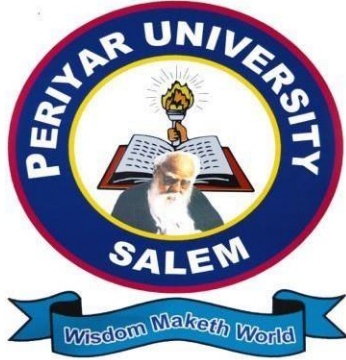


**PERIYARUNIVERSITY
PERIYAR PALKALAINAGAR
SALEM-636011**



DEGREE OF MASTER OF SCIENCE

CHOICE BASED CREDIT SYSTEM

SYLLABUS FOR M.Sc. FOOD & NUTRITION

**FOR THE STUDENTS ADMITTED FROM THE
ACADEMIC YEAR 2023-2024 ONWARDS**

(TAMILNADU STATE COUNCIL FOR HIGHER EDUCATION)

M.Sc. FOOD & NUTRITION

REGULATIONS AND SYLLABUS

(With effect from the academic year 2023-2024 onwards)

Preamble

The postgraduate program in Food and Nutrition has been designed to provide students a vast cope ranging from alleviation of malnutrition preventive, promotive and therapeutic care in hospitals, in food industries as well as food service managers in various establishments. The specialists in Nutrition and Dietetics play a vital role in promoting the quality of life of individuals and communities, which contributes significantly to the economic and overall development of the nation.

Program objectives

1. To impart knowledge and develop capacities of the students through state of the art higher education in the area of Food, Nutrition and Dietetics
2. To provide practical, field level experience in hospitals and food service establishments
3. To provide professionally competent manpower for academic and research institutions; hospitals and food industries; nutrition and health programs; food safety and quality control; consultancy and entrepreneurship

Eligibility for admission

An under graduate degree in Food and Nutrition/ Nutrition and Dietetics/ Food science and Nutrition/ Clinical nutrition and Dietetics/ Nutrition, Food service management and Dietetics/ Home Science.

Duration of the program

Two academic years consisting of 4 semesters

Highlights of the Revamped Curriculum

- The curriculum focuses on meeting the demands of the Food industry, Entrepreneurs, Public health sector, Hospitality industries, Healthcare and social welfare sectors.
- This student centric programme ensures knowledge and skill development by providing hands on training, on-the-job internships, projects, lab practices, experiential activities, exposure to entrepreneurial skills and training for competitive examinations.
- The course content is comparable to world class curriculum.
- The courses are updated to include recent developments in the field of Nutrition and Dietetics.
- References are updated and web resources are cited.
- Each course in the curriculum carries either a practical/activity or experiential learning component to ensure skill development along with acquiring knowledge in the subject.
- Potential for employability has been enhanced through mandatory internships.
- Digital literacy and competency is ensured using ICT enabled learning environment.

**TANSCHÉ REGULATIONS ON LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK
FOR POSTGRADUATE EDUCATION**

PROGRAMME OUTCOMES - M.Sc FOOD AND NUTRITION	
PO1	Disciplinary knowledge and skills: Possesses sound knowledge on the principles of Food science nutrition and the relationship between diet and health; acquires skill in Applying knowledge gained to prevent and manage disease conditions, promote health And be a productive member in the food processing and health sector.
PO2	Skilled communicator: Acquires the ability to translate evidence-based scientific Information into practical applications for health promotion; Develops skills necessary to be an effective dietitian/nutritionist.
PO3	Critical thinker and problem solver: Develops analytical skills and capabilities to resolve the problems. Efficiently to cater to the needs of a client, customer, an individual, family and society. Either independently or with the support of concerned authorities.
PO4	Sense of inquiry: Develops capability to probe the factors affecting the diet disease Relationship and arrive at diet modifications and recommendations to enhance health and to a manage disease efficiently.
PO5	Team player/worker : Displays ability to be a good team player either as a dietitian in the healthcare industry or as an employee in the food industry.
PO6	Skilled project manager: Demonstrates managerial skills required to be an Entrepreneur or serve in various capacities in the foodservice industry, hospitals and Fitness centres.
PO7	Digitally Efficient: Acquires the ability to utilize ICT for professional purposes in the hospital or in the food processing industry.
PO8	Ethical awareness/reasoning: Remains committed to ethical regulations while practicing as nutritionists, dieticians, foodservice managers and hospital administrators.
PO9	National and international perspective: Values and appreciates societal, environmental, health, safety, and cultural issues related to food within local and Global contexts.
PO10	Lifelong learners: Motivated to be updated at all times in order to achieve personal And professional goals and contribute significantly towards the health and well-being Of the family, community and society at large.

PROGRAMME SPECIFIC OUTCOMES	
PSO1	Attain enhanced knowledge of the recent advancements and trends in Nutrition, Dietetics and its Allied Sciences
PSO2	Acquire scientific temper leading to critical thinking and research motivation in Nutrition, Dietetics and its Allied Sciences
PSO3	Design and communicate scientific concepts, experimental results & analytical arguments and develop solutions for challenging problems of the society
PSO4	Demonstrate the commitment to the discipline of Personalized and Public Health Nutrition to uphold ethical principles in their career and contribute to societal health, safety and legal issues; and practice their responsibilities as a Nutritionist / Dietitian and other professionals
PSO5	Acquire essential skills in different lab techniques and interpret experimental data, applicable for innovative methods and advanced researches to draw logical conclusions.
PSO6	Comprehend the principles and applications of Nutrition and Dietetics and its Allied Sciences and apply them to enhance our life style

TEACHING METHODOLOGIES

Teaching methods :Chalk and Board, Experiential learning, Student centric learning and Smallprojects and Practical assignments; Virtual Classroom, LCD projector, Smart Class, Video Conference and Guest Lectures by eminent people.

Training students to engage in self-study without relying on faculty (for example – library and internet search, manual and handbook usage, etc.)

Library,Net Surfing ,Manuals, NPTEL,Naan Mudhalvan Courses Other university websites.

CREDIT DISTRIBUTION FOR PG PROGRAMME

Semester-I	Credit	Hours	Semester-II	Credit	Hours	Semester-III	Credit	Hours	Semester-IV	Credit	Hours
1.1. Core-I	5	7	2.1. Core-IV	5	5	3.1. Core-VII	5	6	4.1. Core-XI	5	6
1.2 Core-II	5	7	2.2 Core-V	5	6	3.2 Core-VIII	5	6	4.2 Core-XII	5	6
1.3 Core – III	4	6	2.3 Core – VI	4	6	3.3 Core – IX	5	6	4.3 Project with viva voce	7	10
1.4 Discipline Centric Elective -I	3	5	2.4 Discipline Centric Elective – III	3	4	3.4 Core – X	4	6	4.4 Elective - VI (Industry / Entrepreneurship) 20% Theory 80% Practical	3	4
1.5 Generic Elective-II:	3	5	2.5 Generic Elective - IV:	3	4	3.5 Discipline Centric Elective - V	3	3	4.5 Skill Enhancement course / Professional Competency Skill	2	4
			2.6 NME I	2	3	3.6 NME II	2	3	4.6 Extension Activity	1	
			2.7 Human Rights	1	2	3.7 Internship/ Industrial Activity	2	-			
	20	30		23	30		26	30		23	30
Total Credit Points -93											

M.Sc., FOOD AND NUTRITION

SEMESTER - I

Course status	Course Title	Credits	Hours
1.1. Core-I	Advanced Food science	5	7
1.2 Core-II	Advanced Human Physiology	5	7
1.3 Core –III	Advanced Food science practical	4	6
1.4 Elective -I	Macronutrients	3	5
1.5 Elective-II:	Food processing and technology	3	5
Total		20	30

SEMESTER – I

List of Courses	Course Code	Course Title	Hrs/ Week	Credits	University Examination			Exam Hrs
					Internal	External	Total	
Core – I Theory	23PFN 01	Advanced Food science	5	5	25	75	100	3
Core – II Theory	23PFN 02	Advanced Human Physiology	5	5	25	75	100	3
Core – III Practical I	23PFNP 01	Advanced Food science practical	6	4	40	60	100	3
Elective – I Theory	23PFNE01	Macronutrients	5	3	25	75	100	3
Elective – II Theory	23PFNE02	Food processing and technology	4	3	25	75	100	3
Total			30	20	140	360	500	

SEMESTER - II

Course status	Course Title	Credits	Hours
2.1. Core-IV	Research Methods in Nutrition	5	5
2.2 Core-V	Advanced Dietetics	5	6
2.3 Core –VI	Advanced Dietetics Practical	4	6
2.4 Elective –III	Nutrition Through Life Cycle	3	4
2.5 Elective -IV	Perspectives of Home Science	3	4
2.6 NME I	Food Preservation(offered to other departments)	2	3
2.7 Human Rights	Human Rights	1	2
Total		23	30

SEMESTER – II

List of Courses	Course Code	Course Title	Hrs/Week	Credits	University Examination			Exam Hrs
					Internal	External	Total	
2.1. Core-IV		Research Methods in Nutrition	5	5	25	75	100	3
2.2 Core-V		Advanced Dietetics	6	5	25	75	100	3
2.3 Core –VI		Advanced Dietetics Practical	6	4	40	60	100	3
2.4 Elective –III		Nutrition Through Life Cycle	4	3	25	75	100	3
2.5 Elective -IV		Perspectives of Home Science	4	3	25	75	100	3
2.6 NME I		Food Preservation	3	2	25	75	100	3
2.7 Human Rights		Human Rights	2	1	25	75	100	3
		Total	30	23	190	510	700	

SEMESTER - III

Course status	Course Title	Credits	Hours
3.1. Core-VII	Micronutrients	5	6
3.2 Core-VIII	Performance Nutrition	5	6
3.3 Core –IX	Techniques in Food analysis Practical	5	6
3.4 Core –X	Nutritional Biochemistry	4	5
3.5 Elective - V	Food Microbiology	3	4
3.6 NMEII	Diet and Nutrition counselling (offered to other departments)	2	3
3.7 Internship/ Industrial Activity	(Carried out in Summer Vacation at the end of Iyear)-Hospitals/ Food Industry	2	-
	Total	26	30

SEMESTER – III

List of Courses	Course Code	Course Title	Hrs/ Week	Credits	University Examination			Exam Hrs
					Internal	External	Total	
3.1. Core-VII	23PFNCT 01	Micronutrients	6	5	25	75	100	3
3.2 Core-VIII		Performance Nutrition	6	5	25	75	100	3
3.3 Core –IX		Techniques in Food analysis Practical	6	5	40	60	100	3
3.4 Core –X		Nutritional Biochemistry	5	4	25	75	100	3
3.5 Elective - V		Food Microbiology	4	3	25	75	100	3
3.6 NMEII		Diet and Nutrition counselling	3	2	25	75	100	3
3.7 Internship/ Industrial Activity		(Carried out in Summer Vacation at the end of Iyear)-Hospitals/ Food Industries	-	2				
		Total	30	26	165	435	600	

SEMESTER - IV

Course status	Course Title	Credits	Hours
4.1.Core-XI	Public health nutrition	5	6
4.2Core-XII	Food Product Development	5	6
4.3 Project with viva voce	Project	7	10
4.4Elective - VI(Industry/ Entrepreneurs hip) 20% Theory80% Practical	Food Microbiology practical	3	4
4.5 Skill Enhancement course / Professional Competency Skill	Entrepreneurial development	2	4
4.6Extension Activity		1	-
	Total	23	30

SEMESTER – IV

List of Courses	Course Code	Course Title	Hrs/ Week	Credits	University Examination			Exam Hrs
					Internal	External	Total	
4.1.Core-XI		Public health nutrition	6	5	25	75	100	3
4.2Core-XII		Food Product Development	6	5	25	75	100	3
4.3 Project with viva voce		Project	10	7	25	75	100	3
4.4Elective – VI Practical		Food Microbiology practical	4	3	40	60	100	3
4.5 Skill Enhancement course / Professional Competency Skill		Entrepreneurial development	4	2	25	75	100	3
4.6Extension Activity				1				
		Total	30	23	140	360	500	

LEARNING AND TEACHING ACTIVITIES

Work Load:

The information below is provided as a guide to assist students in engaging appropriately with the course requirements.

Activity	Quantity	Workload periods
Lectures	60	60
Tutorials	15	15
Assignments	5	5
Cycle Test or similar	2	4
Model Test or similar	1	3
University Exam Preparation	1	3
Total		90 Periods

1. Tutorial Activities

2. Laboratory Activities

3. Field Study Activities

4. Assessment Activities

Assessment Principles:

Assessment for this course is based on the following principles

1. Assessment must encourage and reinforce learning.
2. Assessment must measure achievement of the stated learning objectives.
3. Assessment must enable robust and fair judgments about student performance.
4. Assessment practice must be fair and equitable to students and give them the opportunity to demonstrate what they learned.
5. Assessment must maintain academic standards.

Assessment Details:

Assessment Item	Distributed Due Date	Weightage	Cumulative Weightage
Assignment 1	3 rd week	2%	2%
Assignment 2	6 th Week	2%	4%
Cycle Test – I	7 th Week	6%	10%
Assignment 3	8 th Week	2%	12%
Assignment 4	11 th Week	2%	14%
Cycle Test – II	12 th Week	6%	20%
Assignment 5	14 th Week	2%	22%
Model Exam	15 th Week	13%	35%
Attendance	All weeks as per the Academic Calendar	5%	40%
University Exam	17 th Week	60%	100%

CREDIT DISTRIBUTION FOR M.Sc FOOD AND NUTRITION

First Year

Semester-I

	Courses	Credit	Hours per Week(L/T/P)
Part A	Core Courses ³ (CC1, CC2, CC3)	14	20
	Elective Courses 2(Generic / Discipline Specific) EC1, EC2	6	10
		20	30

Semester-II

	Courses	Credit	Hours per Week(L/T/P)
Part A	Core Courses ³ (CC4, CC5, CC6)	14	17
	Elective Course 2 (Generic / Discipline Specific) EC3, EC4	6	9
Part B	NME-I & Human Rights	3	3
		23	30

Second Year

Semester-III

	Courses	Credit	Hours per Week(L/T/P)
Part A	Core Courses ³ (CC7, CC8, CC9)	15	18
	Elective Course 3 (Generic / Discipline Specific) EC5	3	3
	Core Industry Module (CC10)	4	6
Part B	NME-II	2	3
	Internship	2	
		26	30

Semester-IV

Part	Courses	Credit	Hours per Week(L/T/P)
Part A	Core Courses ³ (CC11, CC12)	10	12
	Elective Course 1 (Generic / Discipline Specific) EC6	3	4
	Project with Viva voce (CC13)	7	10
Part B	Skill Enhancement Course	2	4
Part C	Extension Activity (Can be carried out from Sem II to Sem IV)	1	
		23	30

Testing Pattern (25+75)

Internal Assessment

Theory Course: For theory courses there shall be three tests conducted by the faculty concerned and the average of the best two can be taken as the Continuous Internal Assessment (CIA) for a maximum of 25 marks. The duration of each test shall be one / one and a half hour.

Computer Laboratory Courses: For Computer Laboratory oriented Courses, there shall be two tests in Theory part and two tests in Laboratory part. Choose one best from Theory part and other best from the two Laboratory part. The average of the best two can be treated as the CIA for a maximum of 25 marks. The duration of each test shall be one / one and a half hour. There is no improvement for CIA of both theory and laboratory, and, also for University End Semester Examination.

**WRITTEN EXAMINATION : THEORY PAPER (BLOOM'S TAXONOMY BASED)
QUESTION PAPER MODEL**

Intended Learning Skills	Maximum 75 Marks Passing Minimum: 50% Duration : Three Hours
Memory Recall / Example/ Counter Example / Knowledge about the Concepts/ Understanding	Part –A (15x 1 = 15 Marks)
Descriptions/ Application (problems)	Part – B (2 x 5 = 10 Marks)
Analysis /Synthesis / Evaluation	Part-C (5x 10 = 50 Marks)

MINIMUM MARKS FOR PASSING:

a). Theory Papers:

The candidate shall be declared to have passed the examination if the candidate secures not less than 50 marks in total (CIA mark + Theory Exam mark) with minimum of 38 marks in the Theory Exam conducted by the University. The Continuous Internal Assessment (CIA) Mark 25 is distributed to four components viz., Tests, Assignment, Seminar and Attendance as 10, 05, 05 and 05 marks, respectively.

b). Practical paper:

A minimum of 50 marks out of 100 marks in the University examination and the record notebook taken together is necessary for a pass. There is no passing minimum for the record notebook. However submission of record notebook is a must. Practical examination

Scheme for **internal marks** (40marks)

Good laboratory practices -10marks

Performance evaluation based on observation note and record- 15marks

Internal tests (Average of best 2out of 3tests) -10marks

Attendance -5marks

Scheme for **external marks** (60 marks)

Record -10 marks

Practical -50marks

c). Project Work/Dissertation and Viva-Voce:

A candidate should secure 50% of the marks for pass. The candidate should attend viva-voce examination to secure a pass in that paper.

Candidate who does not obtain the required minimum marks for a pass in a Paper / Practical/ Project/Dissertation shall be declared Re-Appear (RA) and he / she has to appear and pass the same at a subsequent appearance.

Dissertation

Internal evaluation (25 marks)

Innovative idea -05 marks

Performance evaluation -05 marks

Report preparation -15marks

External evaluation (75 marks)

Report and presentation - 50 marks

Oral presentation - 15 marks

Viva voce - 10 marks

CLASSIFICATION OF SUCCESSFUL CANDIDATES:

Candidates who secure not less than 60% of the aggregate marks in the whole examination shall be declared to have passed the examination in First Class. All other successful candidate shall be declared to have passed in the Second Class. Candidates who obtain 75% of the marks in the aggregate shall be deemed to have passed the examination in the First Class with Distinction provided they pass all the examinations prescribed for the course at the first appearance. Candidates who pass all the examinations prescribed for the course in the first instance and within a period of two academic years from the year of admission to the course only are eligible for University Ranking.

MAXIMUM DURATION FOR THE COMPLETION OF THE PG PROGRAMME:

The maximum duration for completion of the PG Programme shall not exceed Four Years from the year of admission.

TRANSITORYPROVISION:

Candidates who were admitted to the PG course of study before 2023-2024 shall be permitted to appear for the examinations under those regulations for a period of three years, that is, up to end inclusive of the examination of April / May 2024. Thereafter, they will be permitted to appear for the examination only under the regulations then in force.

SYLLABUS FOR M.Sc FOOD AND NUTRITION

Title of the Course	Advanced Food Science						
Paper No.	Core I						
Category	Core	Year	I	Credits	5	Course Code	23PFNCT01
		Semester	I				
Instructional hours per week	Lecture	Tutorial	Lab Practice		Total		
	6	1	-		7		
Prerequisites	Basic concepts of Advanced Food Science						
Objectives of the course	<p>Enable students to</p> <p>Gain knowledge on the source and properties of food</p> <p>Familiarize students with changes occurring in various foodstuffs as a result of processing and cooking.</p> <p>Enable students to use theoretical knowledge in various applications and food preparations</p>						
Course Outline	<p>UNIT I Properties of food- Food nutrients, solids, solutions and colloids, Solutions- Physical properties of solutions, classification of foods based on viscosity characteristics. Solutes-chemical properties, Food dispersion: Colloids- Types of colloid and properties of colloids and rheology of food dispersions; Structure, formation and stability of gels, sols, emulsion and foams. Starch - Sources, Structure and composition of starch; Properties and characteristics of food starches; Modified food starches-Structure and composition, Effect of heat on food starch properties, gluten formation in wheat flour, influencing factors[gluten], gelatinization, gelation and retrogradation, dextrinization and factors affecting gelatinization.</p> <p>UNIT II Proteins-Structure and composition, Classification and properties of proteins; Effect of heat on physio-chemical properties of proteins; Role of proteins in food products; Texturized vegetable protein, protein concentrates. Enzymes: Classification and its nature; Mechanism of action; Factors influencing enzyme activity; Role of enzymes in food products; Immobilized enzymes and its application in food industries.</p> <p>UNIT III Fats and oil -Structure, composition and properties of fats and oil; storage of fat, characteristics [shortening, plasticity, flavor, retention of moisture, melting point, optical activity, color, specific gravity], Hydrogenation, winterization, flavor reversion, smoking point, Rancidity- Types, Mechanism and prevention; Role of fat/oil in food products; Fat substitutes. Sugar and sugar products-Types of sugar, Types of granulated sugar, Physical and chemical properties, Sugar products -Types of honey, Jaggery, corn syrup, various forms of sugar used in cookery and Crystallization of sugar.</p> <p>UNIT IV Milk components- water, carbohydrate, milk fat, milk protein, minerals and other components in milk, Physiochemical properties of milk, Effect of physical and chemical factors on milk components [Effect of heat, protein, factors affecting coagulation, casein coagulation, minerals, Non-enzymatic browning], [Effects of acid], Effects of enzymes-renin, fermented and non-fermented milk products Egg-proteins in Egg, microscopic structure of egg, characteristics [color, size], Nutritional qualities, quality check, functional properties- foaming, factors affecting foam formation.</p>						

	UNIT V Food additives- Definition, different food additives and Need for food additives. Flavour compounds in vegetables, fruits and spices; Effect of processing on food flavours; Role of colours and flavours in food products. Sweeteners- Properties, Artificial and Natural sweeteners and role of sweeteners in food industry.
Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / TNPSC / etc.
Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Recommended Text	1. Srilakshmi.B; Food Science, 6th edition New Age International (p) Limited Publishers 2015. 2. Shakunthalamanay N; Shadaksharaswamy.M; Foods Facts and Principles, Third edition, New Age International (p) Limited Publishers, 2014. 3. Lillian Hoaglandmeyer, Food chemistry, CBS Publishers and distributors, 2004. 4. Arindam Ramaswamy, Elements of Food Science, Oxford book company, 2010. 5. Norman N. Potter, Joseph H. Hotchkiss, and food science, fifth edition, CBS publishers and distributors, 1996. 6. B. Sivasankar, Food Processing and Preservation, PHI Learning Private Limited, 2011.
Reference Books	1. Gerard L. Hasenhuettl, Richard W. Hartel. (2019). Food Emulsifiers and Their Applications. Springer publications. 3 rd edition. 2. Vickie.A. Vacivak. (2021). Essentials of Food science. Springer publications. 5 th edition. 3. Dr.M.Swaminathan.(2015). Advanced text book of Food and Nutrition. volume-2. Bapco publications. 4. Eskein.(2012). Biochemistry of Food. Elsevier publications. 5. Lyn O brien Nabors.(2001). Alternative Sweeteners. Taylor and Francis publications. 6. Janet D. Ward and Larry Ward.(2006). Principles of Food Science. Stem Publishers. 4 th Edition.
Website and e-learning source	www.foodrisk.org. http://www.fsis.usda.gov/ https://www.fda.gov/food

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

CO No.	CO Statement
CO1	Overview the relationship between the chemical structure and the properties of the main components in food like starch, protein and lipids.
CO2	Understand the Composition and characteristics of various food commodities.
CO3	Explain the cooking quality of foods and apply food science knowledge in food industries
CO4	Identify and understand the nutrients and functions of foods in maintaining health
CO5	Analyze the proper use of food colors and food additives in safe food preparation.

MAPPING (CO/PSO):

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	3	3	3	3
CO2	3	3	3	3	3	3
CO3	3	3	3	3	3	3
CO4	3	3	3	3	3	3
CO5	3	3	3	3	3	3
Average	3	3	3	3	3	3

PEDAGOGY:

Lecture, Journal Reviewing, Power point presentations, Assignments and Discussions

Title of the Course	Advanced Human Physiology						
Paper No.	Core II						
Category	Core	Year	I	Credits	5	Course Code	23PNDCT02
		Semester	I				
Instructional hours per week	Lecture	Tutorial	Lab Practice		Total		
	6	1	-		7		
Prerequisites	Basic concepts of Advanced Human Physiology						
Objectives of the course	<p>This course will enable students to: Advance their understanding of some of the relevant issues and topics of human physiology. Enable the students to understand the integrated function of the system Understand alterations of structure and function in various organs and systems in disease conditions.</p>						
Course Outline	<p>UNIT I Cell Structure and Function. Transportation across cell membrane. Cell theory and Cycle. Difference between Meiotic and Mitotic cell. Stem cells- types and functions.</p> <p>Tissue Structure and Function.</p> <p>UNIT II Blood Composition & Functions Blood Group – ABO System & Rh factor. Blood Coagulation.</p> <p>Heart Structure & Function of Heart and Blood Vessels. Systemic & Pulmonary circulation Cardiac cycle and Conduction. Heart rate and Cardiac output. ECG. Blood pressure & their regulations</p> <p>UNIT III Respiratory System Structure and function. Gas Laws pertaining to Gas Exchange (Meaning only)-Henry's Law of Partial Pressure, Boyle - Mariotte's Law of Volume and Pressure, Dalton's Law of Partial Pressure, Charles's Law of Ideal Gas Equation and Fick's Law of Diffusion. Mechanism of respiration. Circulation and Exchange of respiratory gases. Internal and External Respiration. Chloride shift. Definitions of Lung volumes and Lung capacities Ventilation and Artificial Respiration.</p> <p>Immunity Definition and types Innate and Acquire immunity.</p> <p>Endocrine System Hormones and its type. Syndromes resulting from hypo and hyperactivity of Pituitary, Thyroid, Adrenals and Pancreas.</p> <p>UNIT IV Gastrointestinal System Structure and function of GI tract and its accessory organs. Digestion and absorption of Carbohydrates, Proteins and Fats.</p> <p>Reproductive System</p>						

	<p>Roll of hormones in reproduction and Lactation. Menstrual Cycle and Menopause. Invitro (I V) fertilization Spermatogenesis.</p> <p>UNIT V NERVOUS SYSTEM Structure and Function of Neuron. Afferent and Efferent Nerves. Conduction of Nerve Impulse- Synapses, Neurotransmitters, Summation and Action Potential. Sympathetic and Parasympathetic nervous System. Cerebrospinal fluid (CSF) – composition and function. Blood-brain barrier (BBB). Electroencephalogram (EEG)</p> <p>EXCRETORY SYSTEMS Renal system Organs in the Urinary System. Structure and functions of Nephron. Juxtaglomerular Cell. Mechanism of formation of urine, Role of kidney to regulate Blood pressure, Water, Electrolytes and Acid Base Balance. Skin Structure and function. Regulation of temperature of the body.</p>
<p>Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper)</p>	<p>Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / TNPSC / etc.</p>
<p>Skills acquired from this course</p>	<p>Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill</p>
<p>Recommended Text</p>	<p>1. K. Sembulingam&PremaSembulingam (2019), Essentials of Medical Physiology. Jaypee publications. Eighth edition 2. Waugh A, Ross and Wilson (2018). Anatomy and Physiology in Health and Illness. Elsevier publications. 13ed. 3. CC Chatterjee (2020). Human Physiology. CBS publishers. 13 ed.</p>
<p>Reference Books</p>	<p>1. Ganongs.W.F;Review of medical physiology,1985. 2. Campbell.E.Jetal;Clinical and applied physiology,1984. 3. Guyton AC and Hall JB; Textbookof medical physiology,1996. 4. Guyton AC; Functions of human body, 1985. 5. Wilson KJ Wand Waugh A; Ross and Wilson. Anatomy and Physiology in health and illness, 8th edition, 2003.</p>

	6.Judith E.Brown.,Nutrition New,2 nd edition, West/Wadsworth west/Wadsworth, An International Thomson publishing company, 1998.
Website and e-learning source	https://youtu.be/MZDy0RvA52Y -Osmosis https://youtu.be/TgcyiVQnVBs - Respiratory system https://youtu.be/44B0ms3XPKU - nervous system

On successful completion of the course the student will be able to-

CO No.	CO STATEMENT
CO 1	Develop insight of normal functioning of all the organ systems of the body and their interaction. Understand the current state of knowledge about the functional organization of Human Cell and Histology.
CO 2	Understand the structural and functional organization of Blood and Cardiac System
CO 3	Understand the structural and functional organization of Respiration, Immunity and Endocrine GIT and Urinary System
CO 4	Comprehend the structural and functional organization Digestive System and Reproductive System
CO 5	Understand the structural and functional organization of Skin, Nervous and Excretory system

MAPPING (CO/PSO):

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	3	3	3	3
CO2	3	3	3	3	3	3
CO3	3	3	3	3	3	3
CO4	3	3	3	3	3	3
CO5	3	3	3	3	3	3
Average	3	3	3	3	3	3

PEDAGOGY:

Lecture, Journal Reviewing, Power point presentations, Assignments and Discussions

Title of the Course	Advanced Food Science Practical						
Paper No.	Core III						
Category	Core	Year	I	Credits	4	Course Code	23PFNCP01
		Semester	I				
Instructional hours per week	Lecture	Tutorial	Lab Practice		Total		
	-	-	6		6		

COURSE OBJECTIVES:

To enable the students

Comprehend the knowledge gained on characteristics and properties of foods during cooking

Apply the properties of food in various food processing and preparations Analyse the factors affecting cooking quality of foods

Create appropriate food preparation and processing methods to ensure quality standards

UNIT -1

1. Sensory method –
Analysis of taste sensitivity-Threshold test Duo –Trio test, Multiple sample difference
2. Starch
Microscopic structure and gelatinization.
Factors affecting gelatinization –sag test. Gluten formation

UNIT -2

1. PULSE
Factors affecting cooking quality
2. FRUIT
Enzymatic browning Pectin test
Firmness of gel

UNIT -3

1. VEGETABLE
Various method of cooking fat soluble and water-soluble pigment.
2. MILK
Detecting the presence of starch, soda, starch, urea in milk sample. pH of milk sample.
Effect of acid on milk Maillard reaction.

UNIT -4

1. SUGAR
Relative sweetness of sugar- sucrose, maltose, lactose, fructose, dextrose, glucose, artificial sweeteners Stages of sugar cookery
Effect of dextrose, jaggery, honey and cream of tartar on sucrose.
2. FATS AND OIL
Smoking point – Groundnut oil, coconut oil, Gingelly oil, Olive oil, Vanaspati, Ghee, Refined Sunflower oil, Rice bran oil.
Cooking temperature and fat absorption- – Groundnut oil, coconut oil, Gingelly oil, Refined Sunflower oil, Rice bran oil.

UNIT -5

1. PHYSICAL PROPERTIES
 - a. Thousand grain weight
 - b. Thousand grain volume
 - c. Hydration capacity
 - d. Hydration index
 - e. Swelling capacity
 - f. Specific gravity
 - g. Seed displacement test

h. Viscosity - Line spread test, Viscometer.
2. Adulteration

TEXT BOOKS:

Srilakshmi B. (2015). Food Science, New Age International (P) Ltd. Publishers.

Potter N. and Hotchkiss J.H. (1996). Food Science, Fifth ed., CBS Publishers and Distributors, New Delhi

Avantinasharma (2017). Text book of food science and Technology. CBS Publisheres and distributes ltd. 3rd Edition.

Reddy S M. (2015). Basic Food science and technology. New Age International publishers. 2ND edition.

REFERENCES:

Swaminathan A (1979). Food Science And Experimental Foods, Ganesh And Company Madras. 3rd edition.

Bennion, Marion and O. Hughes (2001). Introductory Foods. Edi: mac millian N. Y. 1st edition.

Eskein . (2012). Biochemistry of Food. Elsievier publications

Desrosier, N.W. and James N. (2007). Technology of food preservation.

AVI Publishers.

Manay, S. and Shadaksharamasamy, (2004) .Food: Facts and Principles, New Age International Publishers, New Delhi. 1st edition.

E-LEARNING RESOURCES

<http://www.fao.org/3/V5030E/V5030E00.htm>

<https://fmtmagazine.in/fruits-vegetables-processing-technologies/>

COURSE OUTCOME:

On successful completion of the course the students will be able to

CO No.	CO Statement
CO1	Gain knowledge on sensory analysis and cereal cookery concept
CO2	Understand the properties of various food.
CO3	Analyze the cooking quality of foods and apply knowledge in food industries.
CO4	Identify and understand the Physical characteristics.
CO5	Revise appropriate food preparation and processing methods to ensure standards in food industry.

MAPPING (CO/PSO):

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	3	3	3	3
CO2	3	3	3	3	3	3
CO3	3	3	3	3	3	3
CO4	3	3	3	3	3	3
CO5	3	3	3	3	3	3
Average	3	3	3	3	3	3

Title of the Course	Macronutrients						
Paper No.	ELECTIVE 01						
Category	Elective	Year	I	Credits	3	Course Code	23PNDE01
		Semester	I				
Instructional hours per week	Lecture	Tutorial	Lab Practice		Total		
	4	1	-		5		
Prerequisites	Basic concepts of Macronutrients						
Objectives of the course	<p>To enable the students</p> <p>To understand the relationship between lipid, carbohydrate, protein and mineral metabolism.</p> <p>To learn about the therapeutic uses of carbohydrates protein and fat in prevention of non-communicable disease.</p> <p>To get insights in the inborn errors of metabolism</p>						
Course Outline	<p>UNIT I: ENERGY- Energy content of foods, physiological fuel value, Estimation of total energy requirements (BMR, REE and physical cost of activities) TEE, Energy balance, Basal metabolic rate, total energy requirements, BMR& RMR, Factors affecting BMR, Thermic effect of food. Changes in body weight and body composition with the changing energy balance, Regulation of food intake- role of hunger and satiety centers. Energy balance and obesity.</p> <p>UNIT II: CARBOHYDRATES – Classification , Therapeutic uses of carbohydrates, sugars in parenteral nutrition. Glycemic index of foods and its uses. Toxic effects of fructose, xylitol and galactose. Sugar alternatives, Role of dietary fiber in health and disease. Role of carbohydrates in health and disease</p> <p>UNIT III: PROTEIN – Historical review of protein metabolism, Amino acid patterns in protein & of animals and vegetable origin, critical study of methods of assessment of protein quality. Physiological functions of proteins. Essential Amino Acids, amino acid balance and imbalance, Role of protein in health and disease. Supplementation of individual amino acid.</p> <p>UNIT IV: LIPIDS–Concepts of visible and invisible fats, EFA, SFA, MUFA, PUFA, omega–6 to omega–3 ratios. – sources and physiological functions and their role in health and disease. Adipose tissue – Lipogenesis and Lipolysis, lipoproteins – types and health implication. Storage of body fat, Effects of deficiency. Fat substitutes, Hypocholesterolaemic foods – garlic, fiber and plant proteins.</p> <p>UNIT V: WATER – Sources, Function, Requirement, Distribution of water in the body and Factors influencing distribution of body fluid. Exchange of water</p>						

	in the body. Water imbalance – dehydration- water intoxication, water and electrolyte mechanism – ADH,
Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / TNPSC / etc.
Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Recommended Text	<ol style="list-style-type: none"> 1.Satyanarayana, U., & Chakrapani, U. (2013). Biochemistry, Book and Allied Pvt. <i>Ltd.</i>, <i>Kolkata</i>. 2.Wardlaw, G. M., Byrd-Bredbenner, C., Moe, G., Berning, J. R., & Kelley, D. S. (2013). <i>Wardlaw's perspectives in nutrition</i>. McGraw-Hill. 3.Williams, S. R. (2004). Nutrition and diet therapy. <i>Nutrition and diet therapy</i>. 4.Sizer, F., Whitney, E., & Webb, F. (2003). Nutrition Concepts and Controversy, Thomas Wadsworth, Australia. 9th edition. 5..Shils, M. E., Olson, J. A., &Shike, M. (2000). Modern nutrition in health and disease. Modern Nutrition in Health and Disease . Vol I and II. Lea &Febiger Philadelphia, A Waverly Company. Eighth edition. 6.Mahan, L.K., & Stump, S.E. (2002). Krause’s Food Nutrition and Diet Therapy. W.B. Saunder’s company, Philadelphia. 10th edition.
Reference Books	<p>Guthire, H.A., (2001). Introductory Nutrition. C.V. Mosby Company, St. Louis. Tenth edition.</p> <p>Bogert, J.G.V., Briggs, D.H., & Calloway, (2000). Nutrition and physical fitness. W.B. Saunders Co., Philadelphia, London, Toronto. 11th edition.</p> <p>Brown, J.E., (2002). Nutrition Now. Wadsworth Thomson Learning New York. 3rd edition.</p> <p>Toteja, G. S. (2004). <i>Micronutrient profile of Indian population</i>. Indian Council of Medical Research Publication, New Delhi.</p> <p>Swaminathan, M., (2002). Principles of Nutrition and Dietetics. BAPPCO, 88, Mysore Road. Bangalore – 560 018.</p> <p>Jain, J.L., Jain, S., & Jain, N., (2005). Fundamentals of Biochemistry. S. CHAND & COMPANY Ltd. Ram nagar, New Delhi-110 055. 6th revised edition</p>
Website and e-learning source	<ol style="list-style-type: none"> 1.http://www.nutritionfoundationindia.res.in 2. nhp.gov.in/healthy living/ healthy diet 3.http://www.nin.res.in

COURSE OUTCOMES:

After studying this paper, the students would know

CO No.	CO STATEMENT
CO1	The essentials of nutrients in growth and development of humans
CO2	The importance of major nutrients in maintaining human health and leading active lifestyle
CO3	The enhancement of nutritional quality of the diet.
CO4	Identify the various types & sources of food borne illness and methods of prevention.
CO5	The role of nutrients in health and diseases.

MAPPING (CO/PSO):

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	3	3	3	3
CO2	3	3	3	3	3	3
CO3	3	3	3	3	3	3
CO4	3	3	3	3	3	3
CO5	3	3	3	3	3	3
Average	3	3	3	3	3	3

PEDAGOGY:

Lecture, Journal Reviewing, Power point presentations, Assignments and Discussions

Title of the Course	Food processing and technology						
Paper No.	ELECTIVE 02						
Category	Elective	Year	I	Credits	3	Course Code	23PFNE02
		Semester	I				
Instructional hours per week	Lecture	Tutorial	Lab Practice		Total		
	4	1	-		5		
Prerequisites	Basic concepts of Food processing and technology						
Objectives of the course	<p>To enable the students: Understand the science behind processing of foods and its impact on nutritive value of food stuffs. Acquire in-depth knowledge on production of processed food products and the waste utilization techniques. Understand the changes in physicochemical properties of foods due to processing condition. Understand the various parameters related to post-harvest technology</p>						

COURSE OUTCOME:

On successful completion of the course the students will be able to

CO No.	CO Statement
CO1	The concepts and principles of food processing.
CO2	The various processed food products from plant and animal sources.
CO3	The by-products utilization from food processing.
CO4	The systematic knowledge of basic and applied aspects in food processing and technology.
CO5	The various post-harvest technologies for different food products

UNIT-I

Processing of foods: Primary, secondary and tertiary processing, historical perspective, traditional technologies used in food processing. Effects of processing on components, properties and nutritional value of foods.

Enzymes in Food Processing: Enzyme- Review of classification, enzyme inhibitors, enzymatic browning.

UNIT-II

Cereal Processing and Technology:

Rice: parboiling, milling and pearling; Processing and milling of wheat, maize, barley, oats and rye.

Millets: processing of millets;

Cereal Products: Flours and its quality; Processed products of rice, wheat and

maize; By products utilization; breakfast cereals and extrusion; Effect of processing on nutritive value of cereals; changes in physiochemical properties of cereal starch and protein due to processing.

Milling process: Complete milling process, break rolls, reduction rolls, milled products and their nutritive value and applications

Pulse Processing and Technology:

Dals, flours, protein concentrates, isolates and hydrolysates; Byproducts utilization; Effect of processing on nutritive value and physiochemical properties of pulses.

Nuts and Oil Seeds Processing and Technology:

Nuts Processing methods, Oil seeds processing: Oil extraction methods and refining process; byproducts utilization; Effect of processing on nutritive value and physiochemical properties of vegetable oils.

UNIT-III

Vegetables Processing and Technology:

Pigments: Classification, effects on processing of vegetables; Preliminary processing of vegetables;

Vegetable products: Fermented and nonfermented and its shelf life; Vegetable waste utilization; Effect of processing on nutritive value and physiochemical properties of vegetable

Fruits Processing and Technology:

Concept of maturity, ripening and senescence; Methods of fruit processing technologies: traditional and new methods.

Fruit products: fermented and nonfermented; Effect of processing on nutritive value and physiochemical properties of fruits;

Browning reactions: types and mechanism; prevention methods; Fruit waste utilization.

Milk Processing and Technology:

Milk types, composition, physiochemical properties; Milk processing- Separation, centrifugal process, natural creaming, pasteurization, sterilization, homogenization. Milk storage; Effects of processing on nutritive value and physicochemical properties of milk

UNIT-IV

Egg Processing and Technology:

Egg processing and storage; Effect of processing on nutritive value and physiochemical properties of eggs; changes in egg quality during storage and preservation methods.

Meat Processing and Technology:

Meat processing and storage; Factors influencing meat quality; Ageing and tenderization of meat.

Poultry: Processing and storage of poultry meat; Preservation methods for poultry.

Fish: Processing and storage; Preservation methods for fish. Effect of processing on nutritive value and physiochemical properties of meat, poultry and fish.

UNIT-V

Introduction of post-harvest technology

Introduction to post-harvest technology of agricultural produce; Status of Production, Losses, Need, Scope and Importance.

Post-Harvest Loss- Definition, Factors contributing to Post-harvest Loss; and Technologies and Practices to reduce Post-harvest Losses.

TEXTBOOKS

Shakuntala Manay N ShadakCheraswamyM . (2004) Food Facts and Principles. New age publisher . 2nd edition.

Roday S. (2011) .Food Science. Oxford publication . 1st edition.

B Srilakshmi (2015)Food science. New Age Publishers. 6th edition. Fellows P.(2000). Food Processing Technology, 2nd Edition.

Woodhead Publishing Limited and CRC Press LLC. 1st edition.

Avantina Sharma. (2017).Text book of food science and Technology. CBS Publisheres and distributes ltd. 3rd edition.

REFERENCES

Raog . (2006).Essentials of food process engineering . PHI learning private ltd.

Janet D Ward and Larry Ward.(2006). Principles of Food Science . Stem Publishers. 4th edition.

Srivastava R P and Kumar S. (2006) Fruits and Vegetables Preservation- Principles and Practices. International Book Distributing Co. 3rd edition.

W B Crusess.(2004). Commercial Unit and Vegetable Products.

W.V. Special Indian Edition, PubAgrobios India . 2nd edition. Forsythe S J and Hayes P R (1998). Food Hygiene,

Microbiology and HACCP. GaitersburgMaryland Aspen.

Eskein .(2012). Biochemistry of Food. Elsevier publications. 1st edition.

ELEARNING RESOURCES:

<http://www.fao.org/3/V5030E/V5030E00.htm><https://fmtmagazine.in/fruits-vegetables-processing-technologies>https://www.actioncontrelafaim.org/wp-content/uploads/2018/01/technical_paper_ph1.pdf

<https://www.nutsforlife.com.au/resource/nuts-and-processing><https://www.fssai.gov.in/>

MAPPING (CO/PSO):

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	3	3	3	3
CO2	3	3	3	3	3	3
CO3	3	3	3	3	3	3
CO4	3	3	3	3	3	3
CO5	3	3	3	3	3	3
Average	3	3	3	3	3	3

PEDAGOGY:

Lecture, Journal Reviewing, Power point presentations, Assignments and Discussions

SEMESTER II

2.1 CORE: IV
RESEARCH METHODS IN NUTRITION

CREDIT: 5

SEMESTER: 2

YEAR: 1

HOURS PER WEEK :5

OBJECTIVES:

To provide students understandings about the basic concepts, approaches and methods in conducting research thereby enabling them to appreciate and critique the nuances of designing a research study as well the ethical dimensions of conducting researches.

To explain the importance of research in food science and nutrition.

To make students understand the types of tools applicable to research problem and develop skills of preparing out line of research work and construct common data collection tools.

COURSE OUTCOME:

On successful completion of the course the student will be able to

CO No.	CO STATEMENT
CO 1	Demonstrate knowledge of the scientific method, purpose and approaches to research and Become a qualified researcher.
CO 2	Identify and selection of the research sampling and scales of measurement
CO 3	Understand the types of tools applicable to research problem and develop skills of preparing out line of research work and construct common data collection tools
CO 4	Assess the numerical data for providing statistical evidences to support the research results and interpretation of data with the use of tables and pictorial representations
CO 5	Present research data in a scientific manner and Understand the key elements of a research report and various applications of computer in Nutrition research

Unit 1: Foundation of Nutrition Research

1. Meaning, Objectives and Classification of Research Designs
–**Exploratory, Descriptive** – Longitudinal and Cross sectional, Observation-Participant and Non-participant, Epidemiological Surveillance, Retrospective, IN VIVO, IN VITRO and **Experimental** – Pre-Experimental, Quasi Experimental, True Experimental and Statistical Experimental designs.
2. Need of Research in Food Science and Nutrition
3. Research Process-
 - Selection and Formulation of Research Problem
 - Objectives of Research: Explanation, Control and Prediction
 - Hypothesis: Definition, Importance, Types and Errors - I & II
 - Deciding Variables

Unit 2: Sampling and Sample Design

Sampling Process and Characteristics of good Sampling

1. Classification of Sampling Techniques - Probability and Non Probability Sampling
2. Preparation of Laboratory Food Samples
3. Sampling and Non- Sampling Errors

Measurements and Scaling -

1. Fundamental and Comparative Scales – Meaning and types

- Nominal Scale
- Ordinal Scale
- Interval Scale
- Ratio Scale

2. Non comparative Scales– Meaning and types

1. Continuous Rating Scale
2. Itemized Rating Scale
 - Likert Scale
 - Semantic Differential Scale
 - Stapel Scale

Unit 3: Data Collection and Preparation

1. Data Collection – Tools –0

Primary Data

1. Interviews -structured and unstructured
2. Case studies
3. Questionnaire
4. Surveys – Pilot & KAP
5. Laboratory Experiments

Secondary Data

1. Published Sources
2. Unpublished Sources
3. **Reliability and Validity** of Tools– Meaning

4. Data Preparation Process –

- Editing
- Coding
- Classification
- Tabulation

Unit 4: Statistical Methods

1. Parametric and Non-Parametric tests–Difference and Applications

2. Data Analysis Process-

1. Descriptive Analysis-

- Graphical and Diagrammatic Presentations
- Central Tendency – Mean, Median & Mode
- Dispersion -Standard Deviation

2. Statistical Inference – Tests of Hypothesis

- t – test
- ANOVA – One Way & Two Way
- Chi- square test – Goodness of Fit & Test of Independence

Unit 5: Reporting the Findings and Computer Applications

1. Report Writing –

- Importance
- Types
- Mechanics
- Guidelines and Precautions
- End Notes- Bibliography, Appendices, Footnotes and Glossary of terms

2. computer applications in nutrition research -importance and uses

3. Applicable Statistical Analysis Software-

- Literature Searching-PubMed
- Data Analysis- Micro Soft Excel, SPSS, Minitab
- Plagiarism Checker – Turnitin, Scribbr

TEXTBOOKS

● Kothari C R (2004). Research Methodology – Methods & Methodology. Delhi, New Age International Pvt Ltd. 2nd Ed

Chawla, Deepak and Neena Sondhi (2018): Research Methodology -Concepts and Cases. Noida, Vikas Publishing House Pvt Ltd. 2nd Ed.

● Gupta, SP (2019). Statistical Methods. New Delhi. S Chand & Sons. 45th ed

● Copper, H.M. (2002). Integrating Research : A guide for literature reviews. California: Sage, 2nd Edition.

● Kerlinger, Foundation of Educational Research Ingle P.O. Scientific Report Writing. Nagpur, Sarla P. Ingle.

REFERENCES

- Ranjit Kumar (2011). Research Methodology: a step-by-step guide for beginners, SAGE Publications. 3rd edition.
- Anderson, David R and et.al.(2013) : Statistics for Business and Economics. Delhi, Cengage Learning India Pvt Ltd. 11th Ed.
- Bandarkar, P.L. and Wilkinson T.S. (2000): Methodology and Techniques of Social Research. Himalaya Publishing House, Mumbai.
- Bell, Judith (2005): Doing your Research Project – A guide for first time researchers in education, health and social science. England, Open University Press. 4th Ed.
- Danial, Wayne W and Chad L Cross (2017): Biostatistics – Basic Concepts and Methodology For the Health Sciences – International Student Version. New Delhi, ArEmmInternatonal, 10th Ed.

Mapping: (CO/PSO)

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO6
CO1	1	3	2	2	3	2
CO2	1	1	1	0	2	1
CO3	3	3	3	3	3	2
CO4	1	3	3	0	3	1
CO5	3	2	3	0	0	1
Average	1.8	2.4	2.4	1	2.2	1.4

PEDAGOGY

Lecture, Power Point Presentation, Demonstration, Group Discussion, Assignment, Seminars and Oral & Written Revision

2.2 CORE - V
ADVANCED DIETETICS

CREDIT: 5
SEMESTER :II
YEAR:1
HOURS PER WEEK :6

COURSE OBJECTIVES:

To acquire Knowledge regarding the effect of various diseases on nutritional status and nutrient requirement

To understand the modifications in nutrients and dietary requirements for therapeutic condition.

To Learn recent concepts in dietary management of different diseases.

COURSE OUTCOME:

On successful completion of the course the students will be able to

CO No.	CO Statement
CO1	Critique the Nutritional screening technique
CO2	Comprehend the current concepts of therapeutic diets and critically ill
CO3	Implement the dietary principles on various disorders.
CO4	Acquire the knowledge of diet counseling skills.
CO5	Apply the dietary principles to manage the lifestyle disorders in the society

UNIT I

Nutritional screening, Nutritional care process, Nutritional Assessment, Nutritional diagnosis , Nutritional Intervention , Monitoring and evaluation.

Basic concepts of diet therapy – Therapeutic adaptations of Normal diet, Principles and classification of therapeutic diets. Routine Hospital diets – Regular, soft, fluid diet

Nutritional Management in critical care -Nutritional screening and nutritional Status assessment of critically ill, Nutritional requirement according to the critical condition

Nutritional support systems: Enteral and parenteral nutrition support- Types, composition and complications.

UNIT II

Medical Nutrition therapy for gastrointestinal and liver disorders Upper Gastrointestinal tract Diseases – Nutritional care and diet therapy in Diseases of oesophagus - Oesophagitis, Gastro esophageal reflux disease [GERD] and Hiatus hernia.

Disorders of stomach: Indigestion, Gastritis, Gastric and duodenal ulcers, and dumping syndrome

Lower gastrointestinal tract Diseases/Disorders-Common Symptoms of Intestinal dysfunction - Flatulence, constipation, haemorrhoids, diarrhoea, steatorrhoea, Diseases of the large intestine-Diverticular disease, Irritable bowel syndrome, inflammatory bowel disease Diseases of Small intestine-Celiac disease, tropical sprue, intestinal brush border enzyme deficiencies.

Diseases of the Liver- hepatitis, hepatic coma, cirrhosis, cholecystitis, cholelithiasis and pancreatitis, Zollinger Ellison syndrome and Biliary dyskinesia.

UNIT III

Medical Nutrition therapy for Pulmonary disease-Effect of Malnutrition on pulmonary system, effect of pulmonary disease on nutritional status, chronic pulmonary diseases- Asthma, cystic fibrosis, chronic obstructive pulmonary disease and Pneumonia- Pathophysiology and dietary management.

Medical Nutrition therapy for Rheumatic disease- Etiology, Pathophysiology of Inflammation of Rheumatic diseases, Rheumatoid Arthritis, Osteoarthritis and Sjogren syndrome.

Nutritional management of physiological stress- Classification, Complications, Metabolic changes in protein and electrolytes and Dietary management of burns, dietary management of trauma and stress.

UNIT IV

Nutritional Management on Weight imbalance -Regulation of food intake and pathogenesis of obesity and malnutrition and starvation; Weight Imbalance: prevalence and classification.

Underweight -Etiology and Dietary management; Obesity-Etiology, classification, Energy balance, dietary modifications and Bariatric surgery- types and dietary modifications of pre and post bariatric surgery.

Nutritional Management in metabolic disorders- Prevalence, Etiology, risk factors, complications and dietary modifications of diabetes mellitus.

UNIT V

Nutritional management of cardiovascular diseases-etiology, risk factors, clinical features and dietary modifications of Dyslipidemias, Atherosclerosis, Hypertension, Ischemic heart disease, Congestive cardiac failure.

Nutrition Management of Renal Disease -Etiology, Clinical and metabolic manifestations, Diagnostic tests, Types-Glomerulonephritis, Nephrotic syndrome, Renal Failure: Acute and chronic, ESRD, Nephrolithiasis and Dietary modifications.

Nutritional management in cancer- Pathogenesis and progression of cancer, types, Symptoms and Dietary management.

TEXT BOOKS:

Mahan L.K., Sylvia Escott-Stump.(2000). Krause's Food Nutrition and Diet Therapy. W.B. Saunders Company London. 10th edition.

B. Srilakshmi. (2007).Dietetics. K.K. Gupta For New age International Pvt. Ltd. New Delhi Publisher.

Antia F.P. And Philip Abraham.(2001).Clinical Nutrition and Dietetics.Oxford Publishing Company.

Passmore P. And M.A. East Wood.(Digitised in 2010).Human Nutrition And Dietetics.Churchill Living Stone.

S.R.Mudambi.M.K.Rajagopal.(2009).Fundamentals, Food Nutrition and Diet therapy.New Age Publishers. 5th edition.

Robinson Ch., M.B. Lawlea, W.L., Chenoweth, And A.E., Carwick.(1990).Basic Nutrition and Diet therapy, Macmillan Publishing Company.

REFERENCES:

Garrow JS, James WPT, Ralph A.(2000). Human Nutrition and Dietetics.Churchill Livingstone, NY. 10th edition.

Groff L James, Gropper S Sareen.(2000). Advanced Nutrition and Human Metabolism.West / Wadsworth, UK. 3rd edition.

Sue Rodwell Williams. (1993).Nutrition, Diet Therapy.W.B. Saunders Company London. 7th edition.

Whitney, E. N. and C. B..Cataldo.(1983). Understanding Normal and Clinical Nutrition. West Pub. S1. Paul.

E-LEARNING RESOURCES:

www.nutrition.gov - Service of National agricultural library, USDA.

www.nal.usda.gov/fnic -Food and Nutrition information centre.

<https://www.globalhealthlearning.org>.

Mapping of Co with PSO:

CO/PSO	PSO 1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	2	3	1	2
CO2	2	3	3	3	1	2
CO3	3	3	3	3	1	3
CO4	2	3	3	3	1	2
CO5	3	3	3	3	1	3
Average	2.6	3	2.8	3	1	2.4

PEDAGOGY

Lecture, journal reviewing, Assignments, Power point presentations, video presentations.

**2.3 CORE VI
ADVANCED DIETETICS PRACTICALS**

CREDITS :4
SEMESTER :II
YEAR : 1
HOURS PER WEEK : 6

COURSE OBJECTIVES:

To acquire Knowledge in planning diets for various disorders
To gain knowledge in diet counselling and educating patients. To understand the therapeutic modifications of diet.

COURSE OUTCOME:

On successful completion of the course the students will be able to

CO No.	CO Statement
CO1	Evaluate various therapeutic diets
CO2	Identify the requirements for disease conditions and critically ill patients.
CO3	Assess and plan the diets for various disease conditions.
CO4	Create Knowledge in nutrient calculations and dietary principles.
CO5	Design the personalized diets for different individuals in the society

1. Routine hospital diet : Regular diet, Clear liquid, Soft diet, Full liquid diet and Planning and preparing Enteral feed plan [8hrs].
2. Assessing requirements and planning diet for obese and underweight individual[6hrs]
3. Planning and preparing diet for Diabetes Mellitus[IDDM and NIDDM] [6hrs].
4. Planning and preparation of diet for Atherosclerosis with hypertension[6hrs]
5. Assessing and planning diets for the following conditions[13hrs]
 - a. Celiac disease
 - b. Lactose intolerance.
 - c. GERD
 - d. Peptic ulcer
 - e. Hepatitis
 - f. Cirrhosis

6. Planning and preparing diet for Pneumonia [6hrs]
7. Planning and preparing diet for Rheumatic arthritis[6hrs]
8. Planning and preparation of diet for Glomerulonephritis[6hrs]
9. Planning and preparation of diet for cancer according to the condition.[6hr]
10. Planning and Preparing diet for pre and post Bariatric surgery patients.[6hrs]
11. Assessment and planning diet for post burn condition[6hrs].

TEXTBOOKS:

Stump SE.(2012).Nutrition and diagnosis related care. Lippincott Williams and Wilkins. Canada.7th edition.

Width.M&Reinhardt.T. (2018).The Essential Pocket Guide for Clinical Nutrition.Wolters Kluwer Publishers. 2nd edition.

Whitney EN and RolfesSR.(2002). Understanding Nutrition, 9th edition, West/Wordsworth.

REFERENCES:

Gopalan C., Ram Sastri B.V. And BalSubramaniam S.C. (2006). Nutritive Value of Indian Foods. Hyderabad, National Institute of Nutrition. Indian Council of Medical Research.

E-LEARNING RESOURCES:

www.nutrition.gov - Service of National agricultural library, USDA.

Mapping: (CO/PSO)

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	2	3	3	3	1	2
CO2	3	3	3	3	1	3
CO3	3	2	3	3	2	3
CO4	3	2	3	3	3	2
CO5	3	3	3	3	3	3
Average	2.8	2.6	3	3	2	2.6

PEDAGOGY

Group Discussion, Case study, Assignments, Planning menus in charts.

2.4 ELECTIVE -III

NUTRITION THROUGH LIFECYCLE

CREDIT:3

SEMESTER :II

YEAR :I

HOURS PER WEEK :4

COURSEOBJECTIVES:

To know

- The computation of Recommended Dietary Allowances
- Impart knowledge on the importance of nutrition during lifespan.

COURSE OUTCOME:

On successful completion of the course the students will be able to

CO No.	CO Statement
CO1	Identify the nutritional deficiency symptoms among the population
CO2	Prevent and alleviate nutritional deficiencies common among population
CO3	Understand the role of nutrition in different stages of lifecycle
CO4	Gain knowledge to formulate weaning foods, packed lunch and age/activity specific diets adequate in quality and quantity
CO5	Understand and tackle age specific food related problems and eating behaviours

UNIT-I:RECOMMENEDIETARYALLOWANCES

Recommended allowances - RDA for Indians, basis for requirement, computation of allowance based on energy expenditure, components of energy expenditure. General concepts about growth and development through different stages of life.

UNIT-II: NUTRITION DURING PREGNANCY ANDLACTATION

Nutrition in Pregnancy

Stages of gestation, maternal weight gain, complications of pregnancy, maternal physiological changes and adjustments, nutritional problems and dietarymanagement based on RDA for foods and nutrients, importance of nutrition during and prior to pregnancy, teenage pregnancy - nutritional problems and dietary management, planning a menu.

Nutrition during Lactation

Physiology of lactation, hormonal control and reflex action, efficiency of milk production,

factors influencing volume and composition of breast milk, nutritional composition of breast milk, nutritional concerns during lactation, special foods during lactation, dietary modification, planning a menu.

UNIT-III:NUTRITION IN INFANCY AND PRESCHOOL CHILDHOOD

Nutrition in Infancy

Infant feeding, nutritional needs, premature infant and their feeding, weaning foods, Feeding problems, infant formulae lactose intolerance, planning menu. Nutrition in Pre-school – Physiological development related to nutrition ,feeding problems, behavioural characteristics, nutritional requirement and planning diet.

UNIT-IV:NUTRITION IN SCHOOL GOING YEARS AND ADOLESCENCE

Nutrition in school children - feeding school children and factors to be considered. Planning a menu, feeding problems, packed lunch.

Nutrition during Adolescence –changes in growth and development, hormonal influences, Age at menarche - factors affecting age at menarche, psychological problems, body image, disordered eating behaviour, nutritional and menstrual problems, planning a menu.

UNIT-V:NUTRITION IN ADULTHOOD AND ELDERLY

Nutrition in Adult and Elderly

Nutrition and work efficiency, Nutritional care and support for Menopausal and Post-Menopausal women, hormonal changes, and planning a menu.

Physiological changes in aging - Psycho-social and economic factors affecting eating behaviour, knowledge and belief, institutionalization, common health problems, nutritional requirement, modification in diet, modification of diet for elderly.

TEST BOOKS:

1. Swaminathan,M.AdvancedtextbookonFoodandNutrition,,AnmolPublication Pvt,Ltd, Second Edition.2014.
2. Gopal,C.Kamalakrishnaswamy,NutritioninMajorMetabolicDisease,OxfordIndia Paper backs Publisher First Edition 2000.
3. Srilakshmi,B.NutritionScience,NewAgeInternational[p]ltd,NewDelhi,2018.
4. MahtabS.Bamji,PrasadRao,N.VinodiniReddy.TextbookofHumanNutrition,Oxford and IBH Publishing Co. Pvt .Ltd, Second Edition, 2013.
5. Sumati.R.Mudambi,M.VRajagopal.,FundamentalsofFoods&Nutrition,4thEdition New age International publishers New Delhi, 2006.
6. MelvinH.Willams.,Nutrition for healthfitness&Sport.5theditionMcgraw–Hill, publishing Co., 1999.

REFERENCES BOOKS

Nix .S 2016, Williams' Basic Nutrition & Diet Therapy, Fifteenth Edition, Elsevier.
Simon Langley-Evans, 2015 Nutrition, Health and Disease: A Lifespan Approach 2nd Edition, Wiley Blackwell.

Jacalyn J. McComb, Reid Norman, et al., The Active Female: Health Issues Throughout the Lifespan 2010, Human press.

Aleta L. Meyer and Thomas P. Gullotta., Physical Activity Across the Lifespan: Prevention and Treatment for Health and Well-Being (Issues in Children's and Families' Lives), 2012, Springer.

Antia, F.P., 1992, Clinical Dietetics and Nutrition Oxford University Press, New Delhi.

Corinne, R.H., 1996, Normal and therapeutic nutrition, Mcmillian Co., New York.

Davidson, S.R. and Passmore J.F., 1989, Human Nutrition and Dietetics, ELBS London.

Mahan, K.L., and Stump, S.E., 1996, Krauses Food, Nutrition and Diet therapy M.B. Saunders Co., USA.

Balasubramanian et al., 1998, Dietary guidelines for Indians, ICMR, New Delhi.

Passmore, AH and Adams, A.A., 1990, Clinical assessment of nutritional status – A working manual, Will and Wilson Publishing, London.

Bamji et al(1996), Textbook of Human Nutrition Oxford and IBH Publishing co. Pvt. Ltd. Delhi.

Shils.E.M, Shike .M, Ross. A.C, Cabellero.B and Cousins.R.J (2011) Modern Nutrition in Health and Disease, Eleventh Edition, Lippincott Williams and Wilkins, Philadelphia.

Mahan, K.L., and Stump, S.E., 1996, Krauses Food, Nutrition and Diet therapy M.B. Saunders Co.,

E- LEARNING RESOURCES

❖www.four-h.purdue.edu

❖www.ingenta.connect.com

❖nal.usda.gov/fnic/lifecycle

MAPPING (CO/PSO):

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	3	2	2	2
CO2	3	3	2	2	3	2
CO3	2	3	2	1	2	2
CO4	3	3	3	3	3	3
CO5	3	3	3	3	3	3
Average	2.8	3	2.6	2.2	2.6	2.4

PEDAGOGY:

Lecture, Journal Reviewing, Power point presentations, Assignments and Discussions

**2.5 ELECTIVE -IV
PERSPECTIVES OF HOME SCIENCE**

CREDITS:3

SEMESTER :II

YEAR :I

HOURS PER WEEK :4

OBJECTIVES:

To enable students to have a sound knowledge in various branches of Home Science for strengthening the extension and research base.

SPECIFIC OBJECTIVES OF LEARNING:

On successful completion of these units, students are expected :

- To describe the importance of each branch of Home Science
- To understand the essence of each subject
- To prepare them for UGC NET, SLET and ASRB

COURSE OUTCOME:

On successful completion of the course the student will be able to-

CO No.	CO STATEMENT
CO 1	Understand the concept of Extension Education and its importance
CO 2	Comprehend the key aspects of human growth and development and realize the importance of mastering developmental tasks of each life span stage
CO 3	Understand the basic concepts of Textile and Clothing
CO 4	List personal goals and values, set living standards
CO 5	Understand the meaning of Guidance and Counselling and Career perspectives in Home Science

UNIT – I Extension Education

- a. Meaning, Definition, objectives, characteristics, principles
- b. Extension teaching methods- types and methods
- c. Qualities of a good Extension Worker
- d. Communication, Innovation and Social change

UNIT – II Human Development

- a. Growth, Development, Maturation and Learning
- b. Principles and Developmental stages & Task
- c. Parental Disciplinary Techniques – merits and demerits
- d. Early Childhood Education – Objectives. Types of Nursery Schools.
- e. Exceptional children – Deaf, Blindness, Physical Impairment, Mental Retarded and Giftedness . Rehabilitation.

UNIT – III Textiles and Clothing

- a. Classification and General properties textile fibres.
- b. Processing and manufacture of Cotton, Silk, Wool and Rayon fibres.
- c. Yarn: Classification.
- d. Fabric construction - woven, non-woven and knitted fabric
- e. Clothing: selection for the family.

UNIT – IV Family Resource Management

- a. Home Management – Meaning, objectives and process
- b. Resources - Classification and characteristics
- c. Time, Money and Energy management
- d. Decision making - Steps and Methods of resolving conflicts
- e. Work simplification - Importance of work simplification. Mundel’s classes of Change
- f. Principles and Elements of Interior design, Various colours and colour schemes.

UNIT – V-Guidance and Counselling

- a. Meaning, nature, types and scope of guidance and counselling
- b. Various steps and techniques of Guidance and counselling
- c. Need and importance of educational guidance.

TEXTBOOKS:

1. Jha, J.K. (2002). Encyclopaedia of Teaching of Home Science, Vol.I,II and III . New Delhi: Anmol Publications.
2. Suriakanthi.A., (2002). Child Development - An Introduction Gandhigram: Kavitha Publications.
3. Srilakshmi.B. (2015). Food Science. New Delhi. New Age International Pvt.Ltd.

REFERENCES:

1. Serene and Ahlawat Santos Shekhar (2013), Textbook of Home Science Extension Education.
2. Tami James Moore and Sylvia M.Asay (2008), Family Resource Management, Sage Publications.
3. Diane E. Papalia (2004), 9th edition, Human Development, McGraw Hill India.
4. Rani K. Sudha and Srivastava Sushila, Textbook of Human Development: A lifespan development approach, S. Chand & Co Ltd.

Mapping: (CO/PSO)

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	1	3	3	1	3
CO2	3	2	3	3	2	3
CO3	3	2	3	3	1	3
CO4	3	2	3	3	1	3
CO5	3	1	3	3	1	3
Average	3	1.6	3	3	1.2	3

PEDAGOGY

Lecture, Power Point Presentation, Demonstration, Group Discussion, Assignment, Library Visits, Seminars and Oral & Written Revision

2.6 NME I

FOOD PRESERVATION

(Offered to other departments)

CREDIT:2

SEMESTER: 2

YEAR :1

HOURS PER WEEK:23

LEARNING OBJECTIVES

To enable students to

1. Learn the basic concepts and importance of Food Preservation
2. Understand the different methods of Food Preservation
3. Choose appropriate food handling and storage techniques

COURSE OUTCOME

CO No.	CO Statement
CO1	Describe the basic concepts and principles of Food Preservation
CO2	Identify the best methods of storage of different foods based on their shelf life. Recommend appropriate postharvest technology procedures that increase shelf life of food
CO3	Analyze the use of low and high temperature to preserve food and identify the appropriate method to preserve different foods
CO4	Discuss the use and effects of different preservatives on the quality of foods
CO5	Appreciate the use of modern technology in food preservation and managing food wastage.

Unit I Introduction to Food Preservation

Concept, the importance of food preservation., Common terms used in food preservation.

Different methods and Principles of preservation.

Unit II Preservation by Low Temperature

Use of Cold and Refrigerated Storage ,Use of Freezing temperatures: Slow and fast freezing of foods and Cryogenic freezing of foods, dehydro freezing,Frozen storage and thawing of foods

Unit III Preservation by High Temperature

Preservation of foods by high temperatures. Blanching, Pasteurization and Sterilization of foods. General process of caning of foods

Unit IV Preservation by Drying

Principles and application of drying and dehydration of foods Different types of drying and dryers. Appreciate the use of modern technology in food preservation and managing food wastage.

Unit-IV Preservation by using Chemicals and Salts

Chemical Preservatives–Definition, Types of Preservatives, Preparation and Preservation of Fruit Juices, Pickling – Principles Involved, Process, Types
Preparation of Various Types of Pickles–Lime, Mango ,Ginger, Capsicum, Mixed Vegetables, Brinjal, Onion, Garlic

TEXTBOOKS:

1. Adams,M.R.andMoss,M.O.(2005)FoodMicrobiology,NewAgeInternational(P) Ltd., New Delhi,.
2. UshaChandrasekhar,(2002)FoodScienceandApplicationsinIndianCookery,Phoenix Publishing House Pvt. Ltd., New Delhi,.
- 3.Srilakshmi,B.(2013)FoodScience,NewAgeInternational(P)Ltd.,NewDelhi.

REFERENCEBOOKS:

1. Fellows,P.(2000)Foodprocessingtechnology,Principlesandpractice,2ndedition, CRCPress,WoodlandPublishingLtd.,Cambridge,England,
- 2.Sommers,C.H.andXvetengFan,(2006)FoodIrradiationResearchandTechnology, Blackwell Publishing, 2006.
- 3.Swaminathan,M.FoodScience,ChemistryandExperimentalFoods,Bappco Publishers2013,

E-LEARNING RESOURCES

[https:// www.embibe .com/food -preservation/](https://www.embibe.com/food-preservation/)

<https://agripathshala.com/lessons/principles-of-food-preservation>

www.onlinebiologynotes.com/food-preservation-from-microbial-spoilage-principles

<https://www.researchgate.net/publication/347909697> **FOOD PRESERVATION**

Mapping of Co with PSO:

CO/PSO	PSO 1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	2	3	1	2
CO2	2	3	3	3	1	2
CO3	3	3	3	3	1	3
CO4	2	3	3	3	1	2
CO5	3	3	3	3	1	3
Average	2.6	3	2.8	3	1	2.4

PEDAGOGY

Lecture, journal reviewing, Assignments, Power point presentations, video presentations.

SEMESTER III

3.1 CORE – VII
MICRONUTRIENTS

CREDITS: 5
SEMESTER :III
YEAR :II
HOURS PER WEEK :6

COURSE OBJECTIVES

1. To enable the students to learn the functions, deficiency symptoms, food sources and requirements of the different micro nutrients.
2. To Gain knowledge of nutrients requirement and management of micronutrients during various stages of life and disease
3. To gain insight about recent concept and findings in field of nutrition and application of the same to prevent disease

COURSE OUTCOMES:

On completion of the course the students will be able to...

CO No.	CO Statement
CO1	Evaluate the specific role of functional foods and nutraceuticals in prevention of degenerative disease.
CO2	Understand the importance of micronutrients in growth and development of humans.
CO3	Analyse the importance of diet in maintaining human health to combat nutrient deficiency in the community
CO4	Gain in-depth knowledge of the physiological and metabolic functions of vitamins and minerals and their implications
CO5	Analyse the recent advances in the field of micronutrient and research for the welfare of the community

UNIT I:

Distribution in the body; functions, effects of deficiency, food sources, requirement and recent research of macro minerals - Calcium, Phosphorus, Magnesium, Potassium, Sodium and Chloride.

UNIT – II

Distribution in the body, functions, food sources, requirement deficiency, toxicity and recent research of micro minerals and trace minerals. Micro minerals - iron, zinc, fluoride, copper, iodine and manganese. Trace Minerals -Selenium, cobalt, chromium, silicon, boron and nickel

Selenium and Vitamin E relationship, Chromium and glucose tolerance factor.

UNIT III

Distribution in the body, functions, food sources, requirement deficiency, toxicity and recent research of Fat Soluble Vitamins A,D,E and K

UNIT IV

Distribution in the body, functions, food sources, requirement deficiency, toxicity and recent research of Water soluble vitamins – Water soluble vitamins: vitamin C, thiamine, riboflavin, niacin, pantothenic acid, biotin, folic acid, vitamin B12, vitamin B 6, choline and inositol.

UNIT V:

RECENT CONCEPTS IN NUTRITION:

Immuno-nutrients and Antioxidants

Definition, classification and function of functional food and nutraceuticals.

Antinutrients present in various food groups – Cereals , legumes and nuts and oilseeds

Food and drug interaction.

TEXT BOOKS

1. Guthrie, H.A. (2001) – “Introductory Nutrition”, Tenth edition, C.V. Mosby Company, St. Louis.
2. Bogert, J.G.V., Briggs,D.H, Calloway, (2000). “ Nutrition and physical fitness”, 11th edition W.B. Saunders Co., Philadelphia, London, Toronto.
3. Wardlaw, G.M and Kessel, M, (2002) “ Pererspective in Nutrition”, 5thedition, Mc Graw Hill, New York, New Delhi.
4. Willium, S. R. (2000), “ Nutrition and Diet Therapy”, Mosby Co., St. Louis.
5. Sizer, F.S and Whitney E. R. (2003), “ Nutrition , Concepts and Controversies” 9th edition, Thomas Wadsworth, Australia.

REFERENCE BOOK

1. Brown, J.E. (2002), “Nutrition Now”, 3rd edition, Wadsworth Thomson Learning New York.
2. Maurice, E. Shils, James A. Obson, Moshe shike, (2000), “ Modern Nutrition in Health and Disease”, 8th Edition, Vol I and II, Lea &Febiger Philadelphia, A Waverly Company.
3. Mahan L.K. and Stamp, S.E (2000), “Krause’s Food Nutrition and Diet Therapy”, 11th edition, W.B. saunder’s Company, Philadelphia.
4. Toteja, G.S and Singh P (2004), “ Micronutrient Profile of Indian Population”, ICMR Publication, New Delhi.

5. D. M. Swaminathan (2002), “ Principles of Nutrition and Dietetics”, BAPPCO, 88, Mysore Road Bangalore – 560 018.

E-LEARNING RESOURCES:

<https://www.udemy.com/share/1027yA/>

[WHO | The e-learning platform Nutrition Knowledge Hub launch WFP Nutrition's Learning Platform -](#)

[UN World Food Programme Nutrition Online Courses | Coursera](#)

[E-Learning Programs \(nestlenutrition-institute.org\)](#)

[WFP Nutrition's Learning Platform | Humanitarian Library](#)

Mapping: (CO/PSO)

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	3	3	2	3
CO2	3	3	3	3	2	3
CO3	3	3	3	3	2	3
CO4	3	3	3	3	2	3
CO5	3	3	3	3	2	3
Average	3	3	3	3	2	3

PEDAGOGY

Group Discussion, Case study, seminar, journal reviewing, Assignments, Power point presentations.

3.2CORE – VIII

PERFORMANCE NUTRITION

CREDITS: 5

SEMESTER :III

YEAR :II

HOURS PER WEEK :6

COURSE OBJECTIVES:

To enable the students to

Learn about the role of nutrients in enhancing Sports Performance.

Understand the fundamentals of planning diet for different sports.

Know about the different types of sports supplements and nutrition for special athletes.

COURSE OUTCOME:

On successful completion of the course the students will be able to

CO No.	CO Statement
CO1	Analyze and assess the body composition of athlete.
CO2	Comprehend the role of Macro and micronutrients towards athletic performance
CO3	Emphasize the role of nutrition in competitive performance and for special needs.
CO4	Retrieving the various sports supplements and Ergogenic aids for the athletes.
CO5	Apply personalized nutrition guidance in the area of sports nutrition.

UNITI

Nutritional assessment for athletes-assessment of body composition, techniques of measuring body composition, surface anthropometry, Biochemical, clinical and dietary

assessment, Body composition and sports performance.

Energy requirements for optimal athletic performance- Energy production, Energy metabolism in Athletes, Fatigue and exercise, energy requirements of athletes, factors affecting energy requirements of athletes.

UNITII

Carbohydrates in sports performance- Carbohydrate types, Glycaemic index and Glycaemic load, carbohydrate utilization during exercise, carbohydrate loading, fuelling before during and after exercise, carbohydrate requirements for athletes.

Protein and fat requirement for sports performance -protein and exercise, requirements of protein and fat for athletes, factors affecting protein requirements, protein needs and vegetarian athletes.

UNITIII

Micronutrients in sports- vitamins and mineral requirements in athletes, sports anaemia, antioxidants and exercise induced free radicals.

Hydration for athletes- Fluid balance and thermoregulation, fluid and electrolyte requirements for athletes, Effects of dehydration, factors affecting fluid intake, gastric emptying and fluid delivery to working muscles, Fluid intake before, during and after exercise.

UNITIV

Nutrition for competition performance-Nutrient timing, pre-competition nutritional guidelines, nutrition during exercise and nutrition after exercise, nutrition plan for specific sports events.

Ergogenic aids- Categories of Ergogenic aids and Ergolytics.

Sports foods-sports drinks, sports gels, Sports energy bars and sports gels.

UNITV

Nutrition for athletes with special dietary needs- Nutrition for special population like children, young and older athlete, Female athlete triad, weight loss and weight gain in athletes, vegetarian athlete, diabetic athlete, athletes with disabilities, factors affecting nutritional needs for travel athlete, GI stress and athletes.

TEXT BOOK:

Deakin, Burke.(2006). Clinical Sports Nutrition.McGraw-Hill Australia.3rd edition. Bean, Anit. (2010).The complete guide to Sports Nutrition.A&C.Black. London.6th edition.

Bourns, Fred.(2002).Essentials of Sports Nutrition. John and Wiley. 2nd edition.

B.Srilakshmi, Suganthi.v, C.Kalaivani Ashok.(2017). Exercise physiology fitness and sports Nutrition, New age publishers. 1st edition.

Benardot, Dan. (2000).Advanced Sports Nutrition. Human Kinetics.

REFERENCES:

Burke, Louise. (2007). Practical Sports Nutrition. Human Kinetics. Gleeson, Jeukendrup. (2004). Sports Nutrition: An Introduction to Energy Production and Performance. Human Kinetics. Suzanne Girard Eberle. (2000). Endurance Sports Nutrition. Human Kinetics. Natalie Digate Muth. (2015). Sports Nutrition for health professionals. Quincy McDonald. D. Enette Larson-Meyer. (1963). Vegetarian sports nutrition. Human Kinetics.

E-LEARNING RESOURCES:

<http://ijnpa.biomedcentral.com>

www.acsm.org www.ausport.go

vt.au www.sportsci.org www.gss

iweb.com

Mapping of Co with PSO:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	2	3	3	3	1	2
CO2	2	2	2	3	1	2
CO3	2	3	3	3	1	1
CO4	3	3	3	3	1	1
CO5	2	2	3	3	2	3
Average	2.2	2.6	2.8	3	1.2	1.8

PEDAGOGY

Lecture, Case study, journal reviewing, Assignments, Group discussion, Power point presentations.

3.3 CORE – IX

TECHNIQUES IN FOOD ANALYSIS PRACTICAL

CREDITS:5

SEMESTER:III

YEAR:II

HOURS PER WEEK:6

OBJECTIVES:

To enable students to:

- Learn the techniques of estimating the quantity of different nutrients present in food.
- To enable the students to get practical experience in the laboratory and develop the skills to undertake research work

COURSE OUTCOME:

On successful completion of the course the student will be able to-

CO No.	CO STATEMENT
CO 1	Understand safety rules for the laboratory and demonstrate various instruments used for food analysis.
CO 2	Acquire skills to prepare and standardise various solutions to conduct experiments for food analysis.
CO 3	Acquire skills in ashing of foods and prepare ash solution to analyse mineral contents in food.
CO 4	Demonstrate quantitative analysis of various nutrients in foods i.e. crude fibre, moisture, Vit -C, calcium, phosphorus, iron, etc.
CO 5	Demonstrate experiments to check estimation of protein, fat content and Pigment Analysis

Unit – 1

1. Introduction to Laboratory Practices

2. Instrumental Techniques –

- Autoclave
- Hot Air Oven
- pH Meter
- Electronic Weighing Balance
- Centrifuges
- Hot Plate
- Spectrophotometer
- Water Bath
- Muffle Furnace
- Viscometer
- IR Moisture Analyzer
- Colorimeter

Unit – 2

Preparation and Standardisation of Solution

Unit – 3

Ashing of Food (Thermogravimetric Method) and Preparation of Ash Solution

Unit – 4

Food Analysis Experiments – Estimation of –

- Moisture Content – Thermogravimetric Analysis -Air Oven Method and Infrared Radiation(IR) Moisture Analyzer Method
- Crude Fibre–Gravimetric Method
- Iodine Number of oils – Wij’s Method
- Acid Number of oils - Titrimetric Method
- Peroxide Value of oils - Titrimetric Method
- Ascorbic Acid – 2, 6- Dichloroindophenol Titrimetric Method
- Calcium -Precipitation Titrimetric Method
- Iron – Wong’s Method
- Phosphorus–Colorimetric Method

Unit – 5

Demonstration Experiments

- Estimation of protein content in food by Kjeldahl method
- Estimation of fat content in food by Soxhlet method
- Pigment Analysis by Paper Chromatography Techniques

TEXT BOOKS AND REFERENCES:

- S. Suzanne Nielsen (2017). Food Analysis Laboratory Manual. Springer International Publishing. Third Edition.
- S. Suzanne Nielsen (2017). Food Analysis. Springer International Publishing. Fifth Edition.
- Otles, S. (2005). “Methods of Analysis of Food Components and Additives” CRC Press, USA.
- Ranganna, S. (2001). “Handbook of Analysis and Quality Control for Fruit and Vegetable Products”. Tata-McGraw- Hill, India. 2nd edition.
- Sadasivam, S and Manickam, A (1997). “Biochemical Methods”. New Age International Publishers, New Delhi. 2nd Edition.
- Jayaram, I, (1996), “Laboratory Manual in Biochemistry”, New Age International Publishers, New Delhi. Fifth ed.
- Raghuramulu, N, Nair K.M & Kalayanasundaram, S.A, (1983), “Manual of Laboratory Techniques”, National Institute of Nutrition, ICMR.

Mapping: (CO/PSO)

CO/PSO	PSO	PSO	PSO	PSO	PSO	PSO
	1	2	3	4	5	6
CO1	3	2	3	0	3	2
CO2	2	3	3	0	3	1
CO3	2	3	3	0	3	1
CO4	3	3	3	1	3	3
CO5	3	3	3	1	3	3
Average	2.6	2.8	3	2	3	2

PEDAGOGY

Demonstration, Experiments, Activities as assignment, Group Discussion, Observation and Interpretation

3.4 CORE X

NUTRITIONAL BIOCHEMISTRY

CREDIT:4

SEMESTER :II

YEAR :I

HOURS PER WEEK :5

COURSE OBJECTIVES

1. Understand the need for the study of biochemistry as the basis for nutritional sciences.
2. Make students aware of metabolism of proximate principles and others.
3. A basic understanding of the functions of biological systems in relation to Nutritional biochemistry.

COURSE OUTCOME:

On completion of the course the students will be able to...

CO No.	CO Statement
CO1	Understand the role of enzymes and co enzymes in biological oxidation.
CO2	Gain knowledge on metabolism and regulation of carbohydrate.
CO3	Understand the concept of metabolism and bioenergetics of lipids.
CO4	Discuss the classification, structure, organization and metabolic pathway of protein.
CO5	Comprehend the biological metabolism and functions of nucleic acid and understand recent concepts in biochemistry.

UNIT I

Biological oxidation and enzymes

Biological oxidation, Electron transport chain and Oxidative Phosphorylation.

Enzymes – Definition, Types , mechanism of action, factors affecting enzyme activity, coenzyme, role of b vitamin as coenzyme.

Free radicals – definition, formation in biological systems. Antioxidants – definition, Role of antioxidants in prevention of degenerative disorders

UNIT 2

Metabolism of Carbohydrates: Glycolysis, The Citric Acid Cycle, glycogenesis, glycogenolysis, gluconeogenesis, The Hexose Monophosphate Shunt and 25 bioenergetics.

Hormonal regulations of blood glucose homeostasis

UNIT 3

Protein and amino acid metabolism

Classification of amino acids, Oxidative Deamination, decarboxylation, transamination and transmethylation of amino acids, urea cycle, biosynthesis of non-essential amino acids, catabolism of essential amino acids. Protein biosynthesis.

UNIT 4

Metabolism of Lipids:

Classification of fatty acid, Biosynthesis of fatty acids, beta oxidation of fatty acids and ketone bodies. Essential fatty acids – types and functions. Metabolism of phospholipids, and cholesterol. Lipo proteins – classification and function.

UNIT 5

Overview of intermediary metabolism of carbohydrates, protein and lipid. Hormonal regulation of carbohydrate protein and fat metabolism
Structural components and functions of nucleic acid, Structure of DNA, DNA Replication, RNA synthesis – types and functions and metabolism, translation. Recombinant DNA technology, Metabolism of Xenobiotics, Nutrigenomics

TEXT BOOKS

1. Jain, J.L., Jain, S., & Jain, N., (2005). Fundamentals of Biochemistry. S. CHAND & COMPANY Ltd. Ram nagar, New Delhi-110 055. 6th revised edition.
2. Bettelheim, F. A., Brown, W. H., Campbell, M. K., & Farrell, S. O. (2009). *General, Organic & Biochemistry*. Brooks/Cole Cengage Learning.
3. Champe, P. C., Harvey, R. A., & Ferrier, D. R. (2005). *Biochemistry*. Lippincott Williams & Wilkins, 6th Edition, Wolters Kluwer, London.
4. Talwar, G. P., & Srivastava, L. M. (2002). *Textbook of biochemistry and human biology*. PHI Learning Pvt. Ltd..
5. Murray, R.K., Granner, D.K., Mayes, P.A. and Rodwell, V.W. (2000): 25th Ed. Harpers Biochemistry. Macmillan worth publishers.

REFERENCE BOOK

1. Marshall, W. J., Lapsley, M., Day, A., & Ayling, R. (2014). *Clinical Biochemistry E-Book: Metabolic and Clinical Aspects*. Elsevier Health Sciences.
2. Bender, D. A. (2003). *Nutritional biochemistry of the vitamins*. Cambridge university press.
3. Albanese, A. (Ed.). (2012). *Newer methods of nutritional biochemistry V3: With applications and interpretations*. Elsevier.
4. Champe, P. C., Harvey, R. A., & Ferrier, D. R. (2005). *Biochemistry*. Lippincott Williams & Wilkins.
5. Lieberman, M., & Ricer, R. E. (2009). *Lippincott's Illustrated Q&A Review of Biochemistry*. Lippincott Williams & Wilkins.

25

E-LEARNING RESOURCES:

<https://www.udemy.com/share/1027yA/https://www.classcentral.com/course/swayam->

[biochemistry-5229](https://www.classcentral.com/course/edx-biochemistry-biomolecules-methods-and-mechanisms-12585)

<https://www.classcentral.com/course/edx-biochemistry-biomolecules-methods-and-mechanisms-12585>

<https://www.classcentral.com/course/swayam-experimental-biochemistry-12909>

<https://youtu.be/y6YGZfcAegw>

Mapping of CO with PSO:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO4	PSO 5	PSO 6
CO1	3	3	2	1	1	3
CO2	3	3	2	1	1	3
CO3	3	3	2	1	1	3
CO4	3	3	2	1	1	3
CO5	3	3	3	1	1	3
Average	3	3	2.2	1	1	3

PEDAGOGY (TEACHING METHODOLOGY):

Group Discussion, Case study, seminar, journal reviewing, Assignments, Power point presentations.

3.5 ELECTIVE – V

FOOD MICROBIOLOGY

CREDITS:3

SEMESTER:III

YEAR:II

HOURS PER WEEK:4

COURSE OBJECTIVES

To understand the concept of microorganisms.

To gain knowledge of principles of various techniques of microorganisms in foods.

To acquire knowledge of fermented foods.

COURSE OUTCOMES:

On completion of the course the students will be able to...

CO No.	CO Statement
CO1	Understand the Classification & primary source of microorganism.
CO2	Name and describe Microbial spoilage of cereals & milk products.
CO3	Enumerate Fruits, vegetables & sugar products – contamination, spoilage & preventive measures; Fleshy foods- contamination, spoilage & preventive measures.
CO4	Predict the causative agent and pathogenesis of disease causing food-borne pathogens.
CO5	To learn about the fermented foods.

UNIT – I

Introduction to Food Microbiology, Classification of micro-organism, importance of micro-organisms in food- primary sources of micro-organisms in food- intrinsic and extrinsic parameters of food affecting microbial growth. Isolation and detection of microorganisms in food

UNIT – II

Spoilage of foods - principles and types of spoilage. Microbial spoilage of cereal and cereal products and its prevention. Microbiology of milk and milk products kinds of microorganism, sources of contamination and prevention

UNIT – III

Contamination, spoilage and preventive measures of sugar and sugar products and fruits and vegetables

Spoilage and preventive measures of meat, poultry, fish, egg.

UNIT – IV

Fermented foods

Dairy starter cultures, fermented dairy products: yogurt, acidophilus milk, kumiss, kefir, dahi and cheese, other fermented foods: dosa, sauerkraut, soy sauce and tampeh, Probiotics: Health benefits, types of microorganisms used, probiotic foods available in market.

UNIT – V

Food in relation to diseases- Food poisoning and intoxication- Bacterial- Bacillus, Clostridium botulinum, Clostridium perfringens, E.coli, Salmonella, Shigella, Staphylococcus aureus, Non bacterial- protozoa, fungi, virus, algae – characteristics and preventive measures. Indicators of water and food safety and quality.

TEXT BOOKS

1. Frazier W.C and Westhoff D.C.(2013), Food Microbiology, Tata McGraw Hill Publishing Co., Ltd. New Delhi.
2. Annak.Joshua, (2001). Microbiology, Popular Book Depot.Chennai-15.
3. Ray, B. (2001) Fundamental Food Microbiology, 2nd Ed, CRC press, Boca ratonF.
- 4.JoshiVK&Pandey(2004).Biotechnology:food,fermentation,microbiology,bi och emistryand technology,vol I &II,Educational publishers and distributors,New Delhi.
5. Crueger W and Crueger A (2003) Biotechnology: A textbook of Industrial Microbiology 2nd Edition,Panima Publishing Corpoartion,New Delhi.

REFERENCE BOOK

1. Gutierrez-Lopez GF and Barbosa-Canovas GV (Eds) (2003) Food Science and Food Biotechmolgy CRC press,USA.
2. Halford NG (2003) ‘Genetically Modified Crops’ Imperial College Press, UK Modern Food Micro-Biology by James M. Jay, (2000), 6th edition, An Aspen Publication,Maryland, USA.
3. Food Microbiology: Fundamentals and frontiers by M.P. Doyle, L.R. Beuchatand Thoma J. Montville, (2001), 2nd edition, ASM press, USA.
4. MichealPelczar MJ, Chan ECS, Krieg N. (2001) Microbiology. 5th ed. Tata McGraw-Hill Publishing Co. Ltd.
5. Prescott LM, Harley JP, Klein DA.(2008) Microbiology. 6th ed. WMC Brown

E-LEARNINGRESOURCES:

[Top Microbiology Courses - Learn Microbiology Online |](#)
[CourseraLearn Microbiology with Online Courses and Classes | edX](#)
[72 Online studies in Microbiology - DistanceLearningPortal.comMicrobiology](#)
[Free Online Courses and MOOCs | MOOC List \(mooc-list.com\)](#)
[Virtual Microbiology Classroom: 8-week micro course from Science Prof Online](#)

Mapping: (CO/PSO)

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	2	1	3	2
CO2	3	3	2	1	3	2
CO3	3	3	2	1	3	2
CO4	3	3	2	1	3	2
CO5	3	3	2	1	3	2
Average	3	3	2	1	3	2

PEDAGOGY

Group Discussion, Case study, seminar, journal reviewing, Assignments, Power Point Presentations.

3.6 NME II

DIET AND NUTRITION COUNSELLING

CREDITS:2

SEMESTER:III

YEAR:II

HOURS PER WEEK:3

Course objectives

- ✓ To list out the steps in diet counselling process.
- ✓ To Understand and apply the counseling skills in establishing rapport with patients.

Course Outcome

CO No	Co statement
CO1	Define Dietician and recall the qualities, role and responsibilities of a dietician
CO2	Describes or explains the steps in diet and nutrition counselling
CO3	Uses the skills in assessment of nutritional status of normal and diseased people
CO4	Relate practical skills in dietary counselling of various health and disease conditions
CO5	Develop teaching aids and uses computer applications and smart phones in diet counselling

Course Outline

UNIT-1 Introduction to Dietitian and IDA

- Dietician–Definition and Educational qualification
- Types of Dietician–
Clinical, academic, research, specific, food service, public/Community, industrial, consultant, sports, business etc.
- Qualities, Role and responsibilities of Dietician
- IDA–Objectives, membership; Registered Dietician–eligibility for R.D. exam

UNIT-2 Diet Counselling/ Nutrition Care Process (NCP)

- Diet Counselling/Nutrition Care Process (NCP)–Definition, importance, purposes and ethical principles
- Steps in Diet counseling Process; Documentation–SOAP
- Counseling Skills for a Dietitian; Tools of Dietitian ;Guidelines for effective counselling

UNIT-3 Counseling Approaches

- Counselling Approaches– Meaning, Developing a counseling approach
- Different Counselling Approaches–Psycho analytical, behavioural, humanistic, Patient centered GALIDRAA approaches etc.

UNIT-4 Nutrition Education

- Nutrition Education –Meaning and importance,
- Teaching Methods and aids used for Nutrition Education in the Community
Teaching Methods – Lecture, Group discussion, Role Play, Story telling, Demonstrations, Nutrition Exhibition, Marathon race etc.
- Teaching Aids–Posters, pictures, models, charts, flash cards etc.
- Teaching Materials for patients–Models, pamphlets, leaflets, booklets etc.

UNIT-5 Use of Modern Technology in Diet Counselling

- Use of Computers in Diet Counselling and Nutrition Education
- Use of Computer Applications and Mobile Applications in Diet Counselling and Nutrition Education; Computer and mobile applications available for Diet Counselling
- Prerequisites for setting up a Diet Counselling Center

REFERENCES

1. Srilakshmi,B.“Dietetics”,8thedition,2018, NewAgeInternationalPublishes,NewDelhi
2. IDA, ClinicalDieteticsManual, 2018, 2ndeditionElitePublishingHouseNewDelhi
3. Corinne H. Robinson, Marilyn R. Lawler, “Normal & Therapeutic Nutrition” 17th edition1986
4. Shubangini A Joshi, “Nutrition & Dietetics” 5th edition, 2022, McGraw hill EducationIndia Pvt.Ltd.
5. JudyGable “CounsellingSkillsforDietitians”2ndedition,2007,Black WellPublishingLtd,Oxford,UK.
6. “Clinicaland TherapeuticNutritionM.Sc.”publishedbydirectorateofDistanceEducation,SwamiVivekanandSubhartiUniversity,Meerut,U.P.
7. LindaSnetselaar“NutritionCounsellingSkills fortheNutritionCareProcess”4thedition,2021,JaneandBartlettPublishers,London.

Mapping of CO with PSO

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	2	1	3	1	3	1
CO2	3	3	3	2	2	2
CO3	3	2	3	3	1	2
CO4	3	3	3	2	2	1
C05	3	2	3	3	3	2
Average	2.8	2.2	3	2.2	2.2	1.6

PEDAGOGY

Group Discussion, Case study, seminar, journal reviewing, Assignments, Power Point Presentations

SEMESTER -IV

4.1 CORE –XI

PUBLIC HEALTH NUTRITION

CREDITS:5

SEMESTER:IV

YEAR:II

HOURS PER WEEK:6

COURSE OBJECTIVES:

- To understand the concept of Public Nutrition.
- To enable students to develop a holistic knowledge base on the importance of understanding the nutrition problems and their prevention.
- To understand the nutritional problems during emergencies / disasters as well as the strategies to tackle them.
- To develop skills in preparation of communication aids and planning nutrition education programme for the community

COURSE OUTCOME:

On successful completion of the course the students will be able to

CO No.	CO STATEMENT
CO1	Understand the role of nutrition in national development
CO2	Acquire skill in assessment of nutritional status of community.
CO3	Gain depth knowledge on Strategies for Improving nutrition status and health status of the community.
CO4	Evaluate the role organization in combating malnutrition.
CO5	Understand and apply Nutrition education for the community welfare.

UNIT I

CONCEPT OF PUBLIC NUTRITION

Nutrition and Health in National Development

- Relationship between health and nutrition, National Health Care Delivery System, Determinants of Health Status, Indicators of Health.
- Nutritional deficiency disorders in India -Prevalence, Etiology, Symptoms, Current status and Recent updates- PEM, VADD, IDD, Anemia.
- Nutrition and infection
- Role of public nutritionists in the health care delivery system.

UNIT II

ASSESSMENT OF NUTRITIONAL STATUS

- **Direct methods:** Direct methods of Nutritional assessment, Nutritional anthropometry, biochemical, clinical and dietary assessment and Growth charts - plotting of growth charts, growth monitoring and promotion (GMP). 26
- **Indirect methods:** Demography, population dynamics and vital health statistics and their health implications. Food balance sheets, recent nutritional assessment methods- MUST, SGA, SOAP. Indicators of health and nutrition. Causes of Malnutrition- Vicious cycle of malnutrition

- Basic concepts of Nutritional Surveillance- Millennium Development Goals (MDG)

UNIT III

STRATEGIES FOR IMPROVING NUTRITION STATUS AND HEALTH STATUS OF THE COMMUNITY

Immunization: Awareness, types of vaccines, Importance and schedule of Immunization.

Measures to overcome malnutrition in India

Food Security -Concepts, Meaning and significance, Food security act. Food fortification and Food enrichment, Genetic improvement of foods, National nutrition policy and action plan

Nutrition intervention programmes - Mid day Meal Programme, Balwadi Feeding Programme. Public Distribution System (PDS), Antyodaya Anna Yojana (AAY), Annapurna Scheme, Food for Work Programme, Special Nutrition Programme,

Nutrition Intervention Schemes and programmes operating in India- Control programmes - Vitamin A, Anemia, Goiter, Malnutrition.

Environmental sanitation and health

UNIT IV

ORGANIZATIONS TO COMBAT MALNUTRITION AND NUTRITION DURING EMERGENCIES AND SPECIAL CONDITIONS

- **International organizations** concerned with food and nutrition FAO, WHO, UNICEF, CARE, AFPRO, CWS, CRS, World Bank.
- **National organization** – NIN, CFTRI, ICMR, ICAR, CFTRI, CHEB, NIPCCD, DFRL, NGOs.
- **Nutritional deficiency diseases in emergencies-** Major and micro nutrient. Control of communicable diseases in emergencies- Factors responsible for spread of communicable disease, mode of transmission and prevention of chicken pox, malaria, swine flu, tuberculosis, COVID-19 and AIDS.

Nutritional requirement for space mission, sea voyage and army.

UNIT V

NUTRITION EDUCATION AND EXTENSION OF BETTER NUTRITION

- **Nutrition education for the community** –Objectives, Definition and Importance of nutrition education to the community, Principles of planning, executing and evaluating nutrition education programmes.
- **Development and Use of AV aids in Public Nutrition Education.** -Charts, flip chart, posters, flannel board, models, OHP.

ACTIVITY

1. Planning and evaluation of nutrition education programmes in community. Preparation of communication aids for different groups.
2. Development of low-cost recipes for infants, pre-schoolers, elementary school children, adolescents, pregnant and lactating mothers.
3. Field visits to ongoing national nutrition programmes.

TEXTBOOKS

1. Park, K. (2013). Text Book of Preventive and Social medicine. M/s. Banarsidas Bhanot Publishers, Jabalpur. 22nd Edition. 26
2. Suryatapa Das (2020). Textbook of Community Nutrition. Academic Publishers, Kolkata. 4th Edition
3. Srilakshmi, B (2017). Nutrition Science. New Age International Publishers. Multi

Colour 6th Edition.

4. Connolly, M.A. (2005). Communicable Disease Control in Emergencies: WHO, WHO Library Cataloguing-in-Publication Data.
5. WHO (2002). The management of Nutrition in Major Emergencies. Published by AITBS Publishers, New Delhi.

REFERENCES

1. MuthuVK (2014). A Short Book of Public Health, Jaypee Brothers Medical Publishers. 2nd edition
2. Dr. Srridhar Rao B (2018). Principles of Community Medicine, AITBS Publishers India. 6th edition.
3. Scott M. Smith, Sara R. Zwart and Martina Heer (2014). Human Adaptation to Space Flight: The role of nutrition. NASA Publication.
4. Owen, A.Y. and Frackle, R.T., (2002). Nutrition in the Community. The Art of Delivering Services. Times Mirror/Mosby. 2nd Edition.
5. Carolyn D. Berdanier Johanna T. Dwyer David Heber (2014). Handbook of Nutrition and Food, CRC Press, New York. Third Edition.

E.LEARNING RESOURCES:

<https://apps.who.int/iris/http://egyankosh.ac.in/bitstream/123456789/33312/1/Unit-18.pdf>
https://www.seafarerswelfare.org/assets/documents/ship/SHIP-HealthyFood_A5_20151209_LR.pdf

Mapping(CO/PSO):

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	2	3	3	3
CO2	3	2	3	3	3	3
CO3	2	3	3	3	3	3
CO4	3	3	3	3	2	3
CO5	3	3	3	3	3	3
Average	2.8	2.8	2.8	3	2.8	3

PEDAGOGY: Lecture, Case study, Assignments, Group discussion, Power point presentations.

4.2 CORE XII FOOD PRODUCT DEVELOPMENT

CREDITS:5

SEMESTER:III

YEAR:II

HOURS PER WEEK:6

COURSE OBJECTIVES:

To enable students to:

Understand the various aspects of food product development Develop products that meet consumer requirements and demands

Formulate products that are nutritionally and commercially viable

COURSE OUTCOME:

On successful completion of the course the students will be able to

CO No.	CO Statement
CO1	Apply a product development process to generate ideas, design, develop and evaluate new products and their markets.
CO2	Demonstrate skill in the application of standard methods for the measurement and evaluation of sensory differences
CO3	Evaluate and analyze the different food packaging material
CO4	Review the appropriate labelling to adhere to standards
CO5	Gain knowledge on pricing and marketing of food product

UNIT I: INTRODUCTION TO NEW FOOD PRODUCT

Definition, significance of product development, food needs and consumer preferences, market survey and designing a questionnaire to find consumer needs for a product.

Steps involved in product development, formulation of nutritious food products and standardization, Factors that influence new product development success,

Intellectual Property Rights and patenting of foods.

UNIT II: SENSORY EVALUATION OF THE PRODUCT

Assessing the sensory characteristics of food - colour, texture, harma, odor and taste. Sensory evaluation of foods – Laboratory set up, equipment, panel selection and training, judging quality.

Subjective evaluation techniques – Difference tests: paired comparison test, duo-trio test, triangle test. Rating tests – Ranking single sample, two samples and multiple samples.

Objective tests to assess the sensory properties of foods.

UNIT III: ESSENTIALS OF FOOD PACKAGING

Importance, definition, principles design requirement and basic FSSAI laws governing food packaging.

Selection criteria and types of packaging material – metal, glass, paper, plastic, edible ,wooden . Packages with special features – Boil-in-bag package, plastic-shrink package, cryovac film, microwave oven packaging , aseptic packaging and distribution packaging.

UNIT IV: PRODUCT LABELLING AND REGULATIONS

Definition,purpose, importance, Function ,Nutritional information and laws governing product labelling.

Types of labelling – smart labels, barcode labels, radioactive labels, antimicrobial labels, security labels and other specialized food labels.

Standards and regulations for nutrition harming and Nutrition claims in food labels.

Unit V: QUALITY CONTROL, PRICING AND MARKETING

Analyzing the product stability, evaluation of shelf life, determining the changes in sensory attributes due to environmental conditions.

Pricing a product , Methods of pricing-cost plus pricing, Demand pricing, Competitive pricing

,mark up pricing, Principles of pricing, determining the selling price and profit margin, price bundling, promotional pricing and quantity discounts.

Advertising and marketing strategies- Basic techniques, Food advertising regulations

,Marketing mix “four P’s”

ACTIVITY

Conduct a market survey and develop a new food product based on the needs of your target audience. Conduct sensory analysis tests for the formulated product. Identify a suitable packaging material and design a label for your product. Determine the selling price and devise any two marketing strategies to promote your product.

TEXTBOOKS:

Reddy S M. (2003) .Basic food science and technology . New age publisher , 1st edition.

Subbulakshmi G and Udipi A Shobha . (2017) .Food processing and preservation .new age publisher . 1st edition.

Manay S And Shadaksharamasamy . (2009) .Food: Facts and Principles. New Age International (P) Publishers New Delhi. 1stedition .

AvantinaSharma(2017)Text book of foodscience and technology.CBSOU Publisheres and distributes ltd. 3rdedition .

REFERENCES:

Lyon D H and Francombe M A and Hasdell T A Lawson . (2002) .Guidelines for Sensory Analysis in Food Products Development and Quality Control . Chepman and Hall London. 1st edition.

Fuller G W. (1994). New Food Product Development from Concept to Market Place. RC Press New York. 2ndedition .

Man C M D andJones A A. (1994) . Shelf Life Evaluation of Foods. Blackie Academic and Professional London. 2nd edition.

Frewer L And Van TrijppH .(2007). Understanding consumers of food products. Florida USACRC Press.1st edition.

E RESOURCES

<https://www.fssai.gov.in/>

<https://nzifst.org.nz/resources/foodproductdevelopmenthttps://nzifst.org.nz/resources/foodproductdevelopment/Chapter-3-1-2.htmhttps://www.fssai.gov.in/>

<https://theintactone.com/2019/07/23/im-u3-topic-3-packaging-and-labelling/>

Mapping: (CO/PSO)

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	3	2	3	3
CO2	3	2	3	3	3	2
CO3	3	3	3	3	3	3
CO4	3	3	2	3	2	3
CO5	3	3	3	2	3	3
Average	3	2.8	2.8	2.6	2.8	2.8

PEDAGOGY

Lecture, journal reviewing, Project work, Group discussion, Power point presentations, Field visit.

4.3 Project viva voce

Course Code	
Course Title	PROJECT/SEMESTER IV- Part A
Credits/Hours/week	7/10
Course Objectives	
1. To introduce the purpose and importance of research for future development and sustenance.	
2. To make the students plan and carry out the research work.	
3. To learn the methodology of writing thesis and research articles in journals.	
Prerequisite :	Interest in review writing and research

COURSE OUTCOME

CO: 1 The project gives students the opportunity to experience real research

CO:2 Students will have a greater problem solving skills.

CO:3 Students will gain better understanding of research methods.

CO: 4 Deeper understanding of the discipline of the research

CO: 5 Better understanding of career and education path.

Evaluation of the Project Work:

The Controller of Examination appoints an External Examiner from the Panel of Examiners submitted by the Supervisor through the Head of the Department. Both the Supervisor and External Examiner will conduct the viva voce examination to the candidate and award marks.

Total Marks: 100

Internal (25 marks- awarded by guide)

External(75 marks)

Quality of the Project Work and Dissertation : 50 Marks Oral

Presentation : 15 Marks

Viva-voce : 10Marks

There will be counseling for students regarding facilities available and about the Professors offering guidance. They can choose the topic of the project and the guide at the beginning of III semester. In case the student requires extension of time for submitting the dissertation, University rules will be followed.

4.4 ELECTIVE –VI

FOOD MICROBIOLOGY PRACTICAL

CREDITS:3

SEMESTER:IV

YEAR:II

HOURS PER WEEK:4

COURSE OBJECTIVES

To understand the practical skill in handling microscope and preparation of culture media

To Gain knowledge of principles of various techniques of isolation and determination of microorganisms in foods

To acquire practical skill in production of fermented foods.

COURSE OUTCOMES:

On completion of the course the students will be able to...

CO No.	CO Statement
CO1	CO1 - Gain knowledge in handling of microscope and develop basic skill in cultivation of bacteria with different culture media
CO2	CO2 - Comprehend insight on various techniques of staining and hanging drop method to understand the morphology of microorganism.
CO3	CO3 - Evaluate and isolate microorganism form different sources like air, water and food.
CO4	CO4 - Describe and determine the viable count of microorganism from food samples.
CO5	CO5 - Understand and apply the concept of food fermentation and isolation of organism from fermented food

Unit – I

General microbiology and

Cleaning and sterilization of glass wares.

Handling of hot air oven and autoclave.

Uses and study of microscopes.

Unit 2

Preparation of culture media and their sterilization.

Cultivation of bacteria

Pour plate method.

Spread plate method.

Streak plate method

Unit 3

Study of Morphology of microorganism

Staining of bacteria

Simple staining.

Gram staining.

Microscopic test for bacterial motility by hanging drop method.

Unit – 4

Isolation of micro organisms from different sources

Air (Petri plate exposure method)

Microbial testing of water

Determination of microbiological quality of milk

Unit 5

Determination of viable count of microorganisms

Introduction to colony counter

Total plate count

Yeast and mold count

ACTIVITY

Production and Microbiological examination of fermented food (Any two)

Fermented fruits and vegetables

Fermented dairy product

Wine production

Pickle fermentation

Fermented cereal and legume-based product.

Production of edible mushroom

TEXT BOOKS

1. Frazier W.C and Westhoff D.C.(2013), Food Microbiology, Tata McGraw Hill Publishing Co., Ltd. New Delhi.
2. Annak.Joshua, (2001). Microbiology, Popular Book Depot.Chennai-15.
3. Ray, B. (2001) Fundamental Food Microbiology, 2nd Ed, CRC press, Boca raton.
4. Joshi VK&Pandey(2004).Biotechnology:food,fermentation,microbiology,biochemistry and technology,vol I &II,Educational publishers and distributors,New Delhi.
5. Crueger W and Crueger A (2003) Biotechnology: A textbook of Industrial Microbiology 2nd Edition,Panima Publishing Corpoartion,New Delhi.

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1. Guttierrez-Lopez GF and Barbosa-Canovas GV (Eds) (2003) Food Science and Food Biotechmolgy CRC press,USA.
2. Halford NG (2003) 'Genetically Modified Crops' Imperial College Press, UK
Modern Food Micro-Biology by James M. Jay, (2000), 6th edition, An Aspen Publication,Maryland, USA.
3. Food Microbiology: Fundamentals and frontiers by M.P. Doyle, L.R. Beuchat and Thoma J. Montville, (2001), 2nd edition, ASM press, USA.
4. MichealPelczar MJ, Chan ECS, Krieg N. (2001) Microbiology. 5th ed. Tata McGraw-Hill Publishing Co. Ltd.

E-LEARNING RESOURCES:

[Top Microbiology Courses - Learn Microbiology Online | Coursera Learn](#)

[Microbiology with Online Courses and Classes | edX](#)

[72 Online studies in Microbiology - Distance Learning Portal.com Microbiology Free Online Courses and MOOCs | MOOC List \(mooc-list.com\)](#)

[Virtual Microbiology Classroom: 8-week micro course from Science Prof Online](#)

Mapping: (CO/PSO)

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	2	1	3	2
CO2	3	3	2	1	3	2
CO3	3	3	2	1	3	2
CO4	3	3	2	1	3	2
CO5	3	3	2	1	3	2
Average	3	3	2	1	3	2

PEDAGOGY

Group Discussion, Case study, seminar, journal reviewing, Assignments, Power point presentation.

4.5 SEC
ENTREPRENEURIAL DEVELOPMENT

CREDITS:2

SEMESTER:IV

YEAR:II

HOURS PER WEEK:4

COURSE OBJECTIVES

To enable the students to

1. Understand basic concepts in entrepreneurship.
2. Acquire knowledge about the various Entrepreneurial development agencies.
3. Adopt key steps in the elaboration of business ideas.
4. Understand major steps involved in setting up a Small-Scale Unit.
5. Highlight the Legislation process and Labor Laws Application.

COURSE OUTCOMES

On successful completion of the course the students will be able to

	COURSE STATEMENT
CO1	Discern distinct entrepreneurial traits.
CO2	Explain business idea generation techniques, Evaluate parameters to assess opportunities and constraints for new business ideas and device a business plan. Discuss ownerships and SHG
CO3	Explain financial ,working capital and marketing management
CO4	Identify and include Major steps involved in setting up a Small-Scale Unit Elaborate Export Marketing procedures& formalities and learn about Patents & IPRs
CO5	Analyze Legislation process and explain the Labor Laws Application

Unit I

Entrepreneurship–Basic concepts

Entrepreneurship–Definition, Importance, Challenges and its relevance in career growth
Startups India–Incubation Centre-Digital entrepreneurship & Social entrepreneurship, Entrepreneur-
Meaning and Characteristics.

Unit II

Business Idea and Self-Help Groups

Business Idea Generation Techniques–Identification of Business Opportunities
Ownership-partnership, sole proprietorship, franchise, cottage industries, self-employment
SHG–Meaning, Importance and Government Assistance

Unit III

Financial and Marketing Management

Financial Management- Books of Accounts, Financial Statements, Working Capital Management–
Factors and sources, Break-Even Analysis Marketing Management- Marketing Mix- Product, Promotion, Place & Price. 27

Unit IV

Setting up a Small-Scale Unit

Major steps involved in setting up a Small-Scale Unit Financial support from Financial Institutes-

National level -NBMSME, KVIC, DC-MSME, NSIC, NSTEDB, EDI, NI-MSME, NIESBUD, IIE, NABARD

State level-DIC, SFC, SIDC, SIADB, SIDBI, Export Marketing- procedures & formalities Inventory Management & TQM Basic concepts Patents & IPRs

Unit V

Legislation Formalities

Legislation-Licensing, Registration, Municipal Laws, Business Ethics Labor Laws Application, Consumer Complaints and Redressal Tax– GST and its simplification.

REFERENCES BOOKS

- ❖ Saravanavel, (2005), Entrepreneurial Development, Ess Pee Key Publishing House, Chennai
- ❖ Vasant Desai, (2004), Project Management, Himalaya Publishing House.
- ❖ Holt (2009), Entrepreneurship, New venture creation.
- ❖ S. Saini and S. K., Dhameja, (2011), Entrepreneurship and Small Business Rawart New Delhi.
- ❖ C. Jain, (2012), Handbook for New Entrepreneurs, Oxford University Press.

E-LEARNING RESOURCES

- ❖ <http://www.ddegjust.ac.in/studymaterial/mba/cp-401.pdf>
- ❖ <https://ecestudy.files.wordpress.com/2015/02/theories-of-entrepreneurship.pdf>
- ❖ <http://www.bimkadapa.in/materials/ED-5-UNITS-PDF.pdf>
- ❖ https://www.theseus.fi/bitstream/handle/10024/115894/Laamanen_Pirita.pdf?sequence=1&isAllowed=y
- ❖ <https://www.businessstudynotes.com/finance/project-management/types-feasibility>.

Mapping of CO /PSO

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	2	2	3	2
CO2	3	3	2	2	3	2
CO3	3	3	2	2	3	2
CO4	3	3	2	2	3	2
CO5	3	3	2	2	3	2
Average	3	3	2	2	3	2

PEDAGOGY

Group Discussion, Case study, seminar, journal reviewing, Assignments, Power point presentation.