MOTHER TERESA WOMEN'S UNIVERSITY

KODAIKANAL - 624 101
Tamil Nadu.

DEPARTMENT OF FOODS AND NUTRITION

Curriculum Framework and Syllabus for

M.Sc., Foods and Nutrition

(For the candidates to be admitted from the academic year 2021-2022 onwards)

(UNDER CHOICE BASED CREDIT SYSTEM- CBCS)

1. About the Programme *

The Foods and Nutrition program includes the components of food, nutritional qualities, physiochemical properties, techniques involved in food processing and preservation, quality control in food manufacturing and role of nutrition in human health and communal wellness. The program is structured to fulfill the job requirements in teaching and learning institutions, food industries, food testing laboratories, nutrition intervention programme, fitness centres, diet clinics and hospitals.

2.Program Educational Objectives (PEOs)

1. To develop quality professionals with skills and competencies to serve in food and nutrition related institutions and industries.
2. To equip the learners with professional qualities in food production and to impart innovative ideas with critical thinking skills.
3. To motivate the learners to explore novel research problems and apply practical solutions to them.
4. To encourage the students to promote interactions with societal organizations for learning and problem solving.
5. To enhance communal participation with ethical responsibility

3. Eligibility

A pass in B.Sc. Foods and Nutrition/ B.Sc.-Home Science/B.Sc. Nutrition and Dietetics/ B.Sc. Food Science and Nutrition/ B.Sc. Food Technology/B.Sc. Clinical Nutrition and Dietetics, B.Sc. Nutrition, Food Service Management and Dietetics, B.Sc.-Nutrition Food Service Management with computer applications, B.Voc. Degree related to Foods and nutrition (with equivalence) are eligible to register for the degree of Master of Science in Foods and nutrition are eligible to seek admission.

General Guidelines for PG Programme:

1. **Duration:** The programme shall extend through a period of 4 consecutive semesters and the duration of a semester shall normally be 90 days or 450 hours. Examinations shall be conducted at the end of each semester for the respective subjects.
2. **Medium of Instruction:** English
3. **Evaluation:** Evaluation of the candidates shall be through Internal and External assessment. The ratio of formative and summative assessment should be 25:75 for both Core and Elective papers.

	Theory		Practical	
	Min	**Max**	**Min**	**Max**
Internal	**13**	**25**	**13**	**25**
External	**38**	**75**	**38**	**75**

- **Internal (Theory): Test (15) + Assignment (5) + Seminar/Quiz(5) = 25**
- **External Theory: 75**

Question paper pattern for External examination for Core and Elective papers:

Max. Marks: 75 **Time: 3 Hrs.**

S.No.	Part	Type	Marks
1	**A**	**10*1 Marks=10** Multiple Choice Questions - 2 Questions from each Unit	**10**
2	**B**	**5*4=20** Two questions from each Unit with Internal Choice (either / or)	**20**
3	**C**	**3*15=45** (Open Choice) (Any three Questions out of 5 - one Question from each Unit)	**45**
Total Marks			**75**

Minimum credits required to pass - 90.

4. Project Report

A student should select a topic for the Project Work at the end of third semester itself and submit the Project Report at the end of the fourth semester. The Project Report shall not exceed 75 typed pages.

Evaluation:

There is a Viva Voce Examination for Project Work. The Guide and an External Examiner shall evaluate and conduct the Viva Voce Examination. The Project Work carries 100 marks (Internal: 25 Marks, Viva: 75 Marks)

5. Conversion of Marks to Grade Points and Letter Grade
(Performance in a Course/ Paper)

Range of Marks	Grade Points	Letter Grade	Description
90 – 100	9.0 – 10.0	O	Outstanding
80-89	8.0 – 8.9	D+	Excellent
75-79	7.5 – 7.9	D	Distinction
70-74	7.0 – 7.4	A+	Very Good
60-69	6.0 – 6.9	A	Good
50-59	5.0 – 5.9	B	Average
40-49	4.0 – 4.9	C	Satisfactory
00-39	0.0	U	Re-appear
ABSENT	0.0	AAA	ABSENT

6. Attendance

Students must have earned 75% of attendance in each course for appearing for the examination. Students with 71% to 74% of attendance should apply for condonation in the prescribed form with prescribed fee. Students with65% to 70% of attendance should apply for condonation in the prescribed form with the prescribed fee along with the Medical Certificate. Students with attendance less than 65% are not eligible to appear for the examination and they shall re-do the semester(s) after completion of the course, with the prior permission of the Controller of the Examination, and the Registrar of the University.

7. **Maternity Leave –** The student who avails maternity leave may be considered to appear for the examination with the approval of Staff i/c, Head of the Department, Controller of Examination and the Registrar.

8. Any Other Information:

In addition to the above regulations, any other common regulations pertaining to the PG Programmes are also applicable for this programme

PROGRAMME OUTCOMES (PO)

The Expected Programme Outcomes on completion of M.Sc. Foods and Nutrition

PO1	Provide quality education to make the students expertise in the field of Food Science, Nutrition, and Dietetics.
PO2	Impart knowledge and skills to work in hospitals, research laboratories, food industries, health sectors.
PO3	Promote professional competence to face the challenges of the food processing sector and other nutritional organizations.
PO4	Acquire knowledge and skills in highly entrepreneurial courses in the areas of Food Processing, Quality Control, Food product development, Food labeling, and Nutritional Sciences.
PO5	Attained-based research in Foods and nutrition for improving the livelihood of the community and the nation.
PO6	Identify food-based approaches for alleviating nutritional problems to improve nutrition and health security.
PO7	Develop entrepreneurial skills by providing skill development programs in the food processing sectors.

PROGRAMME SPECIFIC OUTCOMES (PSO)

The Expected Programme Outcomes on completion of M.Sc. Foods and Nutrition

PSO1	Understand the nature and basic concepts in the field of Food Science and Nutrition.
PSO2	Extend the knowledge on applications of research in Foods and nutrition for improving the livelihood of the community
PSO3	Analyze the relationship between diet and health and impart knowledge to alleviate nutritional problems and to achieve health security.
PSO4	Gain proficiency to get employability in hospitals, food processing sectors
PSO5	Apply knowledge on clinical intervention, nutrition education, diet planning, counseling, and health promotion.

M.Sc., FOODS AND NUTRITION

S.No	Course Code	Course Title	Credits	Hours		CIA	ESE	Total
				T	P			
Semester I								
1	P21FNT11	**Core I** Advanced Food science	4	5	-	25	75	100
2	P21FNT12	**Core-II** Human physiology	4	5	-	25	75	100
3	P21FNT13	**Core-III** Community nutrition	4	5	-	25	75	100
4	P21FNT14	**Core-IV** Nutrition through life cycle	4	5	-	25	75	100
5	P21FNP11	**Core-V** Practical I Advanced food science	4	-	6	25	75	100
6	P21CSS11	**Supportive Course I** Computer skills for web designing and video editing	2	4	-	25	75	100
		Total	**22**	**30**		**-**	**-**	**600**
Semester II								
7	P21FNT21	**Core VI** Advanced nutrition-I	4	4	-	25	75	100
8	P21FNT22	**Core-VII** NutritionalBiochemistry	4	4	-	25	75	100
9	P21FNT23	**Core-VIII** Food Product Development	4	4	-	25	75	100
10	P21FNP22	**Core-IX** Nutritional biochemistry practical	4	-	6	25	75	100
11	P21FNP23	**Core-X** Practical II- Foodproduct development practical	4	-	6	25	75	100
12		**Non-major elective**	4	4	-	25	75	100
13	P21FNS22	**Supportive Course II**(Skill) Public health nutrition	2	-	2	25	75	100
		Total	**26**	**30**		**-**	**-**	**700**
Semester III								
14	P21FNT31	**Core XI** Research methods and statistics	4	5	-	25	75	100
15	P21FNT32	**Core-XII** Food microbiology	4	5	-	25	75	100
16	P21FNT33	**Core-XIII** Advanced Dietetics	4	4	-	25	75	100
17	P21FNT34	**Core-XIV** Sports nutrition	4	4	-	25	75	100
18	P21FNT35	**Core-XV** Advanced nutrition-II	4	4	-	25	75	100
19	P21FNP34	**Core-XVI** Therapeutic nutrition practical	4	0	6	25	75	100
20	P21WSS33	**Supportive Course III** Women Empowerment	2	2	-	25	75	100
		Total	**26**	**30**		**-**	**-**	**700**
Semester IV								
21	P21FNE411/ P21FNE412/ P21FNE413	**Elective-I** (Fundamentals of food technology/ Home science	4	4	-	25	75	100

		composite/ ICT tools for nutrition education)/any MOOC course[$]						
22	P21FNE421/ P21FNE422/ P21FNE423	**Elective-II** (Functional foods and Nutraceuticals/ Food safety and quality control/ Food packaging)/ any MOOC course[$]	4	4	-	25	75	100
23	P21FNR41	Project	8	22	-	25	75	100
		Total	**16**	**30**	-			**300**
		Grand total	**90**	**120**				**2300**

Additional Credit Courses (Mandatory)

1. P21FNI21: Internship/Industrial Training – Two Credits- (SecondSemester)
2. P21FNO31: Online Courses-Two Credits- (ThirdSemester)
3. P21FNV11Value Added Program I-Two Credits (First Semester: Drug and nutrient interactions)
4. P21FNV42: Value Added Program II-Two Credits (Fourth Semester: Scientificwriting)

* Those who have CGPA 9 and want to do the project in Industry / Institution during 4th semester, these two elective papers in IV semester can be opted in third semester itself.

$ For Elective – I / Elective- II, the students can also take either one 4-credit course or two 2-credit courses in MOOC, with the approval of Departmental Committee.

Outside Class Hours (Attendance compulsory)

- Health, Yoga and Physical fitness.
- Library information access andutilization
- EmployabilityTraining.
- Students SocialResponsibility.

- **Non-major Electives (NME)**

Paper No.	Paper Code	Course Title		Credits	Hours	CIA	ESE	Total
1	P21FNN211	NME	Basics of human nutrition	4	4	25	75	100
2	P21FNN212	NME	Women and health	4	4	25	75	100
3	P21FNN213	NME	Food processing	4	4	25	75	100

Semester-I

Course Code	P21FNT11	ADVANCED FOOD SCIENCE	L	T	P	C
CORE –I			5	-	-	4
Cognitive Level	**K2:Understand K3:Apply K4: Analyze**					
Learning Objectives	• To understand the composition, classification, and function of various food groups • To analyze the factors affecting cooking and keeping quality offood. • To identify the foods with their nutritional properties and the scope ofthe research in futurefoods					

UnitI Food classification: cerealsandpulses

Food classification by ICMR- FSSI- Food groups- Cereals - Rice & wheat and other Millets– Composition- Nutritive Value-and Processing - Role of starch and gluten in cookery Pulses and legumes–Nutritive value- types- Processing- and anti-nutritional factors- factors affecting cooking quality- germination.

UnitII Fruits andVegetables

Fruits - Classification Nutritive value- ripening of fruits- changes in ripening and peptic substances- browning-Vegetables: classification - nutritive values- processing- pigments- color changes-browning- Vegetable based preserved foods.

UnitIII Milk andMeatfoods

Milk – Classification- Nutritive value- Putrefaction- processing- Egg – Structure- Composition- Nutritive Value - and Role of egg in cookery- Meat - Structure, Composition- Nutritive value- Changes on cooking and Rigor mortis- Poultry – Composition- Nutritive value- changes in cooking- Fish - Composition, Nutritive value- Selection- Spoilage- Changes on Cooking-Fish processing and its advancements.

UnitIV FatsandOils

Fats and Oils – Types - Properties of fat relating to cooking - Rancidity- Tests for rancidity- antioxidants used for rancidity - Hydrogenation- The role of fats in cookery.

UnitV SugarandBeverages

Sugar cookery - Types of sugar – Properties - Crystallization - Stages in Sugar cookery - Application in Indian recipes - Artificial sweeteners: processing and safety measures of artificial sugarintake.

a. Beverages –Basic Classification - Nutritive value - Preparation of milk-based beverages- Tea- Coffee Cocoa processing - malted beverages - flavored drinks - Processing of beverages - Recent developments in beverageprocessing.
b. Spices and Condiments – production - nutrient contents – classification - processing of spices andcondiments.

Textbooks

1. Srilakshmi, M., Food science, New Age International (P) Ltd., Publishers2010.
2. Swaminathan, M., Foodscience, Chemistry and Experimental Foods, Bappco Publishers,2005
3. Potter, Norman N., and Joseph H. Hotchkiss. Food Science. Springer Science & Business Media, 2012.
4. Manay S and Swamy S, Food Facts and Principles, New Age International (P) LtdPublishers, New Delhi,2001.

Reference Books:

1. Brown. A. Understanding Food, Wadsworth, Thomson Learning Publications,2000.
2. Mehas, K.Y., and Rodgers, S. L., Foodscience and You. McmillanMcgraw Hill Company,2000.
3. Paul, P.C., and Palmer, H. H., Food Theory and Applications. John Wiley and Sons, New York, 2000 RevisedEdition.
4. Fellows,P, Food Processing Technology-Principles and Practice.,2nd edition, CRC press Wood Lead Publishing Ltd, Cambridge, England,2000.
5. Vaclavik, Vickie A., Elizabeth W. Christian, and Elizabeth W. Christian. Essentials of food science. Vol. 42. New York: Springer,2008.
6. Sivasankar B, Food Processing and Preservation, Prentice-Hall of India Private Limited, New Delhi,2002
7. Mehas, K.Y., and Rodgers, S. L., Food science and You. McmillanMcgraw Hill Company,2000.

JOURNALS

1. Indian Food ScienceJournal
2. International journal of FoodTechnology

Course Outcomes

On successful completion of the course, the students will be able to gain knowledge about

CO	Course Outcomes	Knowledge Level
CO1	The importance of food groups based on the nutrient value to enable meal planning in cereals	**K2**
CO2	The scientific basis of preliminary of food: pulses and fruits	**K2**
CO3	Conservation of nutrients and acceptability of food preparation in egg and Fish	**K3**
CO4	Advanced food science in milk and oil.	**K2**
CO5	The effect of processing and storage on the nutritional composition of sugar, beverages, and spices	**K4**

Mapping of COs with POs& PSOs:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	S	M	S	S	S	M	M	S	M
CO2	S	S	S	S	M	S	S	S	M	M	S	M
CO3	S	S	S	S	M	S	S	S	M	M	S	M
CO4	S	S	S	S	M	S	S	S	M	M	S	M
CO5	S	S	S	S	M	S	S	S	M	M	S	M

Strongly Correlating (S) 3 Marks Moderately Correlating (M) 2 Marks
Weakly Correlating (W) 1 Mark No Correlation (N) 0 Mark

Course Code	P21FNT12	HUMAN PHYSIOLOGY	L	T	P	C
CORE -II			5	-	-	4
Cognitive Level	K1:Recall K2: Understand K4:Analyze					
Learning Objectives	• To aid the student's to conquer knowledge about the variousphysiological structure andbody • To integrate the functions of all the systems and diseaseconditions					

Unit1 CellComponents

Cellular basis of Physiology- Body fluid compartment, membrane potential- cell structure and functions - Regulation of cell multiplication.Digestive System -Review of structure and function of various parts in the gastrointestinal tract in brief - Role of liver- pancreas - gall bladder and their dysfunction- Role of specific hormones associated in GI tract.

Unit2 RespiratorySystem

Review of structure and functions. Role of lungs in the exchange and transport of gases.Respiratory volumes - Excretory System- Anatomy and physiology of kidneys and nephron-Formation of urine, acid - base balance - Role of the kidney in maintaining pH of theblood.

Unit3 ImmuneSystem

Immunity – Properties - natural and acquired Immunity - features of immune responses - antigen - antibodies – types - properties - and antigen - antibody interaction - Autoimmune disorder and allergy - Circulatory System - Structure and function of the heart and blood vessels – Blood-Composition – plasma - blood cells – haemoglobin - blood clotting process - Regulation of cardiac output - cardiac cycle - blood pressure.

Unit4 EndocrineSystem

Anatomy and physiological functions of endocrine glands - Hormones - Mode of action – Pituitary- Adrenal- Thyroid- Parathyroid- Sex glands- and Pancreas -. Hypo and Hyper activities of the glands.

Reproduction System: structure, physiological functions of male and female reproductive organs, menstrual and ovarian cycle, spermatogenesis, contraceptives, infertility and its recent developments, Rh factor.

Unit5 Nervous System

Review of CNS & ANS, the function of neuron, conduction of nerve impulse, synapse, the role of neurotransmitters. The blood-brain barrier, CSF.Hypothalamus and its role in various body functions –sleep, memory, and obesity. Sense organs: Review of structure and function skin, eye, ear, nose, and tongue in the perception of stimuli.

Textbooks

1. Sembulingam, Kirma, and PremaSembulingam. *Essentials of medical physiology*. JP Medical Ltd,2012.
2. Ashalatha, P. R., and G. Deepa. *Textbook of Anatomy & Physiology for Nurses*. JP Medical Ltd, 2012.

3. Chatterjee CC, Human Physiology, Volume I, 11th Edition, CBS Publishers, New Delhi,2016.
4. Sathya P and Devanand V, Textbook of Physiology, First edition, CBS Publishers and Distributers Pvt Ltd, New Delhi,2013

Reference books

1. Ganong, WF, Review of Medical Physiology,21st Edition, McGraw Hill Publishers, 20039.
2. Guyton AC & Hall JE,Textbook of Medical Physiology,10th Edition, Harcourt AsiaP. Ltd Singapore,2001
3. Subrahmanyam, Sarada, K. Madhavankutty, and H. D. Singh. *Textbook of human physiology*. S. Chand Publishing,1987.
4. Boron WF and Boulpaep EL, Medical Physiology, II edition, Saunders Elsevier,2009
5. MariebEN,Human Anatomy and Physiology, VI edition, Pearson edition,2004
6. Tortora. G&Grabowski, S.R. Principles of Anatomy & Physiology,10thEdition, John Wiley & Sons, USA,2003

Course Outcome

On successful completion of the course, the students will be able to gain knowledge about

CO	Course Outcomes	Knowledge Level
CO1	Cellular science and the human digestive system	K2
CO2	Respiratory functions and excretory system functions	K4
CO3	Immune system and role of the digestive system	K2
CO4	Endocrine and reproductive system	K1
CO5	Nervous system and sensory organs	K2

Mapping of COs with POs &PSOs :

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	M	S	S	S	M	S	M	S	S	M
CO2	M	S	M	S	S	S	M	S	M	S	S	M
CO3	M	S	M	S	S	S	M	S	M	S	S	M
CO4	M	S	M	S	S	S	M	S	M	S	S	M
CO5	M	S	M	S	S	S	M	S	M	S	S	M

Strongly Correlating (S)	3 Marks	Weakly Correlating (W)	1 Mark
Moderately Correlating (M)	2 Marks	No Correlating (N)	0 Mark

Course Code	P21FNT13	COMMUNITY NUTRITION	L	T	P	C
CORE -III			5	-	-	4
Cognitive Level	**K1:Recall K2:Understand K4:Analyze K5:Evaluate**					
Learning Objectives	**The course aims to** On successful completion of this course the student will be able to: 1. Understand the nutritional problems at the national and international levels. 2. Recognize the various organizations and their role in communalhealth development.					

UnitI Community nutrition:anoverview

Definition and key concepts – community, nutritional anthropology (community health) health situation in India, the concept of disease, causation (Agent, host, environmental factors) concept, control and prevention, modes of intervention.

UnitII NutritionalEpidemiology

Nutritional epidemiology: classification - Indirect methods - Demography, population dynamics, and vital events and their health implications, indicators of health, and nutrition (IMR, MMR).

Direct methods - Anthropometry, Biochemical, Clinical, Dietary and Functional indices of assessments.

UnitIII Elements ofHealthcare

Elements & principles of health care, SDG, Millennium Development Goal, five-year plan, health care delivery system (primary health care), pyramidal structure of health care service, agencies (Govt. and Private) in delivery health care services.

Unit-IV Communicable andNon-Communicabledisease

Communicable and non-communicable diseases (Epidemiology Prevalence Source of infection, Vaccination schedule, Preventive measures, diet therapy)

Communicable diseases: Typhoid, tuberculosis, cholera, chicken box, hepatitis, SARS, and covid-19.

Non-communicable diseases: Hypertension, CVD, cancer, renal disorders, liver disorders.

UnitVNational and International agencies forhealthcare

Nationalorganizations: ICAR, ICMR, SCWB, SSWB, NNMB, NIN, CFTRI, DFRL, NIPCCID, and NFI: InternationalOrganizations - WHO, FAO, UNICEF, World Bank, FFHC, WFP; Voluntary organizations – Global Alliance for Improved Nutrition (GAIN).

Textbooks

1. Swaminathan, M. "Use of food exchange lists in dietary calculations, Essentials of foodand nutrition, The Bangalore printing and Publishing co." *Ltd* 2 ,2007.
2. Sri lakshmi,B, Nutrition Science, New Age International (Pvt) Ltd, New Delhi, 4th edition2012.
3. Swaminathan,M. Advanced Textbook on Food Science and Nutrition, Vol:2, Second edition,

Reprinted, Bangalore Printing and Publishing Co Inc, Bangalore,2012.

Reference books

1. Bamji, M.S., Rao, P.N., Reddy, V (Eds): Textbook of Human Nutrition, Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi,2003.
2. Swaminathan M, Essentials of Food and Nutrition. An Advanced Textbook Vol. I, The Bangalore Printing and Publishing Co. Ltd, Bangalore,2007.
3. Park, K. "Park's textbook of preventive and social medicine." *Preventive Medicine in Obstet, Pediatrics' and Geriatrics*,2005.
4. Burgess, Ann. *Community nutrition: a handbook for health and development workers*. Edited by MarlouBijlsma, and Carina Ismael. Macmillan, 2009.

Journals:

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

Course Outcomes

On successful completion of the course, the students will be able to gain knowledge about

CO	Course Outcomes	Knowledge Level
CO1	Important nutrition problems and their prevention.	K1
CO2	Compare the nutritional needs for the disadvantaged and upper socio-economic strata in society.	K4
CO3	The causes/determinants and consequences of nutrition problems in society.	K5
CO4	The epidemiological issues of communicable and non-communicable diseases	K4
CO5	The various approaches to nutrition and health interventions, programs, and policies.	K2

Mapping of COs with POs &PSOs :

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	M	M	S	S	M	S	S	S	M	M
CO2	S	S	M	M	S	S	M	S	S	S	M	M
CO3	S	S	M	M	S	S	M	S	S	S	M	M
CO4	S	S	M	M	S	S	M	S	S	S	M	M
CO5	S	S	M	M	S	S	M	S	S	S	M	M

StronglyCorrelating(S) 3 Marks Weakly Correlating (W) 1 Mark

Moderately Correlating (M) 2 Marks No Correlation (N) 0 Mark

Course Code	P21FNT14	NUTRITION THROUGH LIFECYCLE	L	T	P	C
CORE -IV			5	-	-	4
Cognitive Level	K1:Recall K2:Understand K3:Apply					
Learning Objectives	The course aims to On successful completion of this course the student will be able to: 1. Know the role of diet in preventing the degenerative diseases 2. Acquire knowledge about the types ofdiet 3. Improve the lifestyle through proper dietplanning					

UnitI Nutritionalstatus overview

Nutritional status: malnutrition, undernutrition, overnutrition, factors associated with malnutrition, morbidity, and mortality. Global and national data on malnutrition.Nutritional status of different age groups, recommended dietary intake.

UnitII Nutritional in PregnancyandLactation

Stages of gestation, maternal weight gain, complications of pregnancy, nutritional problems and dietary management, the importance of nutrition during and before pregnancy, teenage pregnancy - nutritional problems, and dietary management.
Nutrition in Lactation: Physiology of lactation, hormonal control, and reflex action, the efficiency of milk production, problems of breastfeeding, the nutritional composition of breast milk, nutritional concerns during lactation, special foods during lactation, dietarymodification.

UnitIII Nutrition in Infancy, Pre-School andSchoolChildren

Infant feeding, nutritional needs, premature infant and their feeding, weaning foods.Feeding problems, infant formulae lactose intolerance.

Nutrition in Pre-school - Physiological development related to nutrition, feeding problems, behavioral characteristics, nutritional requirement.

Nutrition in school children - feeding school children and factors to be considered. Nutritional requirements, feeding problems, packed lunch.

UnitIV Nutrition in Adolescentsand Adults

- Physicalchanges
- Nutritionalrequirements
- Food behavior - food habits and dietarypractices.
- Nutritional problems.

UnitV GeriatricNutrition

- The aging process - Physiological, biochemical, and body compositionchanges.
- Socio-psychological aspects of ageing - Special problems of theelderly.
- Nutritional requirements of the elderly & dietary management to meet nutritionalneeds.

Text books

1. Srilakshmi B, Dietetics, sixth edition, New age Publishing Press, New Delhi,2011
2. Gopalan C., Ramanathan, P.V. Balasubramanian, S.C., Nutritive value of Indian foods, NIN, Hyderabad,2001.

Reference books

1. Sharma M, Textbook of Nutrition, 1st edition, CBS publishers & distributors PVT Ltd, New Delhi,2017.
2. Longvah T, Ananthan R, Bhaskar K, Venkaiah K, Indian Food Composition Tables,National Institute of Nutrition, 2017.
3. Abraham S, Nutrition Through Lifecycle, 1st edition, New age international publishers,New Delhi,2016.
4. Verma P, Food, Nutrition& Dietetics, 1st edition, CBS publishers & distributors PVTLtd, New Delhi,2015.
5. Edelstein S, Lifecycle Nutrition- An evidence-based approach, 2nd edition, Jones & Bartlett learning publications,2015.
6. Mahan LK, Stump SE and Raymond JL, Krause's Food and Nutrition Care Process, 13th Edition, Elsevier Saunders, Missouri,2012.
7. Stump SE, Nutrition and diagnosis related care, 7th edition, Lippincott, 2012.
8. Stacy N, William's Basic Nutrition and Diet Therapy, 12th edition, Elsevierpublications,UK, 2005.
9. Whitney EN and Rolfes SR, Understanding Nutrition, 9 th edition, West/Wordsworth,2002.
10. Garrow JS, James WPT, Ralph A, Human Nutrition and Dietetics 10th edition,Churchill Livingstone, NY,2000.
11. Groff JL, Gropper SS, Advanced Nutrition and Human Metabolism 3 rd edition, West / Wadsworth, UK.2000.

JOURNALS

1. International journal of food, nutrition and publichealth
2. Indian journal of nutrition anddietetics

Course Outcomes

On successful completion of the course, the students will be able to gain knowledge about

CO	Course Outcomes	Knowledge Level
CO1	The Vulnerable sections of society	K2
CO2	Nutrition in pregnancy and lactation needs	K3
CO3	Nutrition and growth and development during infancy, pre-school, and School-going children.	K2
CO4	The students with the multifaceted aspects of adolescents and adults	K3
CO5	The nutritional and health care of the elderly.	K1

Mapping of COs with POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	M	S	S	M	M	S	S	M	S	M
CO2	S	S	M	S	S	M	M	S	S	M	S	M
CO3	S	S	M	S	S	M	M	S	S	M	S	M
CO4	S	S	M	S	S	M	M	S	S	M	S	M
CO5	S	S	M	S	S	M	M	S	S	M	S	M

StronglyCorrelating(S) - 3Marks

ModeratelyCorrelating (M) - 2Marks

WeaklyCorrelating (W) - 1Mark

NoCorrelation (N) - 0Mark

Course Code	P21FNP11	PRACTICAL I ADVANCED FOOD SCIENCE PRACTICALS	L	T	P	C
CORE-V			-	-	6	4
Cognitive Level	K2:Understand K5:Evaluate K6:Create					
Learning Objectives	The course aims to 1. do various food evaluation methods for the determination of food constituents 2. understandthe processing conditions on physicochemical propertiesof food constituents during foodprocessing.					

1. **Food Evaluation**: -organoleptic evaluation with differentscales.
2. **Cereal cookery**–Dextrinization, caramelization, and gelatinization. Study the development of gluten, water holdingcapacity.
3. **Pulse cookery** - Effects of soaking, acid, alkali, and sprouting and different methods of cooking- on-cooking time and quality ofpulses.
4. **Fruits and vegetable cookery** - Effect of acid, alkali, and methods of cooking on pigments. Browning reactions in fruits andvegetables.
5. **Egg, meat, fish, poultry** – Egg foaming, egg coagulation, effect of temperature on egge coagulation, study of cooking time on different typesofmeat.
6. **Fats and oils** - Smoking point of different fats and oils, rancidityassessment.
7. **Sugar cookery** - Stages of sugar cookery, uses of sugar in Indian recipes. Crystallization and factors affectingcrystallization.
8. Milk cookery- effect of acid, salt, heat on milk proteins, fermentationtechniques.

Course Outcomes

On successful completion of the course, the students will be able to gain knowledge about

CO	Course Outcomes	Knowledge Level
CO1	Food evaluation techniques.	K5
CO2	Various cookery methods and their evaluation procedures in cereals, pulses, and vegetable cookery.	K5
CO3	The cooking principles on meat and poultry	K5
CO4	The smoking point of different fats and oils.	K2
CO5	Various sugar-based recipes food analytical techniques on sugar and milk cookery.	K6

Mapping of COs with POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	S	M	M	S	S	M	M	S	S
CO2	S	S	S	S	M	M	S	S	M	M	S	S
CO3	S	S	S	S	M	M	S	S	M	M	S	S
CO4	S	S	S	S	M	M	S	S	M	M	S	S
CO5	S	S	S	S	M	M	S	S	M	M	S	S

StronglyCorrelating(S) - 3Marks

ModeratelyCorrelating (M) - 2Marks

WeaklyCorrelating (W) - 1Mark

NoCorrelation (N) - 0Mark

Semester-II

Course Code	P21FNT21	ADVANCED NUTRITION- I	L	T	P	C
CORE-VI			4	-	-	4
Cognitive Level	**K1:Recall K2:Understand K5:Evaluate**					
Learning Objectives	**The course aims to** 1. the essential of nutrients in the growth and development of humans 2. the importance of nutrients in maintaining human health and leading an activelifestyle					

UnitI Humanenergyrequirements

Total energy expenditure-Basal Metabolic Rate, Physical activity, SDA

a. Components of energyrequirements.
b. Factors affecting energy expenditure and requirements: the thermal effect of food, energy expended in physicalactivity.

Methods of estimation of energy expenditure and requirements. Harris-Benedictequation
Energy excess and energy are deficient inbrief.

UnitII Carbohydrates

Classification (available and unavailable), sources, digestion, absorption, metabolic utilization functions, and regulation of blood glucose concentration.
Dietary fiber: Classification of dietary fiber, physiological effects, potential health benefits, recommended intake and sources.

UnitIII Proteins

a. Functions, classification, sources, RDA, Digestion, absorption, utilization andstorage,
b. Evaluation of proteinquality.
c. Essential and non-essential amino acids, Amino acid balance, imbalance, andtoxicity.

UnitIV Lipids

- Functions, classification, sources,RDA
-Digestion, absorption, utilization, and storage.
- Transport and storage of fats in thebody.
- Lipoproteins.

UnitV Water

Water: composition of body fluids extra- and intra- cellular fluid; Physiological functions; water balance and its regulation; Requirement and the sources; Nutritional and health problems due to deficiency or excess of water intake.

Text books

1. Krause, M. V and Hunsher, M. A, Food, Nutrition and Diet Therapy, 11th edition, W.B. Saunders company, Philadelphia, London,2007.
2.Advanced Nutrition: Macronutrients, Micronutrients, and Metabolism Carolyn D. Berdanier (Author), Lynnette A. Berdanier, Janos Zempleni Edition: 12008.
3. Recommended dietary allowances, ICMR, National Institute of Nutrition, Hyderabad,2010.

Reference books

1. Swaminathan. Advanced Textbook on Food Science and Nutrition, Vol:2, Second edition, Reprinted, Bangalore Printing and Publishing Co Inc, Bangalore,2012.
2. Sri Lakshmi, Nutrition Science, New Age International (Pvt) Ltd, New Delhi, 4th edition2012.
3. Maurice Edward Shils, Moshe. Shike Modern Nutrition in Health and Diseases 10th edition 2006.
4. Wahlqvist, Mark L. "The new nutrition science: sustainability and development." *Public Health Nutrition* 8, no. 6a (2005):766-772.

Journals:

1. Annual Reports, National Institute of Nutrition,Hyderabad.
2. Indian Journal of Medical Research, Indian Council of Medical Research, NewDelhi.
3. Proceedings of the Nutrition Society of India, Nutrition Society of India,Hyderabad.
4. The Indian Journal of Nutrition and Dietetics, Sri Avinashilingam Education Trust Institutions for Women,Coimbatore.

Course Outcomes

On successful completion of the course, the students will be able to gain knowledge about

CO	Course Outcome	Knowledge Level
CO1	The methods to determine body composition	K2
CO2	The current trends in the area of human nutrition requirements the methods of determining nutrient requirements and current figures of nutritional requirements.	K1
CO3	Advances in the field of energy, carbohydrate, lipid, and protein nutrition.	K2
CO4	Facts on nutrients and their requirements.	K5
CO5	Functional foods and their applications	K2

Mapping of COs with POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	M	M	S	S	M	S	S	M	S	M
CO2	S	S	M	M	S	S	M	S	S	M	S	M
CO3	S	S	M	M	S	S	M	S	S	M	S	M
CO4	S	S	M	M	S	S	M	S	S	M	S	M
CO5	S	S	M	M	S	S	M	S	S	M	S	M

Strongly Correlating (S) 3 Marks Weakly Correlating (W) 1 Mark

Moderately Correlating (M) 2 Marks No Correlation (N) 0 Mark

Course Code	P21FNT22	NUTRITIONAL BIOCHEMISTRY	L	T	P	C
CORE-VII			4	-	-	4
Cognitive Level	**K1:Recall K2:Understand K5:Evaluate**					
Learning Objectives	**The course aims to** On successful completing of this course the student will be able to: 1. Understand the biochemical basis for nutrition andhealth 2. Understand the mechanisms adopted by the human body for the regulation of metabolicpathways. 3. Get an insight into interrelationships between various metabolicpathways.					

UnitI Metabolismof carbohydrate

Introduction, Classification.Structure and Properties of monosaccharides (hexoses and pentoses). Oligosaccharides – Sucrose, maltose, lactose, isomaltose, cellulose. Homopolysaccharides - Structures of storage polysaccharides (starch and glycogen). Heteropolysaccharides – Structures of Hyaluronic acid, Heparin, and Chondroitin sulfate.

Glycolysis, Gluconeogenesis, TCA cycle, HMP shunt, bioenergetics, disorders of carbohydrate metabolism - galactosemia, glycogen storage disease, pentosuria, abnormal level in blood glucose.

Unit-II Protein andaminoacidmetabolism

Structure and classification of amino acids.

Biosynthesis of protein, general catabolism of amino acids, deamination, transamination, urea cycle, disorders of amino acid metabolism - phenylketonuria, cystinuria, albinism, alkaptonuria, and maplesyrupdisease.

Unit-III BiologicalOxidation

Enzymes and co-enzymes involved in oxidation and reduction, respiratory chain, phosphates in biologic oxidation and energy capture, the role of the respiratory chain, and mechanism ofphosphorylation.

Unit-IV Metabolism ofnucleicacids

Structure of DNA, Structure of RNA, Replication, Biosynthesis of purine and pyrimidine nucleotides, Disorders of purine and pyrimidine metabolism: hyperuricemia, gout, neurological problems, developmental disorders: causes, symptoms, risk factors, complications and preventive measures.

Unit-V Metabolismoflipids

Biosynthesis and oxidation of saturated and unsaturated fatty acids, glycerides, phospholipids and cholesterol, bioenergetics, disorders of lipid metabolism (fatty liver, atherosclerosis), lipoproteins and their significance.

Text books

1. Ramadevi K, Ed: AmbikaShanmugam Fundamentals of biochemistry for medical students, 8th edition, Wolters Kluwer Health, India,2016
2. Rodwell V, Bender D, Botham KM, Kennelly PJ, Weil PA, Harper's IllustratedBiochemistry, 30th Edition, McGraw hill Education, 2015

Reference books

1. Sulochana H, Principles of Biochemistry, PBS enterprises, Chennai,2010.
2. Cox MM and Nelson DL, Leininger Principles of biochemistry, 5th edition, EH Freman&Company, New York,2008.
3. Vasudevan DM, Sreekumari S, Textbook of Biochemistry, 5th edition, Jaypee Publishers, New Delhi,2007.
4. Veera Kumari L, Biochemistry, 1st edition, MJP Publishers, 2005.
5. Murray RK, Granner DK, Mayes PA, Rodwell VW, Harper's IllustratedBiochemistry,26th edition, Mcgraw hill publishing house,2003.

Journals

1. International journal of ClinicalNutrition
2. Indian Journal of medicalBiochemistry

Course Outcomes

On successful completion of the course, the students will be able to gain knowledge about

CO	Course Outcome	Knowledge Level
CO1	The concepts and chemistry of biological oxidation	K1
CO2	The concepts of macronutrient metabolism	K2
CO3	The metabolism of lipids	K5
CO4	The concepts of protein and amino acid metabolism	K2
CO5	The role of nucleic acids in metabolism	K2

Mapping of COs with POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	S	S	M	M	S	S	S	M	M
CO2	S	S	S	S	S	M	M	S	S	S	M	M
CO3	S	S	S	S	S	M	M	S	S	S	M	M
CO4	S	S	S	S	S	M	M	S	S	S	M	M
CO5	S	S	S	S	S	M	M	S	S	S	M	M

Strongly Correlating (S) 3 Marks Weakly Correlating (W) 1 Mark

Moderately Correlating (M) 2 Marks No Correlation (N) 0 Mark

Course Code	P21FNT23	FOOD PRODUCT DEVELOPMENT	L	T	P	C
CORE-VIII			4	-	-	4
Cognitive Level	**K2:Understand K3: Apply K4Analyze**					
Learning Objectives	The course aims to ➢ To understand various aspects of the development of a foodproduct ➢ Standardize and generate the process flow chart for a new foodproduct ➢ To acquire knowledge on the importance of Consumer Research, Finance andCommunication					

UnitI Food consumptionpattern

Trends in Food Consumption pattern.Economical, Psychological and Sociological Dimensions of Food Consumption patterns.Trends in Social Change as a Base for New Product Development. Food product development in India, advantages of new food product development and its new trends.

UnitII Introduction to Food Processing and Product Development

Food Components, Types of Food Processing, Status of Food Processing Industry in India and Scope of Growth in Future Principles and Purpose of New Product Development, Product Design, and Specifications.

UnitIII RecipeDevelopment

Traditional Foods, Weaning Foods, Convenience Foods, RTE, RTS, Extruded foods, IMF Foods, Specialty Products, Health foods, Nutritional Supplements, Functional Foods, Nutraceuticals, and Designer Foods, Sports Foods, Foods for Defense Services, Space foods. Different food products and its significance.

UnitIV Testing, Evaluation, and PackagingofProducts

Standardization, Portion size, Portion Control, Quantity Cooking, Shelf-Life Evaluation-Sensory and Microbial Testing of Processed Foods, Nutrient Analysis. Suitable Packaging Materials for Different Foods, SWOT Analysis, cost calculation and its importance, nutrient calculation.

UnitV Financial Management and Marketing ofFoodProducts

Institutional Support (Training and Finance) for Entrepreneurship Development. Financial Institutions (Central and State Government) banks/Funding Agencies, Financial Accounting Procedures, Book Keeping, Market Research, Marketing Strategies, Cost Calculation, Advertising Methods, Product sales, Product License, Legal specifications, Consumer Behaviour and Food Acceptance.

Text books

1. Smith, Jim, and Edward Charter, eds. "Functional food product development."(2011).
2. Sankaranarayanan, A., N. Amaresan, and DharumaduraiDhanasekaran, eds. *Fermented food products*. CRC Press,2019.

3. Fuller, Gordon W. *New food product development: from concept to marketplace*. CRC Press, 2016.
4. Vijaya Khader "Textbook of Food Science and Technology", Indian Council of Agricultural Research,2013.

Reference books

1.Jacqueline H. Beckley, M. Michele Foley Elizabeth J. Topp&_J. C. Huang WitoonPrinyawiwatkul, Accelerating New Food Product Design and Development. Blackwell Publishing Company. IFT Press. USA,2007.

2.Howard R. Moskowitz, I. Sam Saguy& Tim Straus (2009). An Integrated Approach to New Food Product Development. Taylor and Francis Group, LLC.USA,2009.

3.Mary Earle and Richard Earle, Case studies in food product development Wood head Publishing Limited and CRC Press LLC.USA, 2008.

Journals

- International journal food science andtechnology
- International journal of foodscience

COURSE OUTCOMES

On successful completion of the course, the students will be able to gain knowledge about

CO	Course Outcome	Knowledge Level
CO1	The Food needs & consumer preference for new food product	K2
CO2	The design thinking process to develop a concept for a new food product	K3
CO3	The knowledge of standardization for large-scale production.	K4
CO4	The Quality, safety & regulatory aspects ofdeveloped products.	K2
CO5	Marketing and Entrepreneurship awareness.	K3

Mapping of COs with POs & PSOs:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	M	M	S	M	M	M	S	M	S	M
CO2	S	S	M	M	S	M	M	M	S	M	S	M
CO3	S	S	M	M	S	M	M	M	S	M	S	M
CO4	S	S	M	M	S	M	M	M	S	M	S	M
CO5	S	S	M	M	S	M	M	M	S	M	S	M

Strongly Correlating (S) -3 Marks
Moderately Correlating (M) -2 Marks
Weakly Correlating (W) -1 Mark
No Correlation (N) -0 Mark

Course Code	P21FNP22	NUTRITIONAL BIOCHEMISTRY PRACTICAL	L	T	P	C
CORE-IX			-	-	6	4
Cognitive Level	**K2:Understand K4: Analyze K5:Evaluate**					
Learning Objectives	**The course aims to** On successful completion of this course the student will be able to: 1. To develop a skill in handling equipment for blood and urineanalysis 2. to obtain skill in blood analysis and urineanalysis 3. to understand the disease conditions based on the blood and urine analysisreports					

I BloodAnalysis

Methods of collection of blood.Separation of serum and plasma Estimation ofHeamoglobin.
Estimation of glucose
Estimation of serum creatinine
Estimation of serum bilirubin
Estimation of serum albumin
Estimation of serum cholesterol
Estimation of SGPT /SGOT

II UrineAnalysis

Qualitative analysis of urine sugar, albumin, ketone bodies, and bile salts
Estimation of Urine sugar
Estimation of Urine Albumin
Estimation of Urine Bile salts
Estimation of Urine Creatinine
Estimation of urine urea.

References

1. Nielson S, Food Analysis Laboratory Manual, 3rd edition, Springer International Publishing, 2017.
2. Cheung PCK and Mehta BM (Eds), Handbook of Food chemistry, 1st edition, SpringerVerlag Berlin Heidelberg,2015
3. Cappuccino J, Sherman, N, Microbiology: A Laboratory Manual, 10th edition, Pearson,201364
4. Garg N and Garg KL, Laboratory Manual of Food Microbiology, 1st edition, KG Mukerji Publishers,2010
5. James CS, Analytical chemistry of Foods, 1st edition Springer US,1995

JOURNALS

1. Journal of clinicalnutrition
2. Journal of microbiology

Course Outcomes

On successful completion of the course, the students will be able to gain knowledge about

CO	Course Outcome	Knowledge Level
CO1	The concepts and clinical biochemistry	K2
CO2	The concepts of biochemical assessment	K2
CO3	The blood profile and its clinical significance	K4
CO4	The urine analysis to find its clinical significance	K4
CO5	The interpretation of the disease based on the blood and urine analysis report	K5

Mapping of COs with POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	M	M	S	S	M	S	S	S	M	S
CO2	S	S	M	M	S	S	M	S	S	S	M	S
CO3	S	S	M	M	S	S	M	S	S	S	M	S
CO4	S	S	M	M	S	S	M	S	S	S	M	S
CO5	S	S	M	M	S	S	M	S	S	S	M	S

StronglyCorrelating(S) - 3Marks

ModeratelyCorrelating (M) - 2Marks

WeaklyCorrelating (W) - 1Mark

NoCorrelation (N) - 0Mark

Course Code	P21FNP23	FOOD PRODUCT DEVELOPMENT PRACTICAL	L	T	P	C
CORE-X			-	-	6	4
Cognitive Level	K3:Apply K4 Analyze K6 Evaluate					
Learning Objectives	The course aims to ➢ To acquire skills in food productdevelopment ➢ To analyze the process of optimizing food productdevelopment ➢ To assess the food product-based analysis formarketing					

A. Product Development andStandardization

1. Cereal and Pulse BasedFoods
2 Fruit Juices, Squash, Jams, andPreserves
3 Pickles, Ketchup,Sauce
4 WeaningFoods
5 Health Foods and NutritionalSupplements
6 Convenience foods, RTS, and RTEfoods
7. Healthy Bakeryfoods

B. Marketing of a Food Product

1. Selection of a Product, Preparation, Standardization, and QuantityCooking
2. Selection of Packaging Material, Labeling, Cost Calculation, andMarketing
3. Presentation ofReport

References

1. Pomeranz, Yeshajahu, ed. *Food analysis: theory and practice*. Springer Science & Business Media,2013.
2. Nollet, Leo ML, and Fidel Toldrá, eds. *Food analysis by HPLC*. CRC press,2012.
Hart, Frank L., and Harry J. Fisher.*Modern food analysis*.Springer Science & Business Media, 2012.
3. Fuller, Gordon W. *New food product development: from concept to marketplace*. CRC Press, 2016.
4. Smith, Jim, and Edward Charter, eds. "Functional food product development."2011.

Course outcomes

On successful completion of the course, the students will be able to gain knowledge about

CO	Course Outcome	Knowledge Level
CO1	New food product preparation	K2
CO2	Food product marketing skill	K2
CO3	Food analysis methods	K4
CO4	Food adulteration techniques	K4
CO5	The marketing strategies on food product Marketing	K5

Mapping of COs with POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	M	M	S	S	M	S	S	S	M	S
CO2	S	S	M	M	S	S	M	S	S	S	M	S
CO3	S	S	M	M	S	S	M	S	S	S	M	S
CO4	S	S	M	M	S	S	M	S	S	S	M	S
CO5	S	S	M	M	S	S	M	S	S	S	M	S

StronglyCorrelating(S) - 3Marks

ModeratelyCorrelating(M) - 2Marks

WeaklyCorrelating (W) - 1Mark

NoCorrelation (N) - 0Mark

Course Code	P21FNS22	PUBLIC HEALTH NUTRITION PRACTICAL	L	T	P	C
SUPPORTIVE SKILL COURSE-II			-	-	2	2
Cognitive Level	K2:Understand K3: Apply K5: Evaluate K6:Create					
Learning Objectives	The Course aims to On successful completion of this course the student will be able to: 1. To make the communication process with small and largegroups 2. To create awareness among people with Mass media andadvertisement. 3. To develop the tools for nutritioneducation					

UnitI Nutritional Assessment: Anthropometrical and biochemical

Assessment of Nutritional Status,Dietary surveys, anthropometry and body composition, biochemical and clinical methods. Anthropometric assessment: IBW, BMI, kanwati index, Gomez classification, fat free mass measurements, WHR, skin fold measurements. etc. Biochemical assessment: Blood analysis and hemogram, clinical assessment for deficiency diseases. Albumin, prealbumin, CRP, transferrin, hemoglobin, urea and creatine, lymphocytes and point deficiencies.

UnitII Assessment: clinicalanddietary

Clinical assessment for nutritional deficiency diseases, Dietary assessment:24-hour dietary recall, food frequency, 3-day dietary recall. Stress scale (Standard), personality test (MMPI), cognition tests. Standardization of tools and techniques,

UnitIII Development of low-costrecipes

Development of low-cost recipes: recipe design, standardization, cost calculation. Development of recipes for needed communities: infants, preschoolers, elementary school children, adolescents, pregnant and lactating mothers. The sensory analysis of developed recipes with rating scales.

UnitIV Fieldvisit

Field visits to ongoing national nutrition programs: Integrated Child Development Services, Mid-day meal program, Iron folic acid supplementation, deworming, maternal and child welfare programs, vaccination centers, primary health centre, nutrient ball supplementation.

UnitV Weaning food

Importance of weaning foods, rules and regulations for weaning foods, specific regulating conditions applicable for baby foods and foods for immune competence. Formulation of different weaning foods: nutrient calculation, sensory analysis and cost calculation.

Text books

1. ChanderVir S, Public Health Nutrition in developing countries, Part I, 1st edition, Woodhead Publishing, New Delhi,2011.
2. Park K, Park's Textbook of preventive medicine, 2005. 3. Bamji, Textbook of Human Nutrition, Oxford publishers, New Delhi,2010

Reference books

1. ChanderVir S, Public Health Nutrition in developing countries, Part II, 1st edition, Woodhead Publishing, New Delhi,2011
2.Gopalan C., Ramanathan, P.V. Balasubramanian, S.C., Nutritive value of Indian foods, NIN, Hyderabad,2010.
3. Bhatt VB, Protein Energy Malnutrition, PeePublishers, New Delhi,2008
4. Sharma N, Child Nutrition, 1st edition, Murarilal& sons, New Delhi,2006
5. Gupte S, Textbook of Pediatric Nutrition, Pawaninder P Vij Publishers, New Delhi,2006.

Course Outcomes

On successful completion of the course, the students will be able to gain knowledge about

CO	Course Outcome	Knowledge Level
CO1	Plan and prepare low-cost nutritious dishes/menus for vulnerable groups.	K3
CO2	Preparation of communication aids and planning nutrition education programs for the community.	K6
CO3	The ongoing national nutrition programs	K2
CO4	Basic community-based survey and nutrition education.	K5
CO5	Specific foods and their food regulations	K2

Mapping of COs with POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	M	S	S	M	S	S	S	S	M
CO2	S	S	S	M	S	S	M	S	S	S	S	M
CO3	S	S	S	M	S	S	M	S	S	S	S	M
CO4	S	S	S	M	S	S	M	S	S	S	S	M
CO5	S	S	S	M	S	S	M	S	S	S	S	M

StronglyCorrelating(S) - 3Marks

ModeratelyCorrelating (M) - 2Marks

WeaklyCorrelating (W) - 1Mark

NoCorrelation (N) - 0Mark

Semester-III

Course Code	P21FNT31	RESEARCH METHODS AND STATISTICS	L	T	P	C
CORE XI			5	-	-	4
Cognitive Level	**K2:Understand K3: Apply K4Analyze**					
Learning Objectives	The course aims to ➢ Learn some basic concepts of research and itstypes ➢ Know the different statisticalanalyses. ➢ Understand different types ofresearch ➢ Study scientific investigation to solve the problem, test hypotheses, develop or invent newproducts. ➢ Gain knowledge on the research process and reportpreparation					

UnitI Research methodology:anoverview

Research: definition, the process of research, objectives of the research, and characteristics of research. Identifying the research problem, sources of the research problem, Basic components of researchdesign.

Types of research: fundamental/ basic research, applied research, action research, descriptive research, exploratory research, case studies, experimental research.
Review of literature: meaning, sources of literature review, the importance of literature collection.

UnitII Data and methodsofsampling

Primary and secondary data: Methods of data collection: Interview schedule, questionaries, observation, experimentation, Pre-testing, and pilot study
Methods of sampling- probability and non-probability, Hypothesis- meaning and types of hypothesis.

UnitIII Data analysis:Descriptivemeasures

The measure of central tendency: Mean, Median, Mode and their uses with applications
The measure of Dispersion: significance and methods used in studying dispersion and their uses with applications, standard deviation: uses and applications. Tables, figures and charts: formulation, interpretation and application.

UnitIV Probability and testofsignificance

Co-efficient of correlation, rank correlation, basic concepts in regression, Student- "t" test, chi-square: use and application of t test and chi square. Analysis of variance- one way and two-way classification- characteristics of ANOVA.
Computer-assisted data coding and analysis: Statistical Package for Social Sciences (SPSS)

UnitV Concept of theresearchreport

Research reports- basic concepts of the research report

a. Preliminaries- title page, acknowledgment, list of tables, list of figures,index.
b. Main text.

c. Data analysis: Classification- qualitative, Quantitative- frequency distribution, discrete and continuousTabulationofdata-partsofatable,preparationofblanktablesDiagrammatic–One-dimensional diagrams, two-dimensional diagrams, pictogram, and cartography Graphical- Frequency graphs- line, polygon, curve,histogram
d. Bibliography, glossary,appendices.

Textbooks

1. Kothari, Chakravanti Rajagopalachari. *Research methodology: Methods and techniques*. New Age International,2004.
2. Singh, Yogesh Kumar. *Fundamental of research methodology and statistics*. New Age International,2006.
3. Goddard, Wayne, and Stuart Melville. *Research methodology: An introduction*. Juta and Company Ltd,2004.
4. McNeill, Patrick. *Research methods*. Routledge,2006.
5. Bhandarkar, P. L., T. S. Wilkinson, and D. K. Laldas. "Methodology & Techniques of Social Research Himalaya Publishing House."(2000).
6. Corbetta, Piergiorgio. *Social research: Theory, methods and techniques*. Sage,2003.
7. Chiang, Chin Long. *Statistical methods of analysis*. World Scientific,2003.

Course outcomes

On successful completion of the course, the students will be able to gain knowledge about

CO	Course Outcome	Knowledge Level
CO1	Research design and concepts	K2
CO 2	Application of Statistics in research	K3
CO 3	Analyzing the process of developing a Research Plan.	K4
CO 4	Research process and report preparation	K2
C05	Efficient usage of different statistical tools and interpretation of data	K3

Mapping of COs with POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	M	M	S	M	M	M	S	M	S	M
CO2	M	S	M	M	S	M	M	M	S	M	S	M
CO3	M	S	M	M	S	M	M	M	S	M	S	M
CO4	M	S	M	M	S	M	M	M	S	M	S	M
CO5	M	S	M	M	S	M	M	M	S	M	S	M

Strongly Correlating (S)	3 Marks	Weakly Correlating (W)	1 Mark
Moderately Correlating (M)	2 Marks	No Correlation (N)	0 Mark

Course Code	P21FNT32	FOOD MICROBIOLOGY	L	T	P	C
CORE XII			5	-	-	4
Cognitive Level	**K1:Recall K2:Understand K4:Analyze**					
Learning Objectives	**The course aims to** On successful completion of this course the student will be able to: 1. Clarify the communications between microorganisms and the food environment. 2. Illustrate the characteristics of food borne, waterborne, and spoilage microorganisms. 3. Effects of fermentation in food production and how it influences the microbiological quality and status of the foodproduct.					

UnitI Food microbiologyinReview

Food microbiology in Review- Morphology, and Taxonomy of microorganisms. Different types of microorganisms in food, factors affecting microbial growth. Methods of Isolation and identification of Microorganisms or their products in food.
-ELISA
-PCR (Polymer chain reactions)

UnitII Spoilageandcontamination

Spoilage and contamination of common foods**:** causes and types of microorganisms responsible for spoilage and the contamination of common foods. Cereal and cereal products.Fruits and vegetables.Egg, meat, poultry, sea foods, milk, and milk products.
Role of microorganisms in putrefaction and decay and fermentation-part played by microorganisms in putrefaction and decay.Fermentation, types- aerobic respiration and anaerobic respiration.

UnitIII Destruction of bacteria, food poisoning, and food borne diseases

Salmonella food poisoning, staphylococcus food poisoning, botulism, clostridium, shigellosis.Food borne diseases- bacterial- staphylococcus, streptococcus. Diphtheria, scarlet fever, tuberculosis, hepatitis. Measures to prevent food poisoning and food-borne disease: sterilization- application of dry and moist heat, use of filters. Disinfection- methods of disinfection- natural, physical andchemical.

UnitIV Foodsanitation

Food Sanitation- microbiology in food plant sanitation, bacteriology of water, sewage, and waste treatment and disposal.Microbiology of the food product.Indicators of food safety and quality- microbiological criteria of foods and their significance. Food sanitation principles, rules and regulations in food service industries,home.

UNIT-V Productsoffermentation

Products of fermentation: yeast, yogurt, cheese, meat, beer, vinegar, fruits, and vegetables.cereal-based fermented products-idli, dhokla, bread, the concept of probiotics, prebiotics, and symbiotics. Commercial fermented foods and its beneficial effects, genetically modified foods: merits anddemerits.

Text books

1. Adams M. R and Moss M. O, Food Microbiology, New Age International (P) Ltd., New Delhi, 2005.
2. Frazier C and Denis, W.C, Food Microbiology, 4th edition, Tata McGraw Hill publishing Company. New Delhi,2006.
3. Vijaya Ramesh, K. Food Microbiology, MJP Publishers, Chennai ,2007
4. James G.Cappuccino and Natalie Sherman, Microbiology – A Laboratory Manual, Pearson Education Publishers, USA,2008.
5. James M. Jay Modern Food Microbiology, Fourth edition, CBS Publishers and Distributors, New Delhi,2005.
6. Adam Tamine, Probiotic Dairy products, Blackwell Publishing, USA,2005.
7. Curricula On Food Safety, Directorate of General of health Services, Ministry of health &family Welfare, Govt of India, New Delhi,2003.
8. Purohit, S.S Microbiology – Fundamentals & applications, 6 th Edition, Agro bices Indiana, 2002.

Reference Books

1. Parija SC, Textbook of Microbiology & Immunology, 2nd Edition, Elsevier India,2012.
2. AnandanarayananR and Panicker CK, Textbook of Microbiology, Seventh edition, University Press, Hyderabad,2009.
3. Ramesh VK, Food Microbiology, MJP Publishers,2007.
4. Dubey RC, Maheswar DK, A Textbook of Microbiology, 1st edition, S. Chand & Co Ltd Publications,2005.

Course Outcomes

On successful completion of the course, the students will be able to gain knowledge about

CO	Course Outcome	Knowledge Level
CO1	general characteristics of micro-organisms and their role in food spoilage.	K1
CO2	microorganisms in health and diseases.	K2
CO3	codex principles in food labeling and packaging.	K4
CO4	the impact of microbes in the food processing industry.	K2
CO5	food fermentation and genetically modified foods	K2

Mapping of COs with POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	S	S	M	S	S	M	M	S	S
CO2	S	S	S	S	S	M	S	S	M	M	S	S
CO3	S	S	S	S	S	M	S	S	M	M	S	S
CO4	S	S	S	S	S	M	S	S	M	M	S	S
CO5	S	S	S	S	S	M	S	S	M	M	S	S

Strongly Correlating (S) 3 Marks
Moderately Correlating (M) 2 Marks
Weakly Correlating (W) 1 Mark
No Correlation (N) 0 Mark

Course Code	P21FNT33	ADVANCED DIETETICS	L	T	P	C
CORE XIII			4	-	-	4
Cognitive Level	**K2:Understand K4: Analyze K6:Create**					
Learning Objectives	**The course aims to** 1. to intervene in the metabolic anomalies of acute and chronicdiseases. 2. to plan a menu for various diseases based on their nutritional status and dietaryneeds.					

UnitI Techniquesoffeeding

Techniques of feeding:Principle of Nutritional care, recent advances, and techniques in feeding substrates. Types of hospital diets.Nutrition Support Techniques, Enteral feeding - indications, Types - Nasogastric, Gastrostomy, and jejunostomy - requirements and advantages. Parenteral feeding - Nutritional Support, Formula feeds, and Complications in TPN.
Diet in Trauma and surgical conditions- Stress response, physiological response to surgery, pre- and post-operative nutritional care, Burns-complications, nutritional requirement, and dietary management.

UnitII Nutritional Management inEnergyImbalance

Nutritional Management in Energy Imbalance - Underweight and obesity, Etiology and dietary management.
Diabetes mellitus: etiology, classification, metabolism, factors affecting normal blood sugar levels, diagnosis, signs and symptoms, types of insulin, glycemic index, oral hypoglycemic drugs, complications, and prevention of diabetes.

UnitIII Nutritional Management of GI tract Diseases and Disorders

Nutritional Management of GI tract Diseases and Disorders:Disorders, Etiology, Symptoms and dietary management of Acute gastritis, Chronic gastritis, Peptic ulcer - duodenal & gastric Intestinal disease - Flatulence, Diarrhea and Dysentery, Constipation, Celiac disease, Tropical sprue, irritable bowel syndrome, diverticular disease, colon cancer, Ulcerativecolitis.
Nutritional management of Liver, gall-bladder, and pancreatic disorders: Liver disease - Hepatitis, cirrhosis, Jaundice, fatty liver, cholecystitis cholelithiasis, Hepatic coma gall stones, and Pancreatitis.

UnitIVNutritional management in cardiovasculardiseasesand hypertension

Nutritional management in cardiovascular diseases and hypertension - prevalence, etiology-Dyslipidemia, atherosclerosis, angina pectoris, myocardial infarction, Ischemic heart disease, Prevention of CVD.
Hypertension - Classification, prevalence, Diet related factors influencing hypertension, Management of hypertension.
Nutritional Management of Cancer and AIDS - the role of diet, metabolic effects, and nutritional effects.

UnitV Renal diseases anddruginteraction

Diseases of the Kidney - Etiology, Symptoms and Dietary modification, Nephritis, Nephrosis, Acute, and chronic renal failure, End-Stage Renal Disease (ESRD), Renal calculi. Transplantation and dialysis, Dietary Modification.
Diet andDrugInteraction: effects of drugs on food and nutrient intake – ingestion, digestion, absorption, metabolism, andrequirements.

Text books

1. Robinson, Corinne Hogden, and Marilyn R. Lawler. *Normal and therapeutic nutrition*. No.Ed. 16. Collier Macmillan Publishers, 1982.
2. Dietary Guidelines of Indians- A Manual, National Institute of Nutrition, Hyderabad,2006.
3. Srilakshmi B, Dietetics, sixth edition, New age Publishing Press, New Delhi,2011
4. Stacy N, William's Basic Nutrition and Diet Therapy, 12th edition, Elsevier publications, UK, 2005.
5. Elia M, Ljunggvist O, Stratton RJ, Lanham SA, Clinical Nutrition (The Nutrition Society Textbook), 2nd edition, Wiley Blackwell Publishers,2013.
6. Mahan LK, Stump SE and Raymond JL, Krause's Food and Nutrition Care Process, 13th Edition, Elsevier Saunders, Missouri,2012.
7. Stump SE, Nutrition and diagnosis related care, 7th edition, Lippincott Williams and Wilkins, Canada,2012.

Reference books

1. Gopalan C., Ramanathan, P.V. Balasubramanian, S.C., Nutritive value of Indian foods, NIN, Hyderabad,2010
2. Marian M et al., Clinical Nutrition for surgical patients, Jones and Bartlett Publishers,Canada, 2008
3. Joshi Y.K, Basics of Clinical Nutrition, 2nd edition, JP Medical Publishers Pvt Ltd, New Delhi, 2008
4. Stacy N, William's Basic Nutrition and Diet Therapy, 12th edition, Elsevier publications, UK, 2005
5. Gibney MJ, Elia M, Ljunggvist O, Clinical Nutrition (The Nutrition Society Textbook) Wiley Blackwell Publishers,2005
6. Whitney EN and Rolfes SR, Understanding Nutrition, 9 th edition, West/Wordsworth,2002
7. Guthrie H, Introductory Nutrition, CV Mosby Co.St. Louis,2002
8. Williams SR, Nutrition & Diet Therapy, CV. Mosby St. Louis,2001
9. Garrow et al, Human Nutrition & Dietetics, 10th Edition, Churchill Livingston,2001

Journals:

1. Journal of American DieteticAssociation.
2. The American Journal of ClinicalNutrition
3. The Indian Journal of Nutrition and Dietetics,
4. Journal of ClinicalNutrition
5. Food and NutritionBulletin

Course Outcomes

On successful completion of the course, the students will be able to gain knowledge about

CO	Course Outcome	Knowledge Level
CO1	the etiology, physiology, and metabolic anomalies of acute and chronic diseases and patient needs.	K2
CO2	the effect of the various diseases on nutritional and dietary requirements.	K4
CO3	nutritional care for the prevention and treatment of gastrointestinal diseases	K6
CO4	nutritional management in cardiovascular diseases and hypertension	K2
CO5	renal diseases and drug and nutrient interactions.	K2

Mapping of COs with POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	S	M	S	M	S	S	S	S	M
CO2	S	S	S	S	M	S	M	S	S	S	S	M
CO3	S	S	S	S	M	S	M	S	S	S	S	M
CO4	S	S	S	S	M	S	M	S	S	S	S	M
CO5	S	S	S	S	M	S	M	S	S	S	S	M

StronglyCorrelating(S) - 3Marks

ModeratelyCorrelating (M) - 2Marks

WeaklyCorrelating (W) - 1Mark

NoCorrelation (N) - 0Mark

Course Code	P21FNT34	SPORTS NUTRITION	L	T	P	C
CORE XIV			4	-	-	4
Cognitive Level	**K2:Understand K3: Apply K4Analyze**					
Learning Objectives	The course aims to ➢ study about the role and importance of nutrition management in sports performance. ➢ understand the components of fitness andwellbeing.					

UnitI SportsNutritionoverview

Need and scope of sports nutrition; Nutrition management during sports; Guidelines for sports person, allowances of nutrition for sports by NIN, Pre-competition, during competition and post-competition meal for sports, importance, the Nutrient requirement in athletes, dietary supplements for athletes; Ergogenic aids in sports.

UnitII Nutrition andfitness

Nutrition in fitness – definition, fitness and its measurements, measurement of body composition, methods of measuring energy expenditure, sources of energy, Energy balance, Body mass and composition, Fuel needs for training and recovery, weight loss energycalculation.

UnitIII Nutrient roles inweightmanagement

Concept of carbohydrate loading and the methods of carbohydrate loading; carbohydrate needs in before, during, and after exercise. Protein needs of athletes: dietary sources of protein - proteins found in dietary supplements - protein supplementation during training (egg protein, soy protein, milk protein, whey protein, bovine colostrum).

UnitIV Sports andelectrolytebalance

Dehydration & Performance: Assessing Fluid loss - Proper Pre-Hydration, Rehydration / fluid replacement - Electrolytes - Role of electrolytes in Muscular contraction- Electrolyte loss & exercise - Maintaining / Restoring electrolyte Balance - Sports & Energy drinks. Vitamins, minerals, and anti-oxidants fortraining.

UnitV Nutritional needs indifferentconditions

Nutritional concern of athletes in specific groups (young athletes, female athletes, power and sprint sports, endurance sports, team sports, weight-conscious sports, traveling athletes, Olympic and elite athletes, vegetarian athletes physically disabled athletes, athletes with chronic medical conditions, athletes with an eating disorder), Environment challenges for athletes, Cultural and regional issues nutritional and performance implications of the use of addictive substances, Nutritional concern and knowledge of coaches and athletic trainers.

Textbooks

1. Bean A, The Complete Guide to Sports Nutrition, 7th edition, Bloomsbury, London,2013.
2. Srilakshmi B, Suganthi V, Ashok CK. Exercise physiology, fitness and Sports Nutrition. New age international publishers,2018.

Reference Books

1. Dunford M, Fundamentals of Sports and Exercise Nutrition, Human Kinetics, Illinois,2010.
2. Jeukendrup A and Gleeson M, Sports Nutrition: An introduction to energy production and performance, Human Kinetics publishers,2004.
3. Maughan RJ, Burke LM, Handbook of Sports Medicine & Science- Sports Nutrition, Blackwell Science publications,2002.
4. Richard B. Kreider, Essentials of Exercise & Sports Nutrition: Science to Practice Kindle Edition. Lulupublishingservices, 2019.

Journals

1. Journal of international society of sportsnutrition
2. International journal of sports nutrition and exercisemetabolism

Course Outcomes

On successful completion of the course, the students will be able to gain knowledge about

CO	Course Outcome	Knowledge Level
CO 1	sports nutrition and ergogenic aids in sports	K2
CO 2	the energy balance, energy expenditure and bodymass, and composition	K3
CO 3	the carbohydrate and protein in sports nutrition	K4
CO 4	hydration status affects performance	K2
CO 5	the nutritional requirements of athletes in specific groups.	K3

Mapping of COs with POs & PSOs:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	S	M	M	S	S	M	S	S	S
CO2	S	S	S	S	M	M	S	S	M	S	S	S
CO3	S	S	S	S	M	M	S	S	M	S	S	S
CO4	S	S	S	S	M	M	S	S	M	S	S	S
CO5	S	S	S	S	M	M	S	S	M	S	S	S

StronglyCorrelating(S) -3Marks

ModeratelyCorrelating (M) -2Marks

WeaklyCorrelating (W) -1Mark

NoCorrelation (N) -0Mark

Course Code	P21FNT35	ADVANCED NUTRITION II	L	T	P	C
CORE XV			4	-	-	4
Cognitive Level	**K1:Recall K2:Understand K3:Apply**					
Learning Objectives	**The course aims to** 1. the role and importance of nutrition management in exercise and sport performance 2. the coping mechanism of the human body during high altitude and sea travel and nutrition management duringemergencies					

UnitI Fat-solublevitamins

Fat-soluble vitamins-A, D, E, K- Chemistry, Functions, Physiological action, Digestion, Absorption, Utilization, Transport, Storage, Excretion, Source, RDA, Deficiency, Diagnosis of deficiency, Toxicity, Interaction of fat-soluble vitamins with other nutrients. Hypoandhypervitaminosis.

UnitII Water-solublevitamins

Water-soluble vitamins**:** Vitamin C, Thiamine, Riboflavin, Niacin, Pyridoxine (B6), Folic acid, Cyanocobalamin (B12), Biotin: Chemistry, Functions, Physiological action, Digestion, Absorption, Utilization, Transport, Storage, Excretion, Source, RDA, Deficiency, Diagnosis of deficiency, Toxicity, Interaction of fat-soluble vitamins with other nutrients.

UnitIII MacroMinerals

Macro Minerals: Calcium, Phosphorous, Magnesium, Sodium, Potassium, Chloride: biological importance, Distribution in the body, digestion, absorption, Utilization, transport, excretion, deficiency, toxicity, food sources, RDA, Regulation of calcium concentration, commercial nutrient supplementation.

UnitIV Micro minerals

Micro Minerals: Iron, Zinc, Copper, Selenium, Chromium, Manganese, Iodine, Fluorine. Distribution, digestion, absorption, Utilization, transport, excretion, deficiency, toxicity, food sources, factors affecting nutrient absorption, recommended dietary allowances, elemental nutrient supplementation,

UnitV Antioxidants andFree Radicals

Antioxidants and free radicals: definition, importance, functions, food sources, mechanism of free radical formation.
Role of vitamins and minerals as antioxidants
Role of oxygen free radicals.
Role of antioxidants in degenerative diseases.

Text Books:

1. Recommended dietary intakes for Indian – Indian Council of Medical Research, New Delhi, 2012.
2. Gopalan, Rama Sastry, B.V. and Balasubramanian, S. Nutritive Value of Indian Foods,National Institute of Nutrition, Hyderabad, 2007.

3. Swaminathan, M. Essentials of Foods and Nutrition, Volume I and II Ganesh and Co., Madras, 2003.
4. Mahan,KathleenL.Krause'sFood,NutritionandDietTherapy,W.B. Saunders,11thEdition 2004.
5. Srilakshmi. E. Nutrition Science, New Age International Publishers, 2012.
6. Swaminathan. Advanced Textbook on Food Science and Nutrition, Vol:2, Second edition, Reprinted, Bangalore Printed and publishing Co Inc, Bangalore,2003.

Journals:

1. American Journal of ClinicalNutrition
2. Annual Reports, National Institute of Nutrition
3. British Journal ofNutrition
4. Indian Journal of MedicalResearch
5. The Indian Journal of Nutrition and Dietetics
7. Nutrition Reviews

Course Outcomes

On successful completion of the course, the students will be able to gain knowledge about

CO	Course Outcome	Knowledge Level
CO1	recent developments in the field of vitamins and minerals.	K1
CO2	the importance of vitamins and minerals concerning other nutrients.	K2
CO3	food components other than essential nutrients	K2
CO4	the information on the potential health implication and mechanisms of action of functional foods	K3
CO5	the role of antioxidants in our health	K3

Mapping of COs with POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	M	S	S	S	M	S	M	S	S	M
CO2	S	M	M	S	S	S	M	S	M	S	S	M
CO3	S	M	M	S	S	S	M	S	M	S	S	M
CO4	S	M	M	S	S	S	M	S	M	S	S	M
CO5	S	M	M	S	S	S	M	S	M	S	S	M

StronglyCorrelating(S) - 3Marks

ModeratelyCorrelating (M) - 2Marks

WeaklyCorrelating (W) - 1Mark

NoCorrelation (N) - 0Mark

Course Code	P21FNP34	THERAPUTIC NUTRITION PRACTICAL	L	T	P	C
CORE XVI			-	-	6	4
Cognitive Level	**K1:Recall K2:Understand K3:Apply K5: Evaluate K6:Create**					
Learning Objectives	**The course aims to** 1. the students will be able to plan a day's menu based on the person/patient's disease condition. 2. the students will be able to prepare a nutritious/ hospital/pediatricdiet.					

UnitI Routinehospitaldiet

Routine hospital diet, importance of hospital diets, types of diet - Full liquid, clear liquid, soft, light, bland, and regular diet. Different types of diseases conditions and its variations. Diet for - obesity, underweight: menu planning, preparation, standardization, sensory analysis, nutrient calculation and costcalculation.

UnitII Diet for gastrointestinal diseases

Diet in gastrointestinal disorders – lower and upper GI diseases, peptic ulcer, pancreatitis diarrhea, constipation. Diet in liver disorders - jaundice, cirrhosis, hepatic coma, fatty liver, and gall stones: menu planning, preparation, standardization, sensory analysis, nutrient calculation and cost calculation.

Unit-III Diet for kidney diseases andDiabetes mellitus

Diet in kidney disorders - Glomerulonephritis, nephrotic syndrome, renal failure, dialysis: menu planning, preparation, standardization, sensory analysis, nutrient calculation and cost calculation. Diet in Diabetes mellitus –type 1, type 2, GDM: menu planning, preparation, standardization, sensory analysis, nutrient calculation and cost calculation.

UnitIV Diet for cardiovasculardiseases

Diet in Cardiovascular disease - Hypertension, atherosclerosis, congestive heart failure, coronary heart disease,: menu planning, preparation, standardization, sensory analysis, nutrient calculation and cost calculation. Dietary counselling for cardio vascular and its associated complications.

UNIT-V Diet counsellingfordifferentconditions

Preparation of Diet Counseling aids for common disorders. Dietary counseling of the patients. Different types of nutritional counselling, importance of nutritional counselling. Nutritional assessment of pediatrics and adults by IAP, SGA: menu planning, preparation, standardization, sensory analysis, nutrient calculation and costcalculation.

References

1. Stump SE, Nutrition And Diagnosis Related Care, 7th edition, Lippincott Williams and Wilkins, Canada,2012.
2. Gopalan C., Ramanathan, P.V. Balasubramanian, S.C., Nutritive value of Indian foods, NIN, Hyderabad,2010
3. Srilakshmi B, Dietetics, sixth edition, New age Publishing Press, New Delhi,2011.

4. Marian M et al., Clinical Nutrition for surgical patients, Jones and Bartlett Publishers, Canada, 2008
5. Joshi Y.K, Basics of Clinical Nutrition, 2nd edition, JP Medical Publishers Pvt Ltd, New Delhi, 2008.

Course Outcomes

On successful completion of the course, the students will be able to gain knowledge about

CO	Course Outcome	Knowledge Level
CO1	various disorders and their complications	K1
CO2	different types of therapeutic diet.	K6
CO3	the dietary measures to reduce/prevent the disease.	K3
CO4	the hands-on experience in therapeutic nutrition and its planning.	K5
CO5	learn the diet counseling process	K2

Mapping of COs with POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	M	S	S	S	M	S	M	S	S	S
CO2	S	S	M	S	S	S	M	S	M	S	S	S
CO3	S	S	M	S	S	S	M	S	M	S	S	S
CO4	S	S	M	S	S	S	M	S	M	S	S	S
CO5	S	S	M	S	S	S	M	S	M	S	S	S

StronglyCorrelating(S) - 3Marks

ModeratelyCorrelating (M) - 2Marks

WeaklyCorrelating (W) - 1Mark

NoCorrelation (N) - 0Mark

SEMESTER-IV

Course Code	P21FNR41	PROJECT	L	T	P	C
CORE XVI			22	-	-	8

The dissertation should be based on individual studies and carry the following format:

Preliminary

1. Title page- title, authorsname
2. Certificate of originality by theguide
3. Declaration by theauthor
4. Table ofcontents
5. List oftables
6. List offigures
7. Acknowledgment
8. Abstract

I. Introduction: Statement of the problem, significance, need for the study, objectives, and definitions.
II. Review ofliterature
III. Methodology: tools used, procedures,hypothesis.
IV. Results and discussion: tables and figures, statistical presentations, hypothesistesting.
V. Summary andconclusion
VI. Suggestion for the future study
VII. References

SUBJECT ELECTIVE COURSES

Course Code	P21FNE411	FUNDAMENTALS OF FOOD TECHNOLOGY	L	T	P	C
ELECTIVE I			4	-	-	4
Cognitive Level	**K1-Recall K2:Understand K3:Apply K4:Analyze**					
Learning Objectives	**The course aims to** 1.to have appropriate knowledge about the significance of food technology 2.to formulate the various food products through various food techniques					

UnitI Introduction aboutfoodtechnology

Food technology-definition, introduction to terminology, principles involved in food technology, recent trends and developments in food technology. Application of technology in Food: food science to the selection, preservation, processing, packaging, labeling distribution, and use of safe food.

UnitII Foodprocessingtechniques

Recent trends in food processing technology in brief: New or novel raw materials including bioactive compounds, Ingredients and technologies,Novel processing and packaging technologies, risk assessment of both biological and non-biological hazards in food, Food allergies and, intolerances, Food function and relationships between diet and disease, Consumer attitudes to food and risk assessment.

UnitIII Fermentation anditsby-products

Fermentation: mechanism, process, advantages of fermentation technology - types of aerobic and anaerobic fermentation Steps in fermentation, Fermented Food Products from various food groups, Dairy products, Beverages, and related products of baking. Role of fermentation in nutrient bioavailability andhealth

UnitIV Enzymetechnology

Enzyme Technology - Production of enzymes - Amylase, Protease, Lipase, Lactase and pectinase, Use of enzymes in food & beverage industry (Cheese, fruit, juice, Wine, Meat tenderizing & dairy). Commercial enzyme production and its application, enzyme applications advantages.

UnitV Food packaging anditsimportance

Food packaging technology and labeling: types of packages-traditional and modern Design and testing of package materials, package performance. Principles in the development of safe and protective packing, safety assessment of food packaging materials. Recent packaging methods-principles-hazards related to packaging.

Textbooks

1. Swaminathan, M., Food Science, Chemistry and Experimental Foods, Bappco Publishers,2005.
2. Paul, P.C., and Palmer, H. H., Food Theory and Applications. John Wiley and Sons,New York, 2000.
3. Srilakshmi, M., Food science, New Age International (P) Ltd., Publishers 2010.
4. Robertson, G.L. Food Packaging: Principles and Practice (2nd ed.), Taylor & Francis,2006.

5. Peppler, H.J. and D. Perlman, Microbial Technology: Fermentation Technology, 2nd Edition, Vol. II Academic Press / Elsevier,2004.
6. Stanbury, Peter F., Allan Whitaker, and Stephen J. Hall. *Principles of fermentation technology*. Elsevier,2013.

Reference books

1. RichardColes,DerekMcDowell,MarkJ.Kirwan,FoodPackagingTechnology, Blackwell Publishers,2003
2. Aaron L. Brody, E. P. Strupinsky, Lauri R, Active Packaging for Food Applications, CRC Press, U.S.A.,2001
3. Ahvenainen, R. (Ed.) 2003 Novel Food Packaging Techniques, CRC Press, Han, J.H. (Ed.) 2005 Innovations in Food Packaging, Elsevier AcademicPress
4. Desrosier, N.W. and James N. The technology of food preservation. AVI Publishers,2007.

Course Outcomes

On successful completion of the course, the students will be able to gain knowledge about

CO	Course Outcome	Knowledge Level
CO1	the food technology principles	K2
CO2	the food preservation, food spoilage, and role of microorganisms	K1
CO3	food fermentation techniques and their products	K1
CO4	information on advanced food techniques	K4
CO5	fundamental of food technology in packaging aspects.	K2

Mapping of COs with POs & PSOs:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	S	M	M	S	S	M	M	S	S
CO2	S	S	S	S	M	M	S	S	M	M	S	S
CO3	S	S	S	S	M	M	S	S	M	M	S	S
CO4	S	S	S	S	M	M	S	S	M	M	S	S
CO5	S	S	S	S	M	M	S	S	M	M	S	S

StronglyCorrelating(S) - 3Marks

ModeratelyCorrelating (M) - 2Marks

WeaklyCorrelating (W) - 1Mark

NoCorrelation (N) - 0Mark

Course Code	P21FNE412	HOME SCIENCE COMPOSITE	L	T	P	C
ELECTIVE I			4	-	-	4
Cognitive Level	**K1:Recall K2:Understand K3:Apply**					
Learning Objectives	**The course aims to** 1. describe the importance of each branch of HomeScience 2. understand the essence of eachsubject 3. prepare them for UGC NET, SLET andICMR					

UnitI Food scienceandnutrition

Basic concepts of food groups and nutrients- Role of microorganisms in food spoilage and its prevention - Recent advances in food processing and preservation-Recent techniques in food technology.
Institutional management: Management of hospitality institutes- hospitals/ hotels/ restaurants/ cafeteria and outdoor catering.

UnitII Extension education

History and development of home science - Formal/ non-formal and extension education - Vocationalisation of home science in India - Concept and classification of communication - Trends in home science research.

UnitIII Resourcemanagement

Concept of home management and steps - Classification of resources - Basic characteristics of resources.
Work simplification - Interior decoration - Household equipment, decision making, resource management, financial management.

UnitIV Humandevelopment

Child development-principles and stages - Life span development - Theories of human development - Early childhood care and education - Family welfareprograms.

UnitV Textilesand Clothing

Textile Fibers-Definition, Classification of Fibers. Natural fiber – Cotton, silk, wool - Man Made Fibers- Polyester, Nylon - Primary and secondary characteristics of textile fibers.
Yarn-Definition- Types- Applications.
Fabric manufacturing techniques – Weaving, Knitting, Non-woven -Definition and applications. Garment Manufacturing-Terminology used in apparel industry- Introduction to apparel categories- Men, Women and children. Tools used-Measuring, Marking, Cutting, finishing and general tools. Steps involved in Garment Manufacturing-Design development, Body measurements, Pattern making, spreading, marking, cutting and apparel construction.

References

1. Jha, J.K, Encyclopedia of Teaching of Home Science, Vol.I, II and III. New Delhi: Anmol Publications,2002
2. Varghese, M.A.et al. Home Management, New Delhi: Viley Eastern Limited,2001

3. Suriakanthi. A.,Child Development - An Introduction Gandhi gram: Kavitha Publications, 2002.
4. Education Planning group, Home Management. Newdelhi: Arya Publishing House,2001.
5. Hurlock, E.B, Developmental Psychology A Life-Span Approach. New Delhi: Tata Mcgraw Hill Publishing Company Limited,2007.
6. E.P.G. Gohl, L.D. Velensky, "Textile Science" CBS Publishers and Distributors,2003.
7. AJ. Hall. "The standard hand book of Textiles", Wood head Publishing 8th edition2004.
8. P.V. Vidyasagar, "Hand Book of Textiles", A. Mittal Publications, 2005
9. Sara J. Kadolph, "Textiles", Prentice Hall, 10th edition2007.
10. Williams, Abigail. *The Social Life of Books*. Yale University Press,2018.

Course Outcomes

On successful completion of the course, the students will be able to gain knowledge about

CO	Course Outcome	Knowledge Level
CO1	the field of food science and nutrition	K1
CO2	various concepts of home science extension education	K2
CO3	the conceptsof home science and its applicationsin resource management	K3
CO4	the basic knowledge of human development.	K2
CO5	the importance of textile and clothing in our daily life events.	K3

Mapping of COs with POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	S	S	S	S	M	M	S	S	S	M
CO2	S	M	S	S	S	S	M	M	S	S	S	M
CO3	S	M	S	S	S	S	M	M	S	S	S	M
CO4	S	M	S	S	S	S	M	M	S	S	S	M
CO5	S	M	S	S	S	S	M	M	S	S	S	M

StronglyCorrelating(S) - 3Marks

ModeratelyCorrelating (M) - 2Marks

WeaklyCorrelating (W) - 1Mark

NoCorrelation (N) - 0Mark

Course Code	P21FNE413	ICT tools for Nutrition Education	L	T	P	C
ELECTIVE I			4	-	-	4
Cognitive Level	K2:Understand K3: Apply K4: Analyze					
Learning Objectives	The course aims to ➢ create awareness among people with Mass media andadvertisement. ➢ develop the tools for nutritioneducation.					

UnitI ICT inNutritionEducation

ICT in Nutrition Education a) Nutrition Education- Nature and Importance to the Community, Objectives, Training Workers in Nutrition Education, and Extension Work.ICT tools to include - Printed media (Newspaper, books, journal magazines) - Computers - Telephones - Communication Network - E-mail - Electronic media (Radio, television, videos films)
- Telex - Satellite –Internet.

UnitII Principles ofnutritioneducation

Principles of Planning, Executing and Evaluating Nutrition Education Programmes.
c) Problems of NutritionEducationProgrammes and Approaches to overcome.
Information and communication devices for making learning in food and Nutrition education: concepts. Develop nutritional messages/ slogan on health and nutrition issues for vulnerable groups in the community.

UnitIII Nutritioneducation tools

Selection and development of appropriate ICT aids for different health and nutrition issues for various vulnerable groups in the community – chart, poster, leaflet, flipbook/flashcard.
Development of nutritional games on health and nutrition issues for vulnerable groups in the community.

UnitIV Different audio-visual aids innutritioneducation

Audio-Video messages through mobile phones, mobile apps, alert calls regarding nutritional uptake of rural mass and regular health checkups. Package of practices of nutrient rich varieties.Monitoring and feedback mechanism through mobile based applications.
Dissemination of recommended dietary requirement [carbohydrate, protein, fat, vitamin, minerals and dietary fibre) to rural mass.Nutritional Campaigns organization and mass awareness in villages.

UnitV Nutritional interventionthroughICT

Analyze the dietary intake and calorie requirement. Analyze the required quantity carbohydrate, protein, fat, vitamin, minerals and dietary fibre - Content Development regarding best nutrition practices.
Mobile based nutritional awareness: nitrify India, Dietary guidelines for Indians, Nutrition atlas, vikaspedia, blog creation online diet counselling: scope and importance.

Text book

1. Suryatapadas –Textbook of Community Nutrition, Academic Publishers,2016.
2. Prabha Bisht- Community Nutrition in India, Star Publications,2017.
3. B.Srilakshmi - Nutrition Science, New Age International, 2006.

Reference books

1. Swaminathan.M- Advanced Textbook on Food & Nutrition Vol 1& 2,Bappco.
2. Hyun, Taisun, Miyong Yon, Sun Hee Kim, Nan Hee Kim, Suk Mi An, Sun Mi Lee, Hyun Jung Chi et al. "Development of a nutrition education website for children." *Korean Journal of Community Nutrition* 8, no. 3 (2003):259-269.
3. Bhatt D.P, Health Education, Khel Sahitya Kendra, New Delhi,2008.

COURSE OUTCOMES

On successful completion of the course, the students will be able to gain knowledge about

CO	Course Outcome	Knowledge Level
CO1	various concepts of nutrition education	K2
CO2	ICT significance nutrition education	K3
CO3	different tools in nutrition education	K4
CO4	content making for nutritional and health issues	K2
CO5	creation of mobile apps, videos, online counselling	K3

Mapping of COs with POs & PSOs:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	M	M	S	M	M	M	S	M	S	M
CO2	M	S	M	M	S	M	M	M	S	M	S	M
CO3	M	S	M	M	S	M	M	M	S	M	S	M
CO4	M	S	M	M	S	M	M	M	S	M	S	M
CO5	M	S	M	M	S	M	M	M	S	M	S	M

StronglyCorrelating(S)	-	3Marks
ModeratelyCorrelating (M)	-	2Marks
WeaklyCorrelating (W)	-	1Mark
NoCorrelation (N)	-	0Mark

Course Code	P21FNE421	FUNCTIONAL FOODS AND NUTRACEUTICALS	L	T	P	C
ELECTIVE II			4	-	-	4
Cognitive Level	**K1:Recall K2: Understand K3:Apply**					
Learning Objectives	**The course aims to** 1. knowledgeable about specific issues concerning functional foods and nutraceuticals 2. understanding the use of various functional foods in therapeutic conditions 3. to develop diet supplements incorporating functionalfoods 4. practicing the effect of each food and its effect onhealth					

UnitI Functional foodsandNutraceuticals

Functional foods and Nutraceuticals – Introduction – Defining, the concept – Review of the history of functional foods – technology of Nutraceuticals – primary and secondary metabolites in plants general teleology – a) Carotenoids b) Conjugated linolenic acid c) Flavonoids d) Nitrogen and Sulphur containing Amino acid derivatives e) proteinase and alpha-amylase inhibitors f) Omega – 3 PUFA g)Terpenoids.

UnitII Classifying NutraceuticalsOrganizationalmodelsforNutraceuticals

Classifying Nutraceuticals Organizational models for Nutraceuticals
a) Food source – Plant: Soya, olive oil, plant steroid, tea, grapevine, garlic, capsicum, dietary fibre, and otherfruits.
b) Animal: Milk and products, meat, fish. Microbialprobiotics.
c) Mechanism of action – Anticancer, positive influence on blood lipid profile, anti-oxidation, anti-inflammatory,osteogenesis.
d) Chemical nature – Isoprenoid derivatives, phenolic substances, fatty acids, and structural lipids, carbohydrates and derivatives, amino acid-base substances, microbes,minerals.

UnitIII Dietarysupplements

Regulation of dietary supplements – Types – inborn errors of metabolism, - obesity, neurological disorder, diabetes mellitus, hypertension vitamin A deficiency, protein energy malnutrition, anemia, Instant foods, and formulas supplement soups, Herbal, and Flowers as functional foods.

UnitIV Bioavailabilityofnutrients

Bioavailability of nutrients in different foods; measurement of functional component and their bioavailability. Need for measurement, safety quality assurance, and cost bioavailability: definition, factor affecting, chemical measurement and physical testing and microbiological testing- functional foods and vitro studies.

UnitV Nutrigenomics

Pharmacology and Nutraceuticals pharmacology of chemical components.derived from a plant source and the therapeutic derived from a plant source and thetherapeutic efficiency of

functional food ingredients. Nutrigenomics Relationship between nutritional supplementation and gene expression and disease prevention.
Dietary supplements

Text books

1. Mary, K. Schmidl and Theodre, P. Labuza, Essentials of Functional Foods, Culinary and hospitality industry publication services,2000.
2. Israel Goldberg, Functional foods, pharma foods, Nutraceuticals, Culinary and hospitality industry publication services,2001.
3. Robert easy Wildman, Handbook of Nutraceuticals and functional foods, Culinaryand hospitality industry publication services,2001.

Reference books

1. Paresh, C. Dutta, Phytosterols as Functional Food Components and Nutraceuticals, Marcel Dekker Inc, New York,2004.
2. Jeffery Horst, Methods of Analysis for Functional Foods and Nutraceuticals, CRS press,2002.
3. Webb, G.P, Dietary Supplements and Functional Foods. New York: Blackwell Publishing Ltd, 2006.
4. Wildman, R.E.C, Handbook of Nutraceuticals and Functional Foods. London: CRC Press, Taylor, and Francis, Boca Raton, 2007.
5. Gibson GR & William CM. Functional Foods - Concept to Product.2000.
6. Goldberg I. Functional Foods: Designer Foods, Pharma Foods.2004.
7. Brigelius-Flohé, J &Joost HG. Nutritional Genomics: Impact on Health and Disease. Wiley VCH. 2006.
8. Cupp J & Tracy TS. Dietary Supplements: Toxicology and Clinical Pharmacology.Humana Press.2003.

Course Outcomes:

On successful completion of the course, the students will be able to gain knowledge about

CO	Course Outcome	Knowledge Level
CO1	the growing importance of Nutraceuticals and functional foods	K1
CO2	the role of functional foods in health	K2
CO3	the commercial food supplements and their occupation in the market	K2
CO4	the functional assessment of foods	K3
CO5	Nutraceuticals and functional foods on health.	K2

Mapping of COs with POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	S	S	M	M	S	S	M	M	S	S
CO2	S	M	S	S	M	M	S	S	M	M	S	S
CO3	S	M	S	S	M	M	S	S	M	M	S	S
CO4	S	M	S	S	M	M	S	S	M	M	S	S
CO5	S	M	S	S	M	M	S	S	M	M	S	S

Strongly Correlating (S)	3 Marks	Weakly Correlating (W)	1 Mark
Moderately Correlating (M)	2 Marks	No Correlation (N)	0 Mark

Course Code	P21FNE422	FOOD SAFETY AND QUALITY CONTROL	L	T	P	C
ELECTIVE II			4	-	-	4
Cognitive Level	**K2:Understand K3: Apply K4 Analyze**					
Learning Objectives	The course aims to ➢ To study the importance of food safety andquality. ➢ To know the laws and standards ensuring food quality andsafety. ➢ To know about the food additives andadulterants.					

UnitI Food safety

Food safety: Principles of quality control and safety, need of quality control and safety, strategy and criteria for food safety, Quality Standards – mandatory standards, Quality Standards - optional standards, Consumer lifestyle, Consumer demand, issues in food safety, food traceability, food recall.

UnitII Importance offoodsafety

Importance of food safety in the food processing industry, risk classification, national and international food regulatory agencies, nutritional labeling regulation (mandatory and optional nutrients, nutritional descriptors, and approved health claims); microbial contamination (including cross-contamination/indirect contamination), chemical contamination, physical contamination, and allergen contamination.

UnitIII Food Additivesand Adulterants

Food Additives and Adulterants: Food additives definition; Common food additives and their function and usage; Permissible limits of additives in foods; Implications of additives on consumers health; Food adulteration: Meaning and definition; Types of food adulterants; Methods used for detection of food adulterants.

UnitIV Foodsafetyprograms

Food safety programs: HACCP, codex Alimentarius, pest control program, facility maintenance, personal hygiene, supplier control, sanitary, design of equipment and infrastructure, procedures for raw material reception, storage, and finished product loading, sanitation program. Sanitation standard operating procedures (SSOPs), product identification, tracking and recalling program, preventive equipment.

UnitV Food LawsandStandards

Food Laws and Standards: Need and importance; National food legislation such as FSSA, Essential Commodities Act, ISI or BIS, AGMARK, FPO, and PFA; International Organization such as FAO, WHO, Codex Alimentarius, and APEDA. Good Manufacturing Practices (GMP), Good Hygienic Practices (GHP), Good Laboratory Practices (GLP), ISO 22000, FSSC 22000, Food SafetyAudit.

Textbooks

1. Ronald H. Schmidt, and Gary E. Rodrick., “Food Safety Handbook”, John Wiley & Sons, New Jersey,2005.

2.YasmineMotarjemi and HuubLelieveld., "Food Safety Management - A Practical Guide for the Food Industry", Elsevier, New York,2014.
3.FSSAI., "Manual of Food Safety Management System", FSS Act, 2006, Ministry of the Health and Family Welfare, New Delhi,2006.
4.FSSAI., "Food Safety and Standards Regulations – 2011", Ministry of the Health and Family Welfare, New Delhi,2011.
5. InteazAlli, "Food Quality Assurance: Principles and Practices", 2nd Edition, Taylor and Francis, UK,2014.

Reference Books

1. George, A.B. 2006. Encyclopedia of Food and Color Additives. Vol. III. CRC Press.
2. Surendar S. Ghokrokta., "Science and Strategies for Safe Food", CRC Press, USA,2017.
3. Branen, A.L., Davidson PM &Salminen S. 2001. Food Additives. 2nd Ed. MarcelDekker.

Course Outcomes

On successful completion of the course, the students will be able to gain knowledge about

CO	Course Outcome	Knowledge Level
CO1	the various criteria of food safety and quality.	K2
CO2	the role and significance of national and international food law that ensures the safety of the food products.	K3
CO3	food additives and adulterants information and its consequences.	K4
CO4	various food safety programs.	K2
CO5	thelaws and standards ensuring food quality and safety.	K3

Mapping of COs with POs & PSOs:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	S	M	S	S	M	S	M	S	M
CO2	S	S	S	S	M	S	S	M	S	M	S	M
CO3	S	S	S	S	M	S	S	M	S	M	S	M
CO4	S	S	S	S	M	S	S	M	S	M	S	M
CO5	S	S	S	S	M	S	S	M	S	M	S	M

StronglyCorrelating(S) -3Marks
ModeratelyCorrelating (M) -2Marks
WeaklyCorrelating (W) -1Mark
NoCorrelation (N) -0Mark

Course Code	P21FNE423	FOOD PACKAGING	L	T	P	C
ELECTIVE II			4	-	-	4
Cognitive Level	K2:Understand K3: Apply K4 Analyze					
Learning Objectives	The course aims to ➢ impart knowledge about the various food packaging materials and their importance ➢ understand the Packaging techniques of foodproducts ➢ recognize the role and significance ofpackaging					

UnitI Introduction tofoodpackaging

Introduction to food packaging: recent developments and advances, Packaging terminology- definition, Functions of foodpackaging, importance of food packaging, packaging environment. Characteristics of foodstuff that influences packaging selection, role of packaging in food safety and foodspoilage.

UnitII Different types offoodpackaging

Types of packaging materials (metals, glass, paper, and plastics), their characteristics, and uses. Paper: pulping, fibrillation and beating, types of papers, and their testing methods. Glass: composition, properties, types of closures, methods of bottle making; Metals: Tinplate containers, tinning process, components of tinplate, tin-free steel (TFS), types of cans, aluminum containers, lacquers; Plastics: types of plastic films, laminated plastic materials, co-extrusion.

UnitIII Packaging aspects of fresh andprocessedfoods

Packaging aspects of fresh and processed foods: Packaging of Fruits and vegetables, Fats and Oils, Spices, Meat, Poultry and seafoods, Dairy Products, Bakery, beverages, Dehydrated and frozen foods. Liquid and powder filling machines – like aseptic system, form, and fill (volumetric and gravimetric), bottling machines. Form Fill Seal (FFS) and multilayer aseptic packaging machines.

UnitIV Package accessories

Package accessories and advances in packaging technology (active packaging, modified atmosphere packaging, aseptic packaging, and packages for microwave ovens, biodegradable plastics, edible gums, and coatings). Advantages of package accessories and its recent developments.

UnitV Packaging Design & Environmental Issuesin Packaging

Packaging Design & Environmental IssuesinPackaging: Food marketing and role of packaging-Packaging aesthetic and graphic design; Coding and marking including barcoding; Consumer attitudes to food packaging materials; Packaging Laws and regulations, safety aspects of packaging materials; sources of toxic materials and migration of toxins into food materials; Packaging material residues in food products; Environmental & Economic issues, recycling, and wastedisposal.

Textbooks

1. GardonL.RobertsonFoodPackaging:PrinciplesandPractice,ThirdEdition,CRCPress,2012.
2. Robertson, G.L. Food Packaging: Principles and Practice (2nd ed.), Taylor & Francis,2006
3. NIIR. Food Packaging Technology Handbook, National Institute of Industrial Research Board, Asia Pacific Business Press, 2003.
4. Richard Coles, Derek McDowell, Mark J. Kirwan Food Packaging Technology, Blackwell Publishers,2003.
5. Aaron L. Brody, E. P. Strupinsky, Lauri R. Active Packaging for Food Applications, CRC Press,2001.

Reference books

1. Ahvenainen, R. Novel Food Packaging Techniques, CRC Press,2003
2. Han, J.H. Innovations in Food Packaging, Elsevier Academic Press,2005.
3. Coles, R., McDowell, D., and Kirwan, M.J. Food Packaging Technology,2003.

Course Outcomes

On successful completion of the course, the students will be able to gain knowledge about

CO	Course Outcome	Knowledge Level
CO1	the functions of packaging along with the influence of various factors on food.	K2
CO2	different types of packaging materials	K3
CO3	the packaging techniques	K4
CO4	recent trends in packaging technology.	K2
CO5	the ecofriendly and modernized packaging	K3

Mapping of COs with POs & PSOs:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	S	M	S	S	M	M	M	S	S
CO2	S	S	S	S	M	S	S	M	M	M	S	S
CO3	S	S	S	S	M	S	S	M	M	M	S	S
CO4	S	S	S	S	M	S	S	M	M	M	S	S
CO5	S	S	S	S	M	S	S	M	M	M	S	S

StronglyCorrelating(S) -3Marks

ModeratelyCorrelating (M) -2Marks

WeaklyCorrelating (W) -1Mark

NoCorrelation (N) -0Mark

Course Code	P21FNN211	BASICS OF HUMAN NUTRITION	L	T	P	C
NME - I			4	-	-	4
Cognitive Level	**K2:Understand K3: Apply K4 Analyze**					
Learning Objectives	The course aims to ➢ To have appropriate knowledge onnutrition ➢ To address the role of nutrition in health andwellness					

UnitI Basic conceptofhealth

Health: definition, importance of health, malnutrition: undernutrition, overnutrition, factors associated with malnutrition: prevalence, dietary recommendations, RDA- ICMR.
Functions of food: food groups, classification of food groups. Interaction between food and health: Role of food in health promotion.

Unit-II Macronutrients

Nutrients: definition, classification, macronutrients: Carbohydrates: functions, requirements, food sources,deficiencies and recommended intake.
Proteins: functions, requirements, food sources,deficiencies and recommended intake.
Fats: functions, requirements, food sources,deficiencies and recommended intake.

UnitIII Micronutrients

Micronutrients: Vitamins and minerals:
Fat soluble vitamins: functions, requirements, food sources,deficiencies and recommended intake.
Water soluble vitamins: functions, requirements, food sources,deficiencies and recommended intake.
Macro minerals: functions, requirements, food sources,deficiencies and recommended intake.
Micro minerals: functions, requirements, food sources,deficiencies and recommended intake.

UnitIV Lifecyclenutrition

life cycle nutrition: infancy: nutritional needs, nutritional deficiencies, RDA and dietary measures. Pre-school: nutritional needs, nutritional deficiencies, RDA and dietary measures. School going: nutritional needs, nutritional deficiencies, RDA and dietary measures.Adolescents: nutritional needs, nutritional deficiencies, RDA and dietary measures. Pregnancy: nutritional needs, nutritional deficiencies, RDA and dietary measures. Lactation: nutritional needs, nutritional deficiencies, RDA and dietary measures. Adulthood and old age: nutritional needs, nutritional deficiencies, RDA and dietarymeasures.

UnitV Communicable andnon-communicablediseases

Communicable and non-communicable diseases: causes, symptoms, risk factors, consequences, dietarymanagement.
Communicable and non-communicable diseases (Epidemiology Prevalence Source of infection, Vaccination schedule, Preventive measures, diet therapy)
Communicable diseases: Typhoid, tuberculosis, cholera, chicken box, hepatitis, SARS, and covid-19.Non-communicable diseases: Hypertension, CVD, cancer, renal disorders, liver disorders.

Text books

1. Srilakshmi B, Dietetics, sixth edition, New age Publishing Press, New Delhi,2011
2. Stacy N, William's Basic Nutrition and Diet Therapy, 12th edition, Elsevier publications, UK, 2005.
3. Mahan LK, Stump SE and Raymond JL, Krause's Food and Nutrition Care Process, 13th Edition, Elsevier Saunders, Missouri, 2012.

Reference books

1. Barasi, Mary. *Human nutrition: a health perspective*. CRC Press,2003.
2. Roday S, Food science and Nutrition, Oxford university press, New Delhi,2007
3. Mahan LK, Stump SE and Raymond JL, Krause's Food and Nutrition Care Process, 13th Edition, Elsevier Saunders, Missouri, 2012.
4. Robinson CH, Normal and Therapeutic nutrition, Oxford and IBH publishing company, Bombay,2010.

Course Outcomes

On successful completion of the course, the students will be able to gain knowledge about

CO	Course Outcome	Knowledge Level
CO1	the basic concepts of health and food	K2
CO2	the concept of macronutrients	K3
CO3	the micronutrients role in health	K4
CO4	role of nutrition in each stage of human life	K2
CO5	communicable and non-communicable disease	K3

Mapping of COs with POs & PSOs:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	S	M	S	S	S	M	M	S	M
CO2	S	S	S	S	M	S	S	S	M	M	S	M
CO3	S	S	S	S	M	S	S	S	M	M	S	M
CO4	S	S	S	S	M	S	S	S	M	M	S	M
CO5	S	S	S	S	M	S	S	S	M	M	S	M

StronglyCorrelating(S) -3Marks

ModeratelyCorrelating (M) -2Marks

WeaklyCorrelating (W) -1Mark

NoCorrelation (N) -0Mark

Course Code	P21FNN212	Women and Health	L	T	P	C
NME –II			4	-	-	4
Cognitive Level	K2:Understand K3: Apply K4 Analyze					
Learning Objectives	The course aims to ➢ to have appropriate knowledge of women'shealth ➢ to address women's Development andEmpowerment					

UnitI Basics ofwomen'shealth

Concept of health, Concept of Women's Health, the status of women's health.Adolescent health: adolescent sexual and reproductive health, global strategy for adolescent health, adolescent mental health, adolescent pregnancy, adolescent nutritional requirements, nutritional deficiencies, eating disorders, obesity, underweight and adolescent anemia sexually transmitted diseases.

UnitII Maternalnutrition

Maternal nutrition: MMR, health care delivery system, stages of pregnancy, physiological changes of pregnancy, nutritional requirements in pregnancy, nutritional deficiencies, complications of pregnancy: Anemia, undernutrition, Gestational Diabetes Mellitus (GDM), Pregnancy-induced Hypertension (PIH).

UnitIII Nutritional needsin lactation

Nourishing health: the physiological process of lactation, nutritional needs in lactation period, problems of lactation, the importance of breastfeeding, nutritional problems in the lactation period.

UnitIV Health needsofwomen

Health needs of women: early, middle and late adulthood, nutritional needs in adulthood period, Polycystic ovarian disease, hormonal imbalances, menopause hormonal changes, nutritional care in menopauseperiod.

UnitV Lifestyle diseasesofwomen

Lifestyle diseases of women: breast cancer, cervical cancer, osteoporosis, arthritis, and other degenerative diseases: incidence, causes, dietarypreventivemeasures.
Health care programs to improve women's health: International, national and state-level agencies for women's health

Text books

1. B. Srilakshmi S. Dietetics (5th edition) New age internationalpublishers,
2. Park, K.: Park's Textbook of Preventive and Social Medicine, 18th Edition, M/s. BanarasidasBhanot, Jabalpur,2000.
3. Swaminathan, M. Essentials of Food and Nutrition, Vols. I and II. Ganesh & Co.2000.

Reference books

1. Indian National Code for Protection and Promotion of Breast Feeding, Govt. of India. Ministry of Social Welfare, NewDelhi.
2. Mahan LK, Stump SE and Raymond JL, Krause's Food and Nutrition Care Process, 13th Edition, Elsevier Saunders, Missouri,2012

Course Outcomes

On successful completion of the course, the students will be able to gain knowledge about

CO	Course Outcome	Knowledge Level
CO1	the status of women's health.	K2
CO2	health care services and available health care providers.	K3
CO3	critical issues in women's health	K4
CO4	women's health and education	K2
CO5	health policy in India and international perspectives on health.	K3

Mapping of COs with POs & PSOs:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	M	S	S	M	M	S	S	M	S	M
CO2	S	S	M	S	S	M	M	S	S	M	S	M
CO3	S	S	M	S	S	M	M	S	S	M	S	M
CO4	S	S	M	S	S	M	M	S	S	M	S	M
CO5	S	S	M	S	S	M	M	S	S	M	S	M

StronglyCorrelating(S) -3Marks

ModeratelyCorrelating (M) -2Marks

WeaklyCorrelating (W) -1Mark

NoCorrelation (N) -0Mark

Course Code	P21FNN213	FOOD PROCESSING	L	T	P	C
NME III			4	-	-	4
Cognitive Level	K1:Recall K2:Understand K3:Apply					
Learning Objectives	The course aims to On successful completion of this course the student will be able to: 1. to Knowledgeable about the applications ofpreservation 2. to make out the different preservationprocess					

UnitI Basic requirements in general for a foodprocessingunit.

Basic requirements in general for a food processing unit: The principle underlying food processing operations, Physical means in food processing operation (including thermal, radiation, refrigeration, freezing, & dehydration) Chemical means in food processing (by sugar, salt, curing, smoke, acids and chemicals, Effect of processing on physicochemical characteristics.

UnitII Preservatives and processing ofvariousfoods

Different types of preservatives, natural and chemical preservatives, use of class II preservatives: advantages and disadvantages.
Processing Technology for the preservation and production of various food products.Processing of cereals, legumes, oilseeds, fruits, and vegetables.

UnitIII Processing Technology for milk andmilkproducts

Processing Technology for milk and milk products.Indigenous milk products pannier and yogurt.Egg processing – manufacturing of egg powder. Fleshy food processing – preprocessing, canning, dehydro freezing, dehydration of meat, poultry, and fish, smoking and curing of meat, fish oil extraction.

UnitIV Beverages andsugarprocessing

The brief manufacturing process of coffee, tea, cocoa, ready-to-serve beverages: treating water, compounding ingredients, carbonating product, filling product, packaging. Hazard prevention in beverage processing, potential risks and health effects.
Sugar – Manufacturing of sugar from sugarcane and palm, sugar cubes, and powdered sugar.

UnitV Recent advances infoodtechnology

Incorporation of conventional and innovative techniques in food processing: food fortification: in wheat flour, salt, oil rice and milk. Importance of food fortification and its recent developments in India.Technologies underlying in enrichment,fermentation, malting, germination.

Textbooks

1. Srilakshmi, M., Food science, New Age International (P) Ltd., Publishers2010.
2. Swaminathan, M., Food science, Chemistry and Experimental Foods, Bappco Publishers,2005
3. Potter, Norman N., and Joseph H. Hotchkiss. Food Science. Springer Science & Business Media, 2012.
4. Manay S and Swamy S, Food Facts and Principles, New Age International (P) LtdPublishers, New Delhi,2001.

Reference books

1. Jood S and Khetarpaul N, Food preservation, Agrotech Publishing, Udaipur,2002
2. Manay S andSwamyM S, Foods: Facts and Principles, New Age International (P)Limited, Chennai,2005.
3. Swaminathan,M.Advanced Textbook on Food Science and Nutrition, Vol:2, Second edition, Reprinted, Bangalore Printing and publishing Co Inc, Bangalore,2003.

Course Outcomes

On successful completion of the course, the students will be able to gain knowledge about

CO	Course Outcome	Knowledge Level
CO1	the importance and methods of post-harvest conservation of foods.	K2
CO2	food processing. technology for preservation and production	K1
CO3	various food processing techniques and its recent developments in milk processing	K3
CO4	various food processing technology and their applications in beverages	K2
CO5	food fortification and enrichment in fermentation techniques	K2

Mapping of COs with POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	S	S	M	S	S	S	M	M	S	S
CO2	S	M	S	S	M	S	S	S	M	M	S	S
CO3	S	M	S	S	M	S	S	S	M	M	S	S
CO4	S	M	S	S	M	S	S	S	M	M	S	S
CO5	S	M	S	S	M	S	S	S	M	M	S	S

StronglyCorrelating(S) - 3Marks

ModeratelyCorrelating (M) - 2Marks

WeaklyCorrelating (W) - 1Mark

NoCorrelation(N) - 0Mark

Course Code	P21FNV11	DRUG AND NUTRIENT INTERACTIONS	L	T	P	C
VALUE ADDED PROGRAMME-I			30	-	-	2
Cognitive Level	K2:Understand K3: Apply K4 Analyze					
Learning Objectives	The Course aims to 1. discuss the significance of food and drug interactions in the present clinical scenario. 2. apply this knowledge in prescribing individualized dietary regimen for various therapeutic conditions in order to optimize drugefficacy. 3. analyze clinically possible interactions between drugs and nutrients in patients who are on enteral and parenteralnutrition. 4. explain the importance of nutritional genomics in improving healthoutcomes. 5. compile knowledge of pharmacology, gene- nutrient and drug- nutrient interactions into the nutrition careprocess.					

UnitI Overview of drug nutrientinteractions

Overview of drug nutrient interactions: Drug- definition, Dosage forms (powders, capsulses, tablets, liquids, rectal dosage forms, topical agents, injections), routes for drug delivery (enteral, parenteral and topical). Basic concepts of Pharmacokinetics - absorption, Factors affecting absorption, distribution, metabolism and elimination; Pharmacodynamics- mechanism of drug action, combined effect of drugs (synergism and antagonism), Factors modifying drug action; Pharmacogenomics.

UnitII Influence of nutritional status on drug disposition andeffect

Influence of nutritional status on drug disposition and effect: Effect of malnutrition on drug disposition. Influence of food or nutrients on drug disposition and effect. Interactions of frequently used drugs with nutrients- Analgesics, antibiotics, hypoglycemic agents, cardiovascular agents (diuretics, anticoagulants, antihypertensive, antihyperlipidemics), antacids, respiratory agents (bronchodilators, corticosteroids), immunosuppressants, psychotropic agents.

UnitIII Drug nutrient interaction by lifestage

Drug nutrient interaction by life stage: Drug–Nutrient Interactions in Infancy and Childhood, Drug–Nutrient Interaction considerations in Pregnancy and Lactation, Drug–Nutrient Interactions in the elderly. Drug–Nutrient Interactions in Nutrition support - (Enteral and parenteral Nutrition).

UnitIV Nutrigenomics

Nutrigenomics: Basics of Nutrigenomics, Tools of Nutrigenomics- Genomics, Transcriptomics, Proteomics, Metabolomics. Interaction between nutrient and gene- direct interactions, epigenetic interactions, genetic variations.Chronic disease and nutritional genomics.Role of nutrigenomics in coronary heart disease.

UnitV Drug nutrient interactions in specific conditions

Drug nutrient interactions in specific conditions: HIV/AIDS, organ transplantation, impact on mineral status and cancer. Safety measures of drugs in different disease conditions, special care

in drug intake. Diet counseling to prevent food and drug interactions, Computers in Nutrient- Drug Interaction management.

References:

1. Joseph I. Boullata, Vincent T. Armenti,, Handbook of Drug-Nutrient Interactions, Humana Press,Totowa,2004.
2. Beverly J. McCabe, Eric H. Frankel and Jonathan J. Wolfe, Hand book of food anddrug interactions, CRC press,2003.
3. Tripathi K.D, Essentials of medical Pharmacology, Ed 5, Jaypeebrothers,Medical publishers Pvt., Ltd.,2003.
4. Srilakshmi B, Nutrition Science, Ed 5, New Age International (P)Ltd.,2008
5. Sumathi R. Mudambi, M.V. Rajagopal. Fundamentals of food, nutrition and diet therapy, Ed. 6, New Age International (P) Ltd,2009.

Course Code	P21FNV42	SCIENTIFIC WRITING	L	T	P	C
VALUE ADDED PROGRAMME-II			30	-	-	2
Cognitive Level	K2:Understand K3: Apply K4 Analyze					
Learning Objectives	The Course aims to ➢ Learn some basic concepts of researchwriting ➢ Gain knowledge on research process and reportpreparation					

UnitI Scientific writing basics

Scientific Writing as a means of communication: concepts and importance. Role of scientific writing in research and its applications. Different forms of scientific writing- Articles in Journals, Research notes and reports, review articles, Monographs, Dissertations,Bibliographies.

UnitII Methods ofwriting

The reasons for preparing outlines- As a guide for plan of writing- As skeleton for the manuscript. Kinds of outline - Topic outlines, - Conceptual outline, - Sentence outlines - Combination of topic and sentence outlines. Importance and scope of preparing outlines or manuscript plan.

Unit III Drafting methods

Methods of drafting in articles: Titles, Sub Titles, Tables, Illustrations - Tables as systematic means of presenting data in rows and columns and lucid way of indication relationships and results. - Formation Tables: Title, Body stab, Stab, Column, Spanner and Box Head - Appendices: Use andguidelines

UnitIV Writing process

The Writing Process –role of writing process in research writing, getting started: Use outline as a starting device - Drafting, Reflecting, Re-reading: Checking organization, headings, content, clarity, Grammar,- Brevity and precision in writing, Drafting and Re-drafting based on critical evaluation

UnitV Supportive measures in scientificwriting

Clearly state the question to be addressed, Rationale and importance of the Empirical and theoretical conceptualization, Presenting pilot study / data, Research proposal and time frame, Clarity, specificity of method, Clear organization, Outcome of study and its implications, Budgeting, Available infra-structure and resources, Executive summary. Software used reference preparation (Mendeley, EndNote, ReadCube Papers.EasyBib.com Zotero Cite This For Me (formerly RefME) Sciwheel. RefWorks) plagiarism checking, grammar checking and citation.

References

1. Gurumani N, Scientific Thesis Writing and Paper Presentation. MJP Publishers,Chennai, 2016.
2. Mathews JR and Mathews RW, Successful Scientific Writing: A step by stepguide for the Biological and Medical Sciences, Fourth Edition, Cambridge UniversityPress,2014.
3. Rahim Abdul. Thesis Writing, A Manual for Researchers, New Age InternationalPvt Ltd,2007.
4. Ramadass, P and Aruni, A.W, Research and Writing Across the Discipline,MJP Publishers, Triplicane,2009.