semester – III CORE PRACTICAL - IV: THERAPEUTIC NUTRITION – SYSTEMIC DISORDERS							
Semester	Corse Code	Course Name	Category	L	T	P	Credits
III	24FNP3CQ	THERAPEUTIC NUTRITION - SYSTEMIC DISORDERS	CORE	-	-	48	2

Preamble	This course has been designed for students to learn and understand • the real-world clinical dietetics through patient-based case studies • the skill-building in individualized nutrition assessment and intervention • the disease-specific nutrition care through hands-on diet planning.
Prerequisite	Knowledge on dietetics and nutrition care process

Course Outcomes (Cos)		
CO Number	**Course Outcomes (COs) Statement**	**Bloom's Taxonomy Knowledge Level**
CO1	Perform nutritional assessment and reassessment using anthropometric and dietary data.	K4
CO2	Identify and interpret nutritional needs of patients based on clinical case histories.	K3
CO3	Recognize clinical symptoms and correlate them with nutritional requirements.	K2
CO4	Plan therapeutic diets tailored to different disease conditions.	K5
CO5	Evaluate the effectiveness of dietary interventions in diverse clinical situations.	K5

Mapping with Program Outcomes:					
Cos / POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1	✓	✓		✓	✓
CO2	✓		✓	✓	✓
CO3	✓		✓		✓
CO4		✓		✓	
CO5	✓			✓	✓

24FNP3CQ	CORE PRACTICAL - IV: THERAPEUTIC NUTRITION - SYSTEMIC DISORDERS

Syllabus

S.No	Contents
1	Nutritional Assessment and Reassessment of a patient.
2	Analyze the case history of a patient for below conditions, calculate modified nutritional requirements, plan a day's menu and calculate the nutrients:
3	Underweight and Obesity
4	Diabetes Mellitus - IDDM, NIDDM, GDM
5	Hypertension
6	Hyperlipidemia
7	Peptic ulcer, Diarrhea, Constipation
8	Hepatitis, cirrhosis
9	Acute and chronic pancreatitis
10	Nephritis, Nephrosis, Renal failure
11	Cancer
12	Food Allergies
13	Pre- and post-operative period

Manuals	1.	Vimala V, 2020, "Advances in Diet therapy", Second Edition, New Age International Pvt Ltd, New Delhi.
	2.	Akanksha Yadav, 2019," Practical Manual of Nutrition and Dietetics ", First Edition, Kalpaz Publications, New Delhi.

Learning Method	Demonstration/ Hands on Training/ Hospital visit

Focus of the Course	Skill Development/Employability/Entrepreneurial Development

Semester – III DSE - III: INSTRUMENTATION IN FOOD INDUSTRY							
Semester	**Course Code**	**Course Name**	**Category**	**L**	**T**	**P**	**Credits**
III	24FNP3DA	INSTRUMENTATION IN FOOD INDUSTRY	DSE	36	-	-	3

Preamble	This course has been designed for students to learn and understand • The instruments used in food industries for food analysis • The working principle and instrumentation of various instruments used for food analysis •The various methods, strategies, proper selection and identification of instruments, Installation and operation of instrumentation
Prerequisite	

Course Outcomes (COs)

CO Number	Course Outcomes (COs) Statement	Bloom's Taxonomy Knowledge Level
CO1	Understand the basic working principle of instruments used for food analysis	K4
CO2	Learn the rheological properties of food	K5
CO3	Acquire skills on the working principle and applications of spectroscopic analysis of food components	K4
CO4	Get to know the applications of chromatographic techniques	K5
CO5	Acquire knowledge on the techniques and applications of electroporesis techniques used in food components	K5

Mapping with Program Outcomes:

COs / POs	PO1	PO2	PO3	PO4	PO5
CO1	✓	✓	✓	✓	✓
CO2		✓	✓	✓	
CO3	✓	✓		✓	✓
CO4	✓	✓			
CO5	✓	✓		✓	✓

24FNP3DA	DSE - III: INSTRUMENTATION IN FOOD INDUSTRY

Syllabus

Unit	Content	Hours	E-Contents / Resources
I	Nature and Concept of Food Analysis-Basic instrumentation: Working principle, components and applications of pH meter, Ultrafiltration, Bomb calorimeter, Calorimetry, Centrifugation and Ultracentrifugation.	7	Text Book
II	Rheological parameters- instruments, Components, working principles and application of viscometer, rheometer, farinograph, extensiograph, amylograph.	7	Text Book
III	Spectroscopic analysis of food components - Working Principle, instrumentation & application of UV-Vis spectrophotometer, IR Spectroscopy, inductively coupled plasma atomic emission spectroscopy (ICP-AES) and NMR.	7	Text Book
IV	Chromatographic analysis of food components - Working Principle, component and application of different chromatography-basics (paper, thin layer, partition) and Advance chromatography: GC, HPLC, HPTLC, UHPC	8	Text Book
V	Electrophoresis analysis of Food Components - Working Principles, Application of Paper & gel electrophoresis, Agarose 2D Gel Electrophoresis.	7	Text Book
	Total	36	

Text Books	**1.**	Suzanne Nielsen.S., 2002, "Introduction to the Chemical Analysis of Foods", CBS Publishers, New Delhi.
	2.	Fennama, O.R., 1976, "Principles of Food Science and Food Chemistry". Marcel Dekker, New York.
Reference Books	**1.**	King, R.D., 1978, "Developments in Food Analysis Techniques", Publishers Ltd, London.
	2.	Fung, D.Y.C. and Matthews, R., 1983, "Instrumental Methods for Quality Assurance in Foods", Marcel Dekker, Inc. New York.

	3.	Raghuramulu N., Madhavan Nair K. and Kalyansundaram S, 1970, "A manual of laboratory techniques" edited by NIN, ICMR, Hyderabad.

Journal and Magazines	https://academic.oup.com/journals
E-Resources and Website	https://iopscience.iop.org/article/10.1088/0022-3735/19/1/001

Learning Method	Chalk and Talk/ Assignment/Seminar/ Interactive session

Focus of the Course	Skill Development/ Employability

Semester – III DSE – III: FOOD PACKAGING TECHNIQUES							
Semester	**Course Code**	**Course Name**	**Category**	**L**	**T**	**P**	**Credits**
III	24FNP3DB	FOOD PACKAGING TECHNIQUES	DSE	36	-	-	3

Preamble	This course has been designed for students to learn and understand • The purpose and the need for food packaging technology • To impart knowledge and skills related to designing packaging system in food products • The developing skills in handling of packaging equipment
Prerequisite	Basic understanding of food packaging technology

Course Outcomes (COs)

CO Number	Course Outcomes (COs) Statement	Bloom's Taxonomy Knowledge Level
CO1	Identify the functions of packaging materials for different foods	K3
CO2	Elucidate the characteristics, application of packaging of foods	K4
CO3	Analyze the packaging techniques, implication and its application.	K4
CO4	Compare the recent advancements in food packaging industry	K5
CO5	Choose the Standards for labeling concerned in food industries.	K5

Mapping with Program Outcomes:

COs / POs	PO1	PO2	PO3	PO4	PO5
CO1	✓			✓	✓
CO2	✓	✓		✓	✓
CO3	✓	✓		✓	✓
CO4	✓		✓	✓	✓
CO5	✓		✓	✓	✓

24FNP3DB	DSE - III: FOOD PACKAGING TECHNIQUES

Syllabus

Unit	Content	Hours	E-Contents / Resources
I	Food packages Introduction of Food packaging, Need of food packaging, Role of packaging in extending shelf life of foods, Types of Packaging material-primary, secondary & tertiary, characteristics. Different forms of packaging - Rigid, semi- rigid, flexible. Packaging Materials-Glass, Metal (steel and Aluminum cans), Aluminum Foils and metalized Films, Paper and paper boards, BOPP, CPVC, Plastics and its application.	7	Text Book
II	Packaging of cereal and pulse products & edible oil Packaging of cereal products- Spoilage factors, Packaging of whole grains (Bulk &Consumer Packs) - Jute bags, HDPE sacks, Packaging of milled grains (flours)- LDPE, LLDPE, HMHDPE, BOPP, Co-extruded films, Packaging of Cereal based convenience products and weaning products. Trends in packaging of Biscuits- wrapping material, packaging style and preparation stages. Packaging of Edible oil- spoilage factors, package types, critical polymers & Indian standards of packaging edible oil, vanaspati and ghee	7	Text Book
III	Packaging of Milk, Egg, Sugars and Confectioneries Packaging of Milk and milk products (Milk Powder,Butter,Yogurt,Cheese. Packaging Materials for Egg and its technique. Sugar and chocolate confectioneries-Packaging requirements, packaging materials - cellulosics, polyolefins, vinyls, Polyester & polyamides, Aluminium foils, Metallised films.	7	Text Book
IV	Technology in development of Food packaging MAP packaging- Techniques of MAP, Packaging Materials, Role of Gases in MAP, Application of Gas	8	Text Book

	Packing for Shelf-Life Extension of Foods-Effect of MAP on fresh meat, fish, poultry & processed meats, Advantages and Disadvantages of MAP Active and Intelligent Packaging, Sustainable Packaging, Degradable Packaging Polyermers-Biodegradable, Photodegradable Packaging.		
V	Labeling & Laws Labeling- Purpose of labels, elements of food label, type of label, labeling regulations, bar code, Nutrition labeling, mandatory labeling provisions. Laws and regulations -SWMA, PFA Rule, Other Labelling Rules.	7	Text Book
	Total	36	

Text Books	**1.**	N. I. I. R. Board, 2010, "Handbook on modern packaging industries". Asia Pacific Business Press Inc., New Delhi.
	2.	NIIR Board, 2020, "Food Packaging technology", 3rd edition, NIIR Project Consultancy Services., New Delhi.
Reference Books	**1.**	Lee, D. S., Yam, K. L., and Piergiovanni, L, 2008, "Food packaging science and Technology",CRC press, New York.
	2.	Francis, F. J.,1999, "Wiley encyclopedia of food science and technology" John Wiley and Sons Inc, Germany.
	3.	Griffrin, R.C, 2002, "Principles of Food Packaging", 2nd Edition. Avi pub Co. Westport.
	4.	Gordon L. Robertson, 2013, "Food Packaging Principles and Practice", 3rd Edition, CRC Press, Baco Raton

Journal and Magazines	https://www.journals.elsevier.com/food-packaging-and-shelf-life
E-Resources and Website	https://www.fao.org https://www.fda.gov/food/food-ingredients-packaging

Learning Method	Chalk and Talk/ Assignment/Seminar/ Interactive session

Focus of the Course	Skill Development/ Employability

Semester – III DSE – III: FOOD MICROBIOLOGY							
Semester	**Course Code**	**Course Name**	**Category**	**L**	**T**	**P**	**Credits**
III	24FNP3DC	FOOD MICROBIOLOGY	DSE	36	-	-	3

Preamble	This course has been designed for students to learn and understand • The interactions between microorganisms and the food environment • Effects of fermentation in food production and the microbiological quality of the food product • The role of microorganisms in food safety
Prerequisite	Basic understanding of microorganisms and contamination mechanisms

Course Outcomes (COs)

CO Number	Course Outcomes (COs) Statement	Bloom's Taxonomy Knowledge Level
CO1	Intricate the factors affecting the growth of microorganisms in food– pH, temperature, moisture, oxidation.	K2
CO2	Illustrate the role of Microorganism in Food Safety. Outline GMP and HACCP.	K2
CO3	Summarize and identify the fermented food – Bread, dairy products, beverage, fish and meat products.	K3
CO4	Explain the Spoilage of food - cereals, vegetables, fruits, egg and milk & canned foods.	K3
CO5	Evaluate the Food borne diseases. Investigation of food poisoning outbreaks by Bacteria and Mycotoxins.	K3

Mapping with Program Outcomes:

COs / POs	PO1	PO2	PO3	PO4	PO5
CO1	✓			✓	✓
CO2	✓	✓		✓	✓
CO3	✓	✓		✓	✓
CO4	✓		✓	✓	✓
CO5	✓		✓	✓	✓

24FNP3DC	DSE - III: FOOD MICROBIOLOGY

Syllabus

Unit	Content	Hours	E-Contents / Resources
I	**Food and Microorganisms** Important microorganisms in food- Bacteria, Mold and Yeast, Factors affecting the growth of microorganisms in food – pH, moisture, oxidation-reduction potential, nutrient content and inhibitory substances and biological structure.	7	Text Book
II	**Microbes In Food Fermentation** Microbes associated with typical food fermentation- Bread, pickle, Sauerkraut, fermented fish and meat products, Fermented dairy products: Yoghurt and cheese & Fermented beverages: Wine and beer.	7	Text Book
III	**Control of microorganisms in foods: Food Preservation** Microbiological spoilage problems and preventive measures associated with typical food products- Vegetables, fruits, Meat, Fish, Poultry, egg and milk & canned foods.	7	Text Book
IV	**Bacterial Agents of Food Borne Illness** Food poisoning and Food borne infections – Salmonella, E. coli, Staphylococcus, Clostridum, Listeria, Shigella, Campylobacter, Vibrio, Mycobacterium and Bacillus.	8	Text Book
V	**Non- Bacterial Agents of Food Borne Illness** Food borne viruses; helminths, nematodes and protozoa. Detection & Enumeration of microbes in foods	7	Text Book
	Total	36	

Text Books	1.	Frazier. W.C and D.C West off., 2017, "Food Microbiology", 5th Edition, McGraw Hill Education Publishers, Boston.

	2.	Martin R Adams, Maurice O Moss, Peter McClure, 2015, "Food Microbiology", 4th edition, Royal Society of Chemistry Publication, Burlington.
Reference Books	1.	David A. Golden, James M. Jay, Martin J. Loessner, 2006 ,"Modern Food Microbiology" 7th edition, Springer-Verlag, New York.
	2.	Roger. Y. Stainer, 2003, "Basic Food Microbiology", 2nd edition, CBS Publishers, United States.

Journal and Magazines	https://www.sciencedirect.com/journal/international-journal-of-food-microbiology
E-Resources and Website	https://www.frontiersin.org/journals/microbiology/sections/food-microbiology

Learning Method	Chalk and Talk/ Assignment/Seminar/ Interactive session

Focus of the Course	Skill Development/ Employability

24FNPSSA	SELF STUDY: COMPOSITE HOME SCIENCE	SEMESTER III

Total Credits: 1

Syllabus

Unit I Food and Nutrition

Food Science and Quality Control, Macro and Micro - Nutrients, Human Nutritional Requirements, Assessment of Nutritional Status, Food Biotechnology

Unit II Institutional Management and Dietetics

Advanced Management and Organization, Management of Human Resources, Experimental Quantity Cookery, Financial and Profit Management, Quantity Food Preparation Techniques, Food Service and, Delivery Systems Marketing, Therapeutic Dietetics

Unit III Child and Human Development

Human Development - Rights perspective, Principles and Theories of Human Development. Early Childhood Care and Development - Strategies, Monitoring and Supervision. Children with special needs and Children at Risk (Child Labor, Street Children, Child Abuse, Chronically Sick); Intervention Programs. Socialization in various family contexts across different cultures. Advances in Assessment of Children.

Clothing and Textiles- Textile Chemistry - Fibers and dyes. Dyeing, printing and finishing of fibers yarns and fabrics. Textile and Apparel Industry - Fundamental of business, specifications, quality control agencies and marketing. Historic and Traditional Textiles of world with emphasis on India. Curriculum and Teaching in clothing and textiles, analysis and development of curriculum; teaching methods and aids. Consumer and Textiles and Clothing. Recent developments in Textile and Clothing.

Unit IV Home and Community Resource Management

Concept of Home management, System approach to family, Input, Output and feedback. Family Resources - Management of Resources like time energy and money; Basic characteristics of Resources; Efficient methods of utilization of Resources. Family Life Cycle - Demands upon resources like time, energy and money. Concept of Ergonomics - its importance and application in home. Concept of Communication process and its importance in family; Barriers in Communication process; Measures for Effective Communication. Concept of Work Simplification - its importance in home; Simple pen and pencil technique. Consumer Education - Laws protecting consumer; Role of consumer society in protecting consumer; Kinds of adulteration; Identification of adulteration.

Unit V Home Science Extension Education

Curriculum Development for Formal Education in Home Sciences. General and Special Methods of Teaching Home Science. Media and Materials for promoting Home Science in Formal / Non - formal / Adult / Extension Education. Non - formal and Adult Education in Home Science. Extension Education in Home Science. Women in Changing India and Plans for their development. Self - Employment and Entrepreneurship through Home Science. Programs of extension in Home Science. Measurement and Evaluation including monitoring and supervision for Formal / Non - formal / Adult Education / Extension Education.

Text Books

1. Premlata Mullick, 2012."Textbook of Home science", Kalyani publications, Coimbatore.
2. Serena Shekar, 2013, "Text book of Home science", Extension education, New Delhi.

24FNPSSB	SELF STUDY: DIET COUNSELING	SEMESTER III

Total Credits: 1

Syllabus

Unit I Practical consideration in giving dietary advice and counselling

a) Factors affecting and individual food choice b) Communication of dietary advice c) Consideration of behavior modification d) Motivation.

Unit II Counselling and educating patient

a) Introduction to nutrition counselling b) Determining the role of nutrition counseller c) Responsibilities of the nutrition counseller d) Practitioner v/s client managed care, e) Conceptualizing entrepreneur skills and behavior, f) Communication and negotiation skills.

Unit III Teaching aids used by dietitians

Charts, leaflets, posters etc., preparation of teaching material for patients suffering from Digestive disorders, Hypertension, Diabetes, Atherosclerosis & Hepatitis and cirrhosis.

Unit IV Use of Computers in Counseling

a) Use of computers by dietitian b) Dietary computations, c) Dietetic management d) Education/ training e) Information storage, f) Administrations g) Research

Unit V Computer applications for counseling

a) Execution of software packages b) Straight line, frequency table, bar diagram, pie chart, Preparation of dietary charts for patients c) Statistical computation- mean, median, standard deviation, conclusion and regression test.

Text Books

1 Premlata Mullick Joshi .Y .K , 2003, "Basic Clinical Nutrition", JAYPEE Brothers, New Delhi.

2 Mahan.K and Escott.S., 2000., "Food Nutrition and Diet Therapy", 11th Edition.,W.S. Saunder's Company, Philadelphia, USA.

References

1 Gibney.M.J, 2004., "Public Health Nutrition" , 1st Edition, Black Well Scientific Publications, Oxford.

2 Wadhwa.A, 2003, "Nutrition in the Community", 1st Edition, Elite Publications, New Delhi.

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APPROVED
BoS- 19th 28.06.25 | AC - | GB -