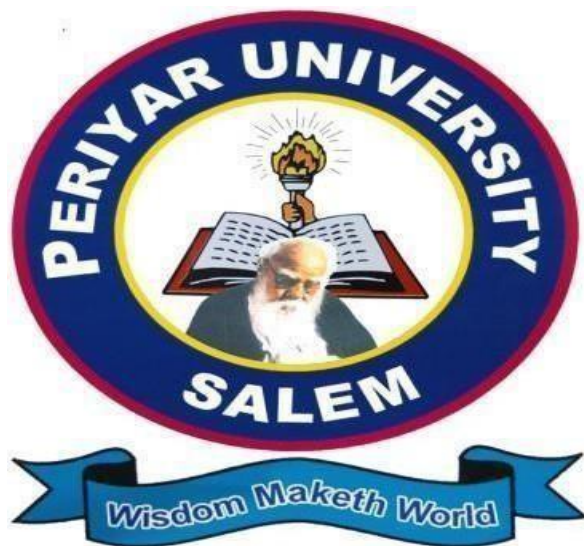


PERIYAR UNIVERSITY
SALEM-636011.



DEGREE OF MASTER OF SCIENCE

CHOICE BASED CREDIT SYSTEM

Syllabus for
M.Sc. FOOD AND NUTRITION
(SEMESTER PATTERN)

(For Candidates admitted in the Colleges affiliated to
Periyar University from 2026-2027 onwards)

Vision of the Department

To strengthen and integrate academic excellence, ethical values and social responsibility to develop a healthy nation by imparting skill-based knowledge, professional competency and entrepreneurial skills.

Mission of the Department

- ❖ To have a breadth of knowledge across the subject areas of Food and Nutrition.
- ❖ To professionally enrich the students for a successful career in Academia, Industry and Research.
- ❖ To promote and inculcate self-reliance, social relevance, sound value system and code of professional practice among students.

Introduction

M.Sc., Food& Nutrition - The Postgraduate program has been designed to provide students a vast scope 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 Food& Nutrition 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. The curriculum is structured in alignment with the Choice Based Credit System (CBCS) and with a strong focus on outcome-based education, skill development, research orientation, and experiential learning. Students are trained to apply evidence-based practices, use modern tools and technologies, and engage in critical analysis and problem-solving related to nutritional assessment, intervention, and policy implementation. Professionals specializing in, contribute significantly to public health advancement, Food& Nutrition security, and human resource development. Consequently, the discipline of Food& Nutrition holds a vital position in supporting national health priorities and contributing to the economic and overall development of the nation.

Programme Outcomes (POs)

The Expected Programme Outcomes on completion of M.Sc. Food & Nutrition

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

Programme Specific Outcomes (PSOs)

The Expected Programme Specific Outcomes on completion of M.Sc. Food & Nutrition

PSOs	Statements
PSO1	Apply advanced knowledge of food science, nutrition, dietetics and biochemistry for promoting health, disease management and nutritional wellbeing.
PSO2	Develop and evaluate safe, nutritious and value-added food products using principles of food processing, microbiology, quality control and functional foods.
PSO3	Perform research, clinical and industrial practices related to food analysis, diet planning, food quality assurance and public health nutrition with professional competence.

Methods of Assessment

METHODS OF ASSESSMENT	
Remembering (K1)	• The lowest level of questions requires students to recall information from the course content • Knowledge questions usually require students to identify Information in the textbook.
Understanding (K2)	• Understanding of facts and ideas by comprehending, organizing, comparing, translating, interpolating, and interpreting in their own words. • The questions go beyond simple recall and require Students to combined at a together
Application (K3)	• Students must solve problems by using/applying a concept learned in the classroom. • Students must use their knowledge to determine an exact response.

Analyze (K4)	- Analyzing the question is one that asks the students to breakdown something into its component parts. - Analyzing requires students to identify reasons, causes or Motives and reach conclusions or generalizations.
Evaluate (K5)	- Evaluation requires an individual to make judgement on something - Questions to be asked to judge the value of an idea, a character, a work of art, or a solution to a problem. - Students are engaged in decision-making and problem– solving.
Create (K6)	- Evaluation questions do not have single right answers. - The questions of this category challenge students to get engaged in creative and original thinking. - Developing original ideas and problem-solving skills

Highlights of the Curriculum

- ❖ The curriculum focuses on meeting the demands of the Food industry, Entrepreneurs, Public health sector, Hospitality industries, Health care 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 a 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 environments.

Eligibility for Admission

An Undergraduate 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 Programme

Two academic years consisting of 4 semesters

Features of Choice Based Credit System

Under Choice Based Credit System (CBCS), a set of Courses consisting of Core Courses, Elective Courses, Skill Based Elective Courses and Non-Major Elective Courses are offered. Beside the Core Courses, which are totally related to the major subject, the students have the advantage of studying supportive papers and Non- Major Courses. This provides enough opportunity to the students to learn not only the major courses but also interdisciplinary and application-oriented courses.

TEACHING METHODOLOGIES

Teaching methods: Chalk and Board, Experimental learning, student centric learning and small projects 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.)

WRITTEN EXAMINATION:

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 College. The Continuous Internal Assessment (CIA) Mark 25 is distributed to four components viz., Tests, Assignment and Seminar as 10, 10 and 05 respectively.

(BLOOM'S TAXONOMY) BASED QUESTION PAPER MODEL MINIMUM MARKS FOR PASSING:

Intended Learning Skills	Maximum 75 Marks Passing Minimum:50% Duration: Three Hours
Memory Recall / Example/ Counter Example/ Knowledge about the Concepts/ Understanding	Part-A (15x1=15Marks)
Descriptions/Application (problems)	Part-B (2x5=10Marks)
Analysis/Synthesis/ Evaluation	Part-C (5x10=50Marks)

B) Practical Papers:

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

Practical Examination

Scheme for Internal Marks (40 marks)

- ❖ Good laboratory practices-10marks
- ❖ Performance evaluation based on observation note and record-15marks
- ❖ Internal tests (Average of best 2 out of 3 tests)-10marks
- ❖ Attendance/ Performance Evaluation of the experiments during the conduct of the course-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 passing. The candidate should attend a viva-voce examination to secure a pass in that paper. Candidates who do 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-15 marks

External Evaluation (75marks)

- ❖ Report and Presentation-50marks
- ❖ Oral Presentation -15marks
- ❖ Viva Voce-10 marks

D)INTERNSHIP

Performance Levels

Highly Commanded (HC)

Demonstrates excellent knowledge, skills, and professional behavior. Performs tasks independently with accuracy, innovation, and confidence.

Commanded (C)

****Demonstrates good understanding and skills.**

**** Performs tasks with minimal supervision and acceptable accuracy.**

Evaluation Components

Component	Marks
Attendance & Punctuality	10
Technical Skills	25
Work Performance	25
Communication Skills	15
Report/Documentation	15
Viva Voce	10

Grade Interpretation

- **Highly Commanded (HC):** 75 – 100 Marks
- **Commanded (C):** 50 – 74 Marks
- **Below Commanded:**< 50 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 candidates 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

(M.Sc. FOOD & NUTRITION)

HR- Human Rights

M.Sc. FOOD & NUTRITION (Semester Wise Structure)

FIRST YEAR

SEMESTER-I

Course Status	Course Title	Credits	Hours
Core-I	Applied Food Science	5	6
Core-II	Applied Human Physiology	5	6
Core-III	Nutrition Through Life cycle	5	6
Core Practical-I	Applied Food Science Practical	4	6
Elective-I	A. Perspectives of Home Science – I (OR)	3	4
	B. Fundamentals of Food Technology		
SEC I	Food Processing & Preservation	2	2
	Total	24	30

SEMESTER - II

Course Status	Course Title	Credits	Hours
Core-IV	Advanced Dietetics	5	5
Core-V	Nutrition Science	5	5
Core-VI	Nutritional Biochemistry	5	6
Core Practical -II	Advanced Dietetics Practical	4	6
Elective-II	A. Perspectives of Home Science – II (OR)	3	4
	B. Bakery Technology		
Human Rights	Human Rights	2	2
NME – I	Food Science	2	2
	Total	26	30

*2.6 - NME - I (offered to other departments)

* Carried out in Summer Vacation at the end of I Year - Hospitals / Food Industries

SECOND YEAR**SEMESTER-III**

Course Status	Course Title	Credits	Hours
Core-VII	Research Methodology & Statistics	5	6
Core-VIII	Food Product Development	5	6
Core-IX	Food Microbiology	5	6
Core Practical-III	Food Product Development Practical	4	6
Elective-III	A. Food Packaging (OR)	3	4
	B. Nutrigenomics		
SEC-II	Food Quality Control	2	2
Internship/ Industrial Activity	Internship (Commended/ Highly Commend)	2	-
	Total	26	30

*3.6 - NME - II (offered to other departments)

SEMESTER-IV

Course Status	Course Title	Credits	Hours
Core-X	Public Health Nutrition	4	6
Core-XI Project with Viva Voce	Project	4	12
Core Practical-IV	Food Quality Control	4	6
Elective-IV	A. Entrepreneurial Development (OR)	3	6
	B. Sports Nutrition		
Extension Activity		1	-
	Total	16	30

Syllabus

Semester I	Core Theory - APPLIED FOOD SCIENCE
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COURSE OBJECTIVES

- Explain the structure, composition, physicochemical properties and functional characteristics of major food components such as carbohydrates, proteins, fats, milk and eggs.
- Classify and interpret different food systems including solutions, colloids, gels, emulsions and foams, and examine their role in food texture, stability and quality.
- Analyze the effects of heat, enzymes, acids and processing conditions on food constituents such as starch, proteins, fats and milk components during food preparation and preservation.
- Apply principles of food science in the use of modified starches, hydrocolloids, enzymes, additives, sweeteners and fat substitutes in processed and convenience food products.
- Evaluate the role of food additives, flavors, colors and rheological properties in improving sensory quality, shelf life and consumer acceptability of food products.

UNIT I

Properties of food- Food nutrients, solids, solutions and colloids, Solutions. 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; 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. Application of modified starches and hydrocolloids in convenience and ready-to-eat foods. Role of food rheology in texture development and consumer acceptability of processed foods

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.

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.

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.

UNIT V

Food additives- Definition, different food additives and Need for food additives. Flavor compounds in vegetables, fruits and spices; Effect of processing on food flavours; Role of colours and flavours in food products.

Sweetners- Properties, Artificial and Natural sweeteners and role of sweeteners in food industry.

Text Books

1. Srilakshmi.B; Food Science,6th edition New Age International (p) Limited Publishers 2015.
2. ShakunthalamanayN; Shadaksharaswamy.M; Foods Facts and Principles, Third edition, New Age International (p) Limited Publishers, 2014.
3. Lillian Hoaglandmeyer, Foodchemistry,CBS Publishers and distributors,2004.
4. ArindamRamaswamy, Elements of FoodScience, Oxford book company, 2010.
5. Norman N.Potter,JosephH.Hotehkiss, and foodscience, 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. 3rd edition.
2. Vickie.A. Vaciavik. (2021). Essentials of Food science. Springer publications. 5th 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. 4th Edition.

E - LEARNING RESOURCES

- www.foodrisk.org.
- <http://www.fsis.usda.gov/>
- <https://www.fda.gov/food>

COURSE OUTCOMES

After successful completion of the course the students will be able to:

CO	Course Outcomes	K level
CO1	Explain the structure, composition, physicochemical properties and functional characteristics of carbohydrates, proteins, fats, milk and eggs.	K2
CO2	Classify and interpret different food systems such as solutions, colloids, gels, emulsions and foams and relate their role in food quality and stability.	K2 / K4
CO3	Analyze the effects of heat, enzymes, acids and processing conditions on starch, proteins, fats and milk components during food preparation and preservation.	K4
CO4	Apply principles of food science in the utilization of modified starches, hydrocolloids, enzymes, additives, sweeteners and fat substitutes in processed foods.	K3
CO5	Evaluate the role of food additives, flavours, colours and rheological properties in improving sensory quality, shelf life and consumer acceptability of foods.	K5

MAPPING (CO/PO/PSO):

CO/PO/PS O	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	2	1	3	–	1	3	3	3	1	1
CO2	3	2	3	3	1	2	3	3	2	3	1
CO3	2	3	3	1	2	2	1	2	2	3	2
CO4	1	3	2	2	3	3	1	2	2	3	2
CO5	1	2	3	1	3	2	2	1	2	3	2

Semester I	Core Theory - APPLIED HUMAN PHYSIOLOGY
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COURSE OBJECTIVES

- Explain the structure and functions of cells, tissues, blood, heart, respiratory system, endocrine system, gastrointestinal system, reproductive system, nervous system, renal system, and skin.
- Describe the physiological mechanisms involved in circulation, respiration, digestion, reproduction, nerve conduction, immunity, and excretion in the human body.
- Apply the principles of human physiology to interpret normal physiological processes such as blood pressure regulation, gas exchange, hormone action, urine formation, and temperature regulation,
- Analyze the relationship between organ-system functions and physiological alterations associated with common disorders such as anemia, asthma, interstitial lung disease (ILD), endocrine dysfunctions, and renal abnormalities.
- Evaluate physiological data and clinical findings related to cardiovascular, respiratory, endocrine, nervous, and renal functions to support health assessment and clinical decision-making.

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.

Tissue

Structure and function.

UNIT II

Blood

Composition& Functions, Blood Group – ABO System &Rh factor. Blood Coagulation. Rh incompatibility, Anemias and clinical manifestations.

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

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. Alteration of pulmonary function -signs and symptoms of pulmonary diseases, asthma, ILD

Immunity Definition and types Innate and Acquire immunity.

Endocrine System Hormones and its type. Syndromes resulting from hypo and hyperactivity of Pituitary, Thyroid, Adrenals and Pancreas.

UNIT IV

Gastrointestinal System Structure and function of GI tract and its accessory organs. Digestion and absorption of Carbohydrates, Proteins and Fats.

Reproductive System

Roll of hormones in reproduction and Lactation. Menstrual Cycle and Menopause. In vitro (I V) fertilization Spermatogenesis.

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)

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. Effects of Diuretics.

Skin

Structure and function.

Regulation of temperature of the body.

Text Book

1. K. Sembulingam & Prema Sembulingam (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.

Reference Books

1. Ganong's W.F.; Review of medical physiology, 1985.
2. Campbell E. J.; Clinical and applied physiology, 1984.
3. Guyton AC and Hall JB; Textbook of medical physiology, 1996.
4. Guyton AC; Functions of human body, 1985.
5. Wilson KJ and Waugh A; Ross and Wilson. Anatomy and Physiology in health and illness, 8th edition, 2003.
6. Judith E. Brown., Nutrition New, 2nd edition, West/Wadsworth west/Wadsworth, An International Thomson publishing company, 1998.

E - LEARNING RESOURCES

- <https://nptel.ac.in>
- <https://swayam.gov.in>
- <https://epgp.inflibnet.ac.in>
- <https://ndl.iitkgp.ac.in>
- <https://openstax.org/details/books/anatomy-and-physiology>
- <https://www.khanacademy.org/science/health-and-medicine/human-anatomy-and-physiology>

COURSE OUTCOMES

After successful completion of the course the students will be able to:

CO	Course Outcomes	K level
CO1	Explain the structure and functions of cells, tissues, blood, heart, respiratory, endocrine, gastrointestinal, reproductive, nervous, renal systems, and skin.	K2
CO2	Describe the physiological mechanisms involved in circulation, respiration, immunity, digestion, reproduction, nerve conduction, and excretion.	K2
CO3	Apply physiological principles to interpret normal body functions such as gas exchange, blood pressure regulation, hormone action, urine formation, and thermoregulation.	K4
CO4	Analyze physiological changes and functional alterations associated with common disorders of the cardiovascular, respiratory, endocrine, and renal systems.	K5
CO5	Evaluate physiological parameters and clinical findings related to cardiovascular, respiratory, nervous, endocrine, gastrointestinal, reproductive, and renal functions for health assessment and clinical decision-making.	K2

MAPPING (CO/PO/PSO):

CO/PO/PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PSO 1	PSO 2	PSO 3
CO1	3	2	3	3	1	3	3	3	3	2	1
CO2	3	3	1	3	1	3	3	3	3	2	1
CO3	2	3	3	2	2	2	3	2	3	3	2
CO4	2	3	2	3	2	1	2	3	3	3	2
CO5	2	3	2	3	3	1	1	3	3	3	3

Semester I	Core Theory - NUTRITION THROUGH LIFE CYCLE
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COURSE OBJECTIVES

- Explain the concepts of Recommended Dietary Allowances (RDA), energy requirements, energy expenditure, and growth and development across different stages of life.
- Describe the physiological, nutritional, and dietary requirements during pregnancy and lactation, including nutritional problems and their dietary management.
- Apply principles of nutrition to plan balanced diets and menus for infants, preschool children, school-going children, and adolescents according to their nutritional needs.
- Analyze the influence of physiological, psychological, social, and hormonal factors on nutritional status, eating behavior, growth, and development during adolescence and adulthood.
- Evaluate the nutritional requirements and dietary modifications needed for adults, menopausal women, and elderly individuals to promote health, work efficiency, and healthy aging.

UNIT-I: RECOMMENDED DIETARY ALLOWANCES

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 AND LACTATION

Nutrition in Pregnancy

Stages of gestation, maternal weight gain, complications of pregnancy, maternal physiological changes and adjustments, nutritional problems and dietary management 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, behavioral characteristics, nutritional requirement and planning diet.

UNIT-IV: NUTRITION IN SCHOOLGOING 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 behavior, 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,,AnmolPublicationPvt,Ltd, Second Edition.2014.
2. Gopal,C.Kamalakrishnaswamy,NutritioninMajorMetabolicDisease,OxfordIndiaPaper backs Publisher First Edition 2000.
3. Srilakshmi,B.NutritionScience,NewAgeInternational[p]ltd,NewDelhi,2018.
4. MahtabS.Bamji,PrasadRao,N.VinodiniReddy.TextbookofHumanNutrition,Oxfordand IBH Publishing Co. Pvt .Ltd, Second Edition, 2013.
5. Sumati.R.Mudambi,M.VRajagopal.,FundamentalsofFoods&Nutrition,4thEditionNew age International publishers New Delhi, 2006.
6. MelvinH.Willams.,Nutrition for healthfitness&Sport.5theditionMcgraw–Hill, publishing Co., 1999.

REFERENCES BOOKS

1. Nix .S 2016, Williams' Basic Nutrition & Diet Therapy, Fifteenth Edition, Elsevier.
2. Simon Langley-Evans, 2015 Nutrition, Health and Disease: A Lifespan Approach 2nd Edition, Wiley Blackwell.
3. Jacalyn J. McComb, Reid Norman, et al., The Active Female: Health Issues Throughout the Lifespan 2010, Human press.
4. 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.
5. Antia, F.P., 1992, Clinical Dietetics and Nutrition Oxford University Press, New Delhi.
6. Corinne, R.H., 1996, Normal and therapeutic nutrition, Mcmillian Co., New York.
7. Davidson, S.R. and Passmore J.F., 1989, Human Nutrition and Dietetics, ELBS London.
8. Mahan, K.L., and Stump, S.E., 1996, Krauses Food, Nutrition and Diet therapy M.B. Saunders Co., USA.
9. Balasubramanian et al., 1998, Dietary guidelines for Indians, ICMR, New Delhi.
10. Passmore, AH and Adams, A.A., 1990, Clinical assessment of nutritional status – A working manual, Will and Wilson Publishing, London.
11. Bamji et al(1996), Textbook of Human Nutrition Oxford and IBH Publishing co. Pvt. Ltd. Delhi.
12. 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.
13. Mahan, K.L., and Stump, S.E., 1996, Krauses Food, Nutrition and Diet therapy M.B. Saunders Co.,

E - LEARNING RESOURCES

- <https://epgp.inflibnet.ac.in>
- <https://ndl.iitkgp.ac.in>
- <https://www.fao.org/nutrition>
- <https://www.who.int/health-topics/nutrition>
- <https://www.unicef.org/nutrition>
- <https://www.icmr.gov.in>

COURSE OUTCOMES

After successful completion of the course the students will be able to:

CO	Course Outcomes	K level
CO1	Describe the nutritional needs, physiological changes, and dietary management during pregnancy and lactation.	K2
CO2	Apply nutritional principles to plan balanced diets and menus for infants, preschool children, school-going children, and adolescents.	K2
CO3	Apply nutritional principles to plan balanced diets and menus for infants, preschool children, school-going children, and adolescents.	K4
CO4	Analyze the impact of physiological, psychological, hormonal, and socio-cultural factors on nutrition and health during adolescence and adulthood.	K5
CO5	Evaluate nutritional requirements and dietary modifications for adults, menopausal women, and elderly individuals to promote health and well-being.	K2

MAPPING (CO/PO/PSO):

CO/PO/PS O	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PSO 1	PSO 2	PSO 3
CO1	3	2	1	3	3	3	3	3	3	2	1
CO2	3	3	2	2	3	3	3	3	3	3	3
CO3	2	3	2	3	2	2	2	3	3	3	3
CO4	2	3	2	3	3	1	2	2	3	3	2
CO5	2	3	2	3	3	1	1	3	3	3	3

Semester I	Core Practical - APPLIED FOOD SCIENCE PRACTICAL
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COURSE OBJECTIVES

- Explain the principles and techniques of sensory evaluation and the physicochemical properties of food constituents such as starch, gluten, pulses, fruits, vegetables, milk, sugars, fats, and oils.
- Apply standard laboratory methods to assess sensory characteristics, gelatinization, cooking quality, enzymatic browning, gel formation, and quality attributes of various food materials.
- Perform experiments to determine the quality and composition of milk, sugars, fats, oils, cereals, and pulses using appropriate analytical techniques.
- Analyze the effects of processing, cooking methods, additives, and environmental factors on the physical, chemical, and sensory properties of foods.
- Evaluate food quality, detect adulteration, and interpret results of physical and sensory analyses for ensuring food safety and quality control.

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 methods of cooking fat soluble and water-soluble pigment.
2. MILK
Detecting the presence of starch, soda, starch, urea in milk samples. 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:

1. Srilakshmi B. (2015). Food Science, New Age International (P) Ltd. Publishers.
2. Potter N. and Hotchkiss J.H. (1996). Food Science, Fifth ed., CBS Publishers and Distributors, New Delhi
3. Avantinasharma (2017). Text book of food science and Technology. CBS Publisheres and distributes ltd. 3rd Edition.
4. Reddy S M. (2015). Basic Food science and technology. New Age International publishers. 2ND edition.

REFERENCES:

1. 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.
2. Eskein . (2012). Biochemistry of Food. Elsievier publications Desrosier, N.W. and James N. (2007). Technology of food preservation. AVI Publishers.
3. Manay, S. and Shadaksharamasamy, (2004) .Food: Facts and Principles, New Age International Publishers, New Delhi. 1st edition.

E - LEARNING RESOURCES

- <https://nptel.ac.in>
- <https://swayam.gov.in>
- <https://www.fssai.gov.in>
- <https://www.nin.res.in>
- <https://ndl.iitkgp.ac.in>

COURSE OUTCOMES

After successful completion of the course the students will be able to:

CO	Course Outcomes	K level
CO1	Explain the principles of sensory evaluation and the physicochemical properties of starch, pulses, fruits, vegetables, milk, sugars, fats, and oils.	K2
CO2	Apply standard laboratory techniques to assess taste sensitivity, gelatinization, cooking quality, enzymatic browning, gel formation, and other food quality attributes.	K2
CO3	Perform practical analyses to determine the quality characteristics of milk, sugars, fats, oils, cereals, and pulses using appropriate experimental methods.	K4
CO4	Analyze the effects of processing, cooking methods, additives, and storage conditions on the physical, chemical, and sensory properties of foods.	K5
CO5	Evaluate food quality, detect common adulterants, and interpret experimental results related to food safety and quality control.	K2

MAPPING (CO/PO/PSO):

CO/PO/PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	2	1	3	1	3	3	3	3	2	2
CO2	2	3	3	2	2	2	3	3	3	3	2
CO3	2	3	3	2	3	3	2	3	3	3	3
CO4	2	3	2	3	2	3	3	3	3	3	3
CO5	2	3	2	3	3	3	3	3	3	3	3

Semester I	Elective Theory - PERSPECTIVES OF HOME SCIENCE – I
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COURSE OBJECTIVES

- Explain the fundamental concepts of food science, food service management, textiles, apparel designing, resource management, and communication for development.
- Demonstrate knowledge of food quality evaluation, food safety standards, textile identification, garment construction techniques, and communication processes.
- Analyze the effects of food processing, textile properties, resource utilization, management functions, and communication models in various contexts.
- Evaluate food service systems, textile materials, apparel designs, family resource management practices, and development communication strategies for effective decision-making.
- Design and develop innovative solutions related to food services, apparel products, resource management plans, and communication programs for community and institutional settings.

Unit I

Food Science and Food Service Management

Food Science - Food science and nutrition, Properties of food – physical and chemical properties, Quality evaluation of foods- objectives and subjective, Effects of cooking and processing techniques on nutritional components and other physical parameters, food preservation and application, Food pigments and additives, Food standards, microbiological safety of food, HACCP, food packaging. **Food Service Management**- Perspectives of food service- menu planning, food cost analysis, New product development - Nano technology, Food service management of institutional level-hospital, educational institutions, social and special institutions

Unit II

Textile terminologies- fibre, yarn, weave, fabric etc., classification of fibers, yarns and weaves, Identification of fibres and weaves, Manufacturing process of major natural and manmade fibres, properties and their end uses, Different methods of fabric construction-woven, knitted and non woven fabrics, their properties and end uses, Textiles finishes-classification, processing and purposes of finishes.

UNIT-III:

Apparel Designing

Body measurements- Procedure, need, figure types and anthropometry, Equipments and tools used for manufacturing garments-advancements and attachments used for sewing machine. Types of machines used and their parts, Elements and principles of design and its application to apparel. Illustrations and parts of garments.

UNIT- IV

Resource Management

Management-concept, approaches, management of time, energy, money, space, motivating factors, motivation theories, decision making, Functions of management. **Resources**-classification, characteristics, factors affecting use, resource conservation, time management, work simplification techniques, classes of change, fatigue and its management.

Money management - family income, types, supplementation, budgeting, household accounts, family savings and investment, tax implications.

Unit V Communication for Development

Basics of communication- nature, characteristics, functions, process, models, elements, principles, barriers, perception, persuasion and empathy, types of communication, levels (settings) of communication transactions, process of listening, Communication systems and communication theories- human interaction theories, mass communication theories, message design theories, communication systems, culture and communication.

Concept of development- theories, models, measurement and indicators of development, Concept of development- communication models and approaches, diffusion and innovation, mass media, social marketing, Role of communication in development- need and importance, development journalism, writing for development-print, radio, television and internet.

TEXTBOOK REFERENCE

1. Premalata Mullick, 2004, Text Book of Home Science, Kalyani Publishers, Pp: 137-160.
2. Sumati R Mudambi, M V Rajagopal, 2012, Fundamentals of Foods Nutrition and Diet Therapy, New Age International (P) Ltd. Publishers, New Delhi, Pp: 1-25.
3. Jha, J.K. (2002). Encyclopaedia of Teaching of Home Science, Vol.I,II and III . New Delhi: Anmol Publications.
4. Suriakanthi.A., (2002). Child Development - An Introduction Gandhigram: Kavitha Publications.
5. 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.

E - LEARNING RESOURCES

- www.swayam.gov.in
- www.nptel.ac.in
- www.ndl.iitkgp.ac.in
- www.epgp.inflibnet.ac.in
- www.fssai.gov.in

COURSE OUTCOMES

After successful completion of the course the students will be able to:

CO	Course Outcomes	K level
CO1	Explain the principles of food science, food service management, food safety standards, preservation methods, and quality evaluation of foods.	K2
CO2	Describe the classification, properties, manufacturing processes, identification, and applications of textile fibers, yarns, fabrics, and finishes.	K2
CO3	Apply the principles and elements of design, body measurements, and garment construction techniques in apparel designing.	K4
CO4	Analyze the concepts and applications of resource management, including time, energy, money, space management, decision-making, budgeting, and work simplification techniques.	K5
CO5	Evaluate communication processes, theories, development communication approaches, and the role of media in promoting social and developmental change.	K2

MAPPING (CO/PO/PSO):

CO/PO/PS O	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PSO 1	PSO 2	PSO 3
CO1	3	2	2	1	2	2	1	1	3	2	2
CO2	3	2	2	1	1	2	2	1	3	2	2
CO3	2	2	3	2	2	2	2	1	3	3	2
CO4	2	3	2	3	2	3	2	2	2	3	3
CO5	2	3	2	2	3	2	3	3	2	3	3

COURSE OBJECTIVES

- Remember and explain the fundamental concepts, principles, terminology, and recent developments in Food Technology.
- Describe and classify the structure, composition, processing methods, and quality characteristics of cereals, millets, pulses, fruits, vegetables, fats, and oils.
- Apply food processing and preservation techniques such as malting, fermentation, pasteurization, homogenization, refining, and packaging to maintain food quality and safety.
- Analyze the physical, chemical, biochemical, and microbiological changes occurring in food products during processing, storage, and spoilage.
- Evaluate the quality, nutritional value, and technological aspects of foods and recommend suitable processing methods for safe and value-added food production.

UNIT – I

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

UNIT – II

I. Cereals and Millets Structure and composition of cereals

Wheat- structure and composition, types (hard, soft/ strong, weak) Diagrammatic representation of longitudinal structure of wheat grain. Malting, gelatinization of starch, types of browning-Maillard & caramelization. Rice- structure and composition, parboiling of rice- advantages and disadvantages.

II. Pulses

Structure and composition of pulses, toxic constituents in pulses, processing of pulses- soaking, germination, decortications, cooking and fermentation.

UNIT – III

I. Fats and Oils

Classification of lipids, types of fatty acids - saturated fatty acids, unsaturated fatty acids, essential fatty acids, trans fatty acids. Refining of oils, types- steam refining, alkali refining, bleaching, steam deodorization, hydrogenation. Rancidity –Types- hydrolytic and oxidative rancidity and its prevention.

II. Fruits and Vegetables

Classification of fruits and vegetables, general composition, enzymatic browning, names and sources of pigments, Dietary fibre. Post harvest changes in fruits and vegetables – Climacteric rise, horticultural maturity, physiological maturity, physiological changes, physical changes, chemical changes, pathological changes during the storage of fruits and vegetables.

UNIT – IV

Flesh Foods - Meat, Fish, Poultry

Meat - Definition of carcass, concept of red meat and white meat, composition of meat, marbling, post-mortem changes in meat- rigor mortis, tenderization of meat, ageing of meat. **Fish** - Classification of fish (fresh water and marine), aquaculture , composition of fish, characteristics of fresh fish, spoilage of fish- microbiological, physiological, biochemical. **Poultry** - Structure of hen's egg, composition and nutritive value, egg proteins, characteristics of fresh egg, deterioration of egg quality, difference between broiler and layers.

UNIT – V

Milk and Milk Products

Definition of milk, chemical composition of milk, its constituents, processing of milk, pasteurization, homogenization. An overview of types of market milk and milk products.

Spices & condiments processing and modern technology

Text Book

1. Swaminathan, M., Food Science, Chemistry and Experimental Foods, Bappco Publishers, 2005.
2. Paul, P.C., and Palmer, H. H., Food Theory and Applications. John Wiley and Sons, New York, 2000.
3. Srilakshmi, M., Food science, New Age International (P) Ltd., Publishers 2010

Reference Books

1. Robertson, G.L. Food Packaging: Principles and Practice (2nd Ed)., Taylor & Francis, 2006
2. Peppler, H.J. and D. Perlman, Microbial Technology: Fermentation Technology, 2nd Edition, Vol. II Academic Press / Elsevier, 2004.

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- www.icar.org.in
- www.fssai.gov.in
- www.cftri.res.in

- www.ifst.org
- www.fao.org/food-safety/food-control-systems/en/

COURSE OUTCOMES

After successful completion of the course the students will be able to:

CO	Course Outcomes	K level
CO1	Explain the basic concepts, principles, terminology, and applications of Food Technology in food processing, preservation, packaging, and distribution.	K2
CO2	Describe the structure, composition, and processing characteristics of cereals, millets, and pulses and their significance in food product development.	K2
CO3	Apply the principles of lipid technology and fruit and vegetable processing to improve food quality, shelf life, and nutritional value.	K4
CO4	Analyze the composition, quality attributes, post-harvest changes, spoilage mechanisms, and processing methods of meat, fish, poultry, fruits, and vegetables.	K5
CO5	Evaluate the processing techniques, quality characteristics, and safety aspects of milk, milk products, spices, and condiments for food industry applications.	K2

MAPPING (CO/PO/PSO):

CO/PO/PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PSO 1	PSO 2	PSO 3
CO1	3	2	1	-	1	-	-	1	3	2	1
CO2	3	2	2	1	-	-	-	1	3	2	2
CO3	2	3	3	1	1	-	1	1	2	3	3
CO4	2	3	2	3	1	1	1	1	2	3	2
CO5	2	2	2	3	3	1	1	2	2	3	3

COURSE OBJECTIVES

- Explain the principles, scope, and historical development of food processing and preservation techniques, including thermal processing and baking operations.
- Describe the principles and applications of radiation and microwave heating in food processing and evaluate their effects on food quality and microbial
- Analyze the role of refrigeration and freezing methods in food preservation and assess their influence on the quality and storage stability of food products.
- Apply chemical preservation, concentration, and fermentation techniques for enhancing food shelf life and maintaining product quality.
- Evaluate various drying and dehydration methods, packaging, storage practices, and moisture analysis techniques used in food processing industries.

UNIT –I

Introduction: Definition and scope of Food science and technology, historical development of food processing and preservation, general principles of food preservation

Processing and preservation by heat: Blanching, pasteurization, sterilization and UHT processing, canning, extrusion cooking, dielectric heating, microwave heating, baking, roasting and frying. Retort processing of ready to eat (RTE) products.

Baking: Milling, Principle of baking various baked products.

UNIT –II

Radiation: Source of radiation, mode of action effect on microorganisms and different nutrients dose requirements for radiation preservation of food.

Microwave heating: Principles and application in Food processing.

UNIT –III

Refrigeration and Freezing Preservation: Refrigeration and storage of fresh food major requirement of refrigeration plant atmospheric storage, refrigerated storage of various food freezing point of selected food influence of freezing and freezing rate of quality of the food product. Method of freezing storage, and thawing of frozen food.

UNIT –IV

Chemical Preservation: Preservation of food by use of sugar, salt, chemicals, antibiotics & by smoking

Concentration: Application in food industry processes and equipment for manufacture of various concentrated foods and their keeping quality

Fermentation: Application in preservation of food pickling. curing etc

UNIT –V

Drying: Processing and preservation by drying, concentration and evaporation, various methods employed in production of dehydrated food products, selection of methods based on characteristics

of foods to be produced, advantages and disadvantages of different methods, sun-drying, tray or tunnel drying, spray drying, drum drying, freeze drying, fluidized bed drying. Physical and chemical changes during drying control of chemical changes, desirable and undesirable changes. Packaging and storage of dehydrated food products. Outlines of moisture analysis.

Textbooks and Reference materials:

1. Desrosier NW & James N. (2007). Technology of food preservation. AVI Publishers
2. Fellows, P.J. (2005). Food processing technology: Principle and Practice. 2nd Ed. CRC Publishers
3. Jelen, P. (2005). Introduction to Food Processing. Prentice Hall
4. N.M. Potter, Food Science and Technology.

E - LEARNING RESOURCES

- <https://www.fda.gov/food>
- <https://www.agritech.tnau.ac.in>
- <https://ndl.iitkgp.ac.in>
- <https://www.coursera.org>
- <https://www.edx.org>
- <https://ocw.mit.edu>

COURSE OUTCOMES

After successful completion of the course the students will be able to:

CO	Course Outcomes	K level
CO1	Explain the concepts, scope, and principles of food science, food processing, and food preservation techniques	K2
CO2	Describe the principles and applications of radiation and microwave heating in food processing and evaluate their effects on food quality and microbial safety.	K2
CO3	Analyze the role of refrigeration and freezing methods in food preservation and assess their influence on the quality and storage stability of food products.	K4
CO4	Apply chemical preservation, concentration, and fermentation techniques for enhancing food shelf life and maintaining product quality.	K5
CO5	Evaluate various drying and dehydration methods, packaging, storage practices, and moisture analysis techniques used in food processing industries.	K2

MAPPING (CO/PO/PSO):

CO/PO/PS O	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PSO 1	PSO 2	PSO 3
CO1	2	2	-	-	-	-	-	2	2	2	2
CO2	2	2	2	-	-	-	-	2	2	2	3
CO3	-	2	2	2	-	-	-	2	2	2	3
CO4	-	-	3	2	2	-	-	3	2	3	3
CO5	-	-	2	3	2	2	-	3	2	3	3

COURSE OBJECTIVES

- Understand principles of diet therapy, hospital diets, role of dietitian, and apply nutrition care process in clinical settings.
- Explain the etiology, clinical features, and dietary management of gastrointestinal disorders.
- Analyze metabolic disorders such as diabetes and cardiovascular diseases and formulate appropriate diet plans.
- Evaluate nutritional requirements and design therapeutic diets for renal, hepatic diseases, and metabolic bone disorders.
- Apply knowledge of drug-nutrient interactions and develop nutritional care plans for cancer and surgical patients.

UNIT I

Diet Therapy – Principles & Objectives, Routine hospital diets, Classification of dietitians, role of dietitian in the hospital and community, Nutrition Care Process (NCP), Diet planning and use of exchange list in nutrient calculation, diet counseling and patient education.

Special Feeding methods: Enteral and Parenteral nutrition – types, applications, nutrient composition of feeds, complications, merits and demerits. Functions of Indian Dietetic Association.

Weight management - Introduction, Clinical manifestation and Dietary management in Underweight, Overweight and Obesity.

UNIT II

Gastro Intestinal Diseases: Diseases of Esophagus Esophagitis and Hiatus hernia.

Disease of Stomach: Indigestion, hypochlorhydria, acute and chronic gastritis, peptic ulcer.

Disease of Intestine: Flatulence, constipation, diarrhea, steatorrhea.

Inflammatory Diseases - Diverticulosis, diverticulitis, regional enteritis, ulcerative colitis, malabsorption syndrome - Sprue.

UNIT III

Nutritional management of Diabetes: Classification & diagnostic criteria, Gestational diabetes, Diabetic complications, Role of Physical activity on blood sugar control, Dietary management of diabetes.

Cardiovascular Disorders, Specific nutritional Causes, Prevention & Management: Dyslipidemia, Mediterranean diet, Dietary effects on serum lipids & lipoproteins, Dietary sources of cholesterol,

Atherosclerosis, Dietary guidelines for CVD, Prevention of CVDs by lifestyle and non-lifestyle modifications, Nutrition on hypertension.

UNIT IV

Renal functions and Nutrition: Nutritional assessment, Daily nutrient & fluid needs, Stages in renal failure, Practical application of diet.

Hepatic functions & nutrition: Role of liver in normal nutrient metabolism, Impact of liver disease in nutritional metabolism, Nutritional evaluation & management of hepatic diseases.

Osteoporosis and Osteopenia: Causes & Consequences, Nutritional management.

UNIT V

Interaction between Drugs and Nutrients - Effect of drugs on absorption, utilization and metabolism of nutrients, Effect of nutrients on absorption and utilization of drugs.

Cancer: Types of Cancer, Nutritional Management, Nutritional management during Chemotherapy.

Dietary management in any type of Surgical conditions & Burns.

Text Books

1. Advances in diet therapy: Practical manual, New Age International Private Limited, Vimala Kathleen Mahan and Sylvia Escort – Stump (2000) : Food, Nutrition & Diet Therapy 11th Edition, W.B. Saunders Company London.
2. Scrimshaw, N.S. and Gleason, G.R. (1992) Assessment Procedures. Qualitative Methodologies for Planning and Evaluation of Health related Programmes. International Nutrition foundation for Developing Countries.

Reference Books

1. Garrow JS, James WPT, Ralph A.(2000). Human Nutrition and Dietetics.Churchill Livingstone, NY. 10th edition.
2. Groff L James, Gropper S Sareen.(2000). Advanced Nutrition and Human Metabolism.West / Wadsworth, UK. 3rd edition.

E - LEARNING RESOURCES

1. <https://www.nin.res.in>
2. <https://www.icmr.gov.in>
3. <https://www.who.int>

COURSE OUTCOMES

After successful completion of the course the students will be able to:

CO	Course Outcomes	K level
CO1	Explain the concepts of diet therapy, hospital diets, and nutrition care process in clinical practice.	K2
CO2	Describe the pathophysiology and dietary management of gastrointestinal diseases.	K2
CO3	Analyze and interpret nutritional needs in diabetes and cardiovascular disorders.	K4
CO4	Evaluate and design therapeutic diets for renal, hepatic, and metabolic bone diseases.	K5
CO5	Apply principles of drug-nutrient interaction and plan diets for cancer and surgical conditions.	K3

MAPPING (CO/PO/PSO):

CO/PO/PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PSO 1	PSO 2	PSO 3
CO1	3	2	1	2	2	1	1	1	3	2	1
CO2	3	2	1	2	2	1	1	1	3	2	1
CO3	3	3	2	3	2	2	1	1	3	3	2
CO4	3	3	3	3	2	2	2	2	3	3	3
CO5	3	2	2	2	2	2	1	1	3	3	2

Semester II	Core Theory - NUTRITION SCIENCE
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COURSE OBJECTIVES

- Understand the classification, digestion, absorption, and metabolic role of carbohydrates, including their impact on blood glucose regulation.
- Explain protein structure, functions, requirements, and the role of water and electrolytes in maintaining body homeostasis.
- Analyze lipid composition, functions, fatty acid types, and the importance of essential fatty acids in human health.
- Describe the functions, metabolism, and deficiency disorders of fat-soluble and water-soluble vitamins.
- Evaluate the role of macro and trace minerals in physiological processes and their nutritional significance.

UNIT I

Carbohydrates – Introduction, Classification - Basis of degree of polymerization, based on digestive fate of carbohydrates. Functions, Food sources, Requirements Digestion, absorption and metabolic utilization of carbohydrates, Regulation of blood glucose concentration. Role of fibre in human nutrition

UNIT II

Proteins-Introduction, Classification, Functions, Requirements and RDA, Food sources, Digestion, absorption and metabolic utilization of protein, Quality of proteins.

Water and electrolytes – Introduction, water, electrolytes and body composition, body water distribution, body electrolyte content: Distribution and exchangeable fractions, Intracellular water and the body cell mass concept, regulation of body water compartments, metabolic links: glucose, water and sodium.

UNIT III

Lipid - Introduction, Classification, Function, Food sources, Requirements, RDA, digestion, absorption, transport and storage. Lipids and gene expression. Dietary fat and coronary heart disease. Fatty acid- Types, Functions, Requirements, food sources and deficiency. Omega fatty acids – Role in good health, daily values, food sources, fortification and omega fatty acids.

UNIT IV

Fat soluble vitamins: Vitamin A, D, E and K – Food sources, RDA, Functions, Absorption, Transport, Storage, Deficiency and toxicity.

Water soluble vitamins: Thiamine, Riboflavin, Niacin, Pantothenic acid, Biotin, B6, Folate, Vitamin B12, Vitamin C – Food sources, RDA, Function, Absorption, transport, storage, excretion and deficiency.

UNIT V

Major minerals: Sodium, Potassium, Calcium, Phosphorus, Magnesium and Chloride – Food sources, RDA, Functions, Absorption, Transport, Storage, excretion and deficiency.

Trace Minerals: Iron, Zinc, Copper, Iodine, Selenium, Manganese, Fluoride – Food sources, RDA, Functions, Absorption, Transport, Storage, excretion and deficiency.

Text Books

1. Nutrition and Dietetics – Joshi, S.A. Nutrition and Dietetics. McGraw Hill Education, New Delhi.
2. Fundamentals of Foods, Nutrition and Diet Therapy – Mudambi, S.R. & Rajagopal, M.V. Fundamentals of Foods, Nutrition and Diet Therapy. New Age International Publishers.
3. Textbook of Human Nutrition – Bamji, M.S., Rao, N.P. & Reddy, V. Textbook of Human Nutrition. Oxford & IBH Publishing Co.

Reference Books

1. Michael. J. Gibney et al; clinical nutrition Blackwell science , 2005.
2. Shubhangini. A. Joshi; Nutrition and Dietetics III edition, McGraw Hill Education (India) private limited
3. Srilakshmi.B; Nutrition Science, 15 edition, New Age International (P) Limited, Publishers, 2016.
4. Sunetra Roday; Food Science and Nutrition, 2nd edition, Oxford University press, 2013
5. Carol Byrd – Bredbenner; Wardlaw's perspectives in Nutrition, 9th edition
6. McGraw – Hill International Edition, 2013

E - LEARNING RESOURCES

1. <https://swayam.gov.in>
2. <https://www.nin.res.in>
3. <https://www.fssai.gov.in>

COURSE OUTCOMES

After successful completion of the course the students will be able to:

CO	Course Outcomes	K level
CO1	Explains the digestion, absorption, and metabolic utilization of carbohydrates and their role in health.	K2
CO2	Interprets protein quality, requirements, and fluid-electrolyte balance in the human body.	K2
CO3	Differentiates types of lipids and evaluates their physiological and nutritional importance.	K4
CO4	Assesses the functions and deficiency manifestations of vitamins in maintaining health.	K5
CO5	Analyzes the role of major and trace minerals in body functions and disease prevention.	K2

MAPPING (CO/PO/PSO):

CO/PO/PS O	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PSO 1	PSO 2	PSO 3
CO1	3	2	1	1	1	1	1	1	3	2	1
CO2	3	2	1	2	1	1	1	1	3	2	2
CO3	3	3	2	2	1	1	1	1	3	3	2
CO4	3	2	2	3	1	1	1	1	3	2	2
CO5	3	3	2	2	1	2	1	1	3	3	2

COURSE OBJECTIVES

- Understand the principles of biological oxidation, enzyme function, and antioxidant defense systems.
- Explain carbohydrate metabolism pathways and their hormonal regulation in maintaining blood glucose homeostasis.
- Describe protein and amino acid metabolism, including synthesis of biologically important compounds.
- Analyze lipid metabolism and its integration with carbohydrate and protein metabolism.
- Interpret the structure and function of nucleic acids and the role of nutrigenomics in health and disease.

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 II

Metabolism of Carbohydrates: Glycolysis, The Citric Acid Cycle, glycogenesis, glycogenolysis, gluconeogenesis, The Hexose Monophosphate Shunt and bioenergetics. Hormonal regulations of blood glucose homeostasis. Glucose level in normal blood, renal threshold, hyper and hypoglycemia and glycosuria; diabetes mellitus, Glycogen storage disorders I -VI, Pentosuria, and galactosemia.

UNIT III

Protein and amino acid metabolism: Oxidative Deamination, decarboxylation, transamination and transmethylation of amino acids, urea cycle, catabolism of essential amino acid. Synthesis of non-essential amino acids. Synthesis of specialized products from amino acids: thyroxine, melanin, serotonin, histamine, melatonin, dopamine.

UNIT IV

Metabolism of Lipids: Intestinal transport of lipids, cellular uptake and metabolism of lipids (beta oxidation, de novo synthesis of fatty acids, synthesis and breakdown of unsaturated fatty acids, cholesterol, phospholipids and triacylglycerol) Lipoprotein metabolism, Regulation of lipid

metabolism. Overview of intermediary metabolism of carbohydrates, protein and lipid. Hormonal regulation of carbohydrate protein and fat metabolism.

UNIT V

Structural components and functions of nucleic acid, Structure of DNA and RNA and its types. DNA Replication. Transcription and 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.

Reference Books

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.

E - LEARNING RESOURCES

- <https://www.ncbi.nlm.nih.gov/books/>
- <https://openstax.org/details/books/biology-2e>
- <https://www.ncbi.nlm.nih.gov/books/NBK21154/>
- <https://www.genome.gov/>

COURSE OUTCOMES

After successful completion of the course the students will be able to:

CO	Course Outcomes	K level
CO1	Explains biological oxidation, enzyme mechanisms, and the role of antioxidants in health.	K2
CO2	Interprets carbohydrate metabolic pathways and regulation in normal and diseased conditions.	K2
CO3	Analyzes protein and amino acid metabolism and synthesis of specialized biomolecules.	K4
CO4	Evaluates lipid metabolism and its role in energy balance and metabolic regulation	K5
CO5	Explains nucleic acid structure, gene expression, and applications of nutrigenomics.	K2

MAPPING (CO/PO/PSO):

CO/PO/PS O	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PSO 1	PSO 2	PSO 3
CO1	3	2	1	1	1	1	1	1	3	2	1
CO2	3	3	2	2	1	1	1	1	3	3	2
CO3	3	3	2	2	1	1	1	1	3	3	2
CO4	3	3	2	3	1	1	1	1	3	3	2
CO5	3	2	2	2	1	2	1	1	3	2	2

Semester II	Core Theory - ADVANCED DIETETICS PRACTICAL
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COURSE OBJECTIVES

- Develop knowledge on therapeutic diet modifications for various clinical conditions.
- Understand principles of planning and preparation of routine hospital diets.
- Apply nutritional assessment techniques in clinical diet planning.
- Design disease-specific diets based on patient requirements and medical conditions.
- Integrate clinical nutrition concepts with practical dietetic management in hospital settings.

ADVANCED DIETETICS PRACTICAL

1. Routine hospital diet: Regular diet, Clear liquid, soft diet, Full liquid diet.
2. Planning and preparing a diet for Obesity & Underweight.
3. Planning and preparing a diet for the GI tract – Peptic ulcer, Diarrhea, and Constipation.
4. Planning and Preparing diet for Hepatitis
5. Assessing and planning diets for Osteoporosis.
6. Planning and preparing a diet for Diabetes Mellitus [IDDM and NIDDM].
7. Planning and preparing a diet for Dyslipidemia.
8. Planning and preparation of diet for Kidney stones, Renal failure, Nephritic and nephrotic syndrome. Dialysis (Pre & Post Dialysis).
9. Planning and preparation of diet for Cardio-vascular diseases - atherosclerosis, hypertension.
10. Planning and preparation of diet for Cancer and Burns

Text Books

1. Stump SE.(2012).Nutrition and diagnosis related care. Lippincott Williams and Wilkins. Canada.7th edition.
2. Width.M&Reinhardt.T. (2018).The Essential Pocket Guide for Clinical Nutrition.Wolters Kluwer Publishers. 2nd edition.
3. Whitney EN and RolfesSR.(2002). Understanding Nutrition, 9th edition, West/Wordsworth.

Reference Books

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

E - Learning resources

1. <https://www.nin.res.in>
2. <https://www.icmr.gov.in>
3. <https://www.who.int/health-topics/nutrition>
4. <https://www.dietitians.ca>

COURSE OUTCOMES

After successful completion of the course the students will be able to:

CO	Course Outcomes	K level
CO1	Explains principles of routine hospital diets and therapeutic modifications.	K2
CO2	Demonstrates planning and preparation of diets for metabolic disorders like obesity, diabetes, and dyslipidemia.	K2
CO3	Analyzes dietary management for gastrointestinal, hepatic, and renal disorders.	K4
CO4	Evaluates and designs therapeutic diets for chronic diseases including cardiovascular diseases, cancer, and burns.	K5
CO5	Applies nutritional assessment techniques in planning individualized diets for clinical conditions.	K2

MAPPING (CO/PO/PSO):

CO/PO/PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PSO 1	PSO 2	PSO 3
CO1	3	2	2	1	1	1	1	1	3	2	1
CO2	3	3	2	2	2	1	1	1	3	3	2
CO3	3	3	3	2	2	2	1	1	3	3	2
CO4	3	3	3	3	2	2	2	1	3	3	3
CO5	3	2	2	2	2	1	1	1	3	2	2

COURSE OBJECTIVES

- Develop understanding of nutrition, human development, and family dynamics across the life span.
- Explain principles of housing, interior design, ergonomics, and energy management.
- Apply concepts of extension education and community development in real-life contexts.
- Analyze social issues, gender roles, and human rights in relation to family and society.
- Integrate interdisciplinary knowledge of home science for holistic development and well-being.

UNIT I

Nutrition and Dietetics - Food groups – balanced diet, food pyramid, macro and micro nutrition. Nutrients-role of nutrients in the body, nutrient deficiencies and requirements for Indians. Public health nutrition. Nutrition through life span-physiological changes, growth and development from conception to adolescence, nutritional needs and dietary guidelines for adequate nutrition through life cycle, nutrition concerns. Community nutrition, sports nutrition, nutrition in emergencies and disasters. Nutritional assessment - methods and techniques. Nutritional intervention - national nutrition policies and programmes, food and nutrition security. Clinical and therapeutic nutrition. Diet counseling and management.

UNIT II

Human Development - Principles of growth and development, care during pregnancy and pre-natal and neonatal development. Theories of human development and behavior.

Early childhood care and education, Influence of family, peers, school, community and culture on personality development. Children and persons with special needs, care and support, special education, prevention of disabilities, rehabilitation. Children at risk-child labour, street children, children of destitute, orphans, child abuse and trafficking. Adolescence and youth: changes, challenges and programs to promote optimal development. Adulthood, characteristics, changing roles and responsibilities in early and middle adulthood. Aging-physical and psychological changes and care needs.

UNIT III

Family Studies - Dynamics of marriage and family relationships. Family welfare-approaches, programmes and challenges, role in national development. Domestic violence, marital disharmony, conflict, resolution of conflict. Parent education, positive parenting, community education. Family disorganization, single parent families. Family studies-family in crisis, family therapy, initiatives for child development.

Human rights, rights of children, rights of women, status of women, gender roles. Guidance and counseling- across life span and for care givers. Health and well being across life span development.

UNIT IV

Housing and Interior Design - Design fundamentals – elements of art, principles of design, principles of composition. Colour - dimensions of colour, psychological effects of colour, colour schemes, factors affecting use of colour. Space planning and design-housing need and important, principles of planning spaces, types of house plans, economy in construction, planning for different income groups. Energy as a resource- conventional and non- conventional sources, renewable /nonrenewable energy, energy management, national efforts on energy conservation. Product design - design thinking process, diffusion and innovation, design communication, ergonomic considerations. Ergonomics - significance, scope, anthropometry, man, machine, environment relationship, factors affecting physiological cost of work, body mechanics, functional design of work place, time and motion study, energy studies.

UNIT V

Extension Management and Community development : Historical perspectives of extension– genesis of extension education and extension systems in India and other countries, objectives of extension education and extension service, philosophy and principles of extension programme development. Programme management - need assessment, situation analysis, planning, organization, implementation, monitoring and evaluation. Extension methods and materials- interpersonal, small and large group methods, audiovisual aids-need, importance, planning, classification, preparation and field testing, use and evaluation of audio-visual materials. Curriculum development and planning for extension education and development activities, Bloom's taxonomy of educational objectives and learning. People's participation and stakeholders' perspectives, Participatory Learning and Action-methods and techniques. Development programmes in India for urban, rural and tribal population groups programmes for nutrition, health, education, wage and self employment, women's development, skill development, sanitation and infrastructure.

Text Books

1. Premalata Mullick, 2004, Text Book of Home Science, Kalyani Publishers, Pp: 137-160.
2. Sumati R Mudambi, M V Rajagopal, 2012, Fundamentals of Foods Nutrition and Diet Therapy, New Age International (P) Ltd. Publishers, New Delhi, Pp: 1-25.
3. Jha, J.K. (2002). Encyclopaedia of Teaching of Home Science, Vol.I,II and III. New Delhi: Anmol Publications.
4. Suriakanthi.A.,(2002).Child Development-An Introduction Gandhigram: Kavitha Publications.
5. Srilakshmi.B. (2015). Food Science. New Delhi. New Age International Pvt.Ltd.

Reference Books

1. Premalata Mullick, 2004, Text Book of Home Science, Kalyani Publishers, Pp: 137-160.
2. Sumati R Mudambi, M V Rajagopal, 2012, Fundamentals of Foods Nutrition and Diet Therapy, New Age International (P) Ltd. Publishers, New Delhi, Pp: 1-25.
3. Jha, J.K. (2002). Encyclopaedia of Teaching of Home Science, Vol.I,II and III . New Delhi: Anmol Publications.
4. Suriakanthi.A., (2002). Child Development - An Introduction Gandhigram: Kavitha Publications.
5. Srilakshmi.B. (2015). Food Science. New Delhi. New Age International Pvt.Ltd.

E - Learning Resources

1. <https://egyankosh.ac.in/bitstream/123456789/117996/1/Unit-1.pdf>
2. <https://wcd.nic.in>
3. <https://bis.gov.in>
4. <https://rural.nic.in>

COURSE OUTCOMES

After successful completion of the course the students will be able to:

CO	Course Outcomes	K level
CO1	Explains concepts of nutrition, food groups, and dietary requirements across life span	K2
CO2	Describes principles of human development, family dynamics, and social issues	K1
CO3	Analyzes housing, interior design, ergonomics, and energy management concepts	K4
CO4	Evaluates extension education methods and community development programmes	K5
CO5	Applies interdisciplinary knowledge of home science in addressing societal and developmental challenges	K3

MAPPING (CO/PO/PSO):

CO/PO/PS O	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PSO 1	PSO 2	PSO 3
CO1	3	2	2	1	1	1	1	1	3	2	1
CO2	3	3	2	2	1	1	1	1	3	3	2
CO3	3	3	3	2	2	1	1	1	3	3	2
CO4	3	3	3	3	2	2	2	1	3	3	3
CO5	3	2	2	2	2	1	1	1	3	2	2

COURSE OBJECTIVES

- Develop knowledge on raw materials and their functional properties in bakery products.
- Understand bakery equipment, tools, and processing techniques used in baking industries.
- Apply principles of cake and wafer preparation, including formulation and fault correction.
- Analyze wheat composition, flour quality, and their role in bakery product development.
- Evaluate dough processing, rheological properties, and modern baking technologies.

UNIT I

Introduction: Raw materials required for bread making and their functional properties. Essential ingredients: Flour, yeast, water, salt. Other ingredients: Sugar, colour, flavor, fat, milk and milk powder and bread improvers. Functions of various raw materials used in baking industries Materials of Baking. Leaveners and yeast foods, shortenings, emulsifiers and antioxidants, Sweeteners and, water and salt, Ingredients from milk and eggs. Fruits, vegetables, and nuts, Spices, flavors and colors. Preservation methods.

UNIT II

Bakery Equipment: Introduction to utensils and equipment used in bakery UNIT and their uses of small equipment, big equipment and oven. Bulk handling of ingredients, dough mixing and mixers, dividing, rounding, sheeting, and laminating, fermentation enclosures and brew equipment. Ovens and Slicers, Packaging materials and equipment.

UNIT III

Cakes: Classification of cakes, Ingredients used and role of ingredients in manufacture of cakes, formula balance in cakes, Processing of cakes, cake faults and remedies.

Wafers: Ingredients used and role of ingredients in manufacture of Wafers. Processing of wafers, Frozen dough products.

UNIT IV

Baking Technology I: Bakery industry in India; Wheat composition, structure and types of wheat. Milling of wheat into flour- composition, types and grades of flour. Quality evaluation of Flour. Wheat flour proteins and the importance of gluten in manufacture of bakery products. HACCP in the bakery industry. Machineries used in the bakery industry.

UNIT V

Baking Technology II: Bakery industry; raw materials and quality parameters; dough development; methods of dough mixing; dough chemistry; rheological testing of dough-Farinograph, Mixograph, Extensograph, Amylograph / Alveo consistograph, Rapid Visco Analyzer, Falling number, stickiness tester. Additives used in bakery products – flour improvers and bleaching agents.

Text Books

1. Technology of Breadmaking – Stanley P. Cauvain & Linda S. Young.
2. Bakery Products: Science and Technology – Y. H. Hui.
3. Professional Baking – Wayne Gisslen.

Reference Books

1. Advanced Bread and Pastry – Michel Suas.
2. The Technology of Cake Making – E.B. Bennett.
3. Baked Products: Science, Technology and Practice – S. P. Cauvain & L. S. Young.
4. Handbook of Dough Fermentations – Karel Kulp & Klaus Lorenz.
5. Practical Baking – William J. Sultan.

E - Learning Resources

1. <https://www.cerealsgrains.org>
2. <https://www.bakingindustryresearchtrust.org.uk>
3. <https://www.buhlergroup.com>

COURSE OUTCOMES

After successful completion of the course the students will be able to:

CO	Course Outcomes	K level
CO1	Explains raw materials and their functional role in bakery products	K2
CO2	Describes bakery equipment and processing techniques used in production	K3
CO3	Analyzes preparation, formulation, and defects in cakes and wafers	K4
CO4	Evaluates wheat composition, flour quality, and bakery industry practices	K5
CO5	Applies knowledge of dough rheology and baking technology in product development	K3

MAPPING (CO/PO/PSO):

CO/PO/PS O	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PSO 1	PSO 2	PSO 3
CO1	3	2	2	1	1	1	1	1	3	2	1
CO2	3	3	2	2	1	1	1	1	3	3	2
CO3	3	3	3	2	2	1	1	1	3	3	2
CO4	3	3	3	3	2	2	2	1	3	3	3
CO5	3	2	2	2	2	1	1	1	3	2	2

COURSE OBJECTIVES

- To understand the basics of food science, nutrition, food groups, nutrients, and balanced diets for good health.
- To learn the functions of major food components and their role in common food changes such as gelatinization, denaturation, rancidity, and browning.
- To gain knowledge of food processing and preservation methods, including traditional and modern techniques.
- To develop awareness of food safety, food-borne diseases, adulteration, hygiene, and the role of food quality standards and regulations.
- To understand food laws, quality evaluation, and emerging trends such as functional foods, nutraceuticals, organic foods, and ready-to-eat foods.

UNIT I

Introduction to Food Science and Nutrition

Food Science: Definition, scope, inter-relationship with other sciences Food groups: ICMR Five food groups, food pyramid, MyPlate Nutrients: Classification, functions, sources, deficiency of macro and micro nutrients – brief Balanced diet: Concept, steps in meal planning for adults Food habits: Factors affecting food choices, changing trends, fast foods – merits and demerits Outcome: Student understands role of food in health

UNIT II

Food Chemistry and Composition

Water: Types in food, water activity concept, role in spoilage Carbohydrates: Classification, gelatinization, dextrinization, role in food Proteins: Denaturation, coagulation, gel formation, functional properties Lipids: Rancidity – types and prevention, shortening, emulsification Enzymatic browning: Mechanism, control in fruits/vegetables Outcome: Student relates basic chemistry to day-to-day food changes

UNIT III

Food Processing and Preservation

Reasons for food spoilage: Microbial, enzymatic, chemical Principles of preservation: Asepsis, removal of microbes, anaerobic conditions, high/low temp Methods: Heat: Pasteurization,

sterilization, blanching, canning Cold: Refrigeration, freezing – slow vs quick freezing Dehydration: Sun drying, tray drying – merits Chemical: Role of salt, sugar, acids as preservatives Newer methods: Basic concept of extrusion, irradiation, MAP – 1 line each Outcome: Student knows why milk is boiled, why pickles don't spoil

UNIT IV

Food Microbiology and Food Safety

Food microbiology: Importance, beneficial vs harmful microbes in food borne diseases: Food infection vs intoxication – eg. Salmonella, Botulism, Staphylococcal Food adulteration: Definition, common adulterants in milk, oil, spices – simple detection tests FSSAI: Role, FSSAI logo, Agmark, ISI mark – consumer awareness Hygiene & sanitation: Personal hygiene for food handlers, kitchen hygiene – do's and don'ts Outcome: Student becomes an aware consumer

UNIT V

Food Laws, Quality and New Trends

Quality evaluation: Sensory evaluation – basic terms: colour, flavour, texture, taste Packaging: Importance, types – glass, metal, plastic, biodegradable – advantages Functional foods: Definition, examples – probiotics, prebiotics, millets, fortified foods Nutraceuticals: Concept, difference from medicine Current trends: Organic foods, vegan foods, ready-to-eat foods – benefits and concerns

Text Books

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. 3rd edition.
2. Vickie.A. Vaciavik. (2021). Essentials of Food science. Springer publications. 5th 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. 4th Edition.

E - LEARNING RESOURCES

1. www.foodrisk.org.
2. <http://www.fsis.usda.gov/>
3. <https://www.fda.gov/food>

COURSE OUTCOMES

After successful completion of the course the students will be able to:

CO	Course Outcomes	K level
CO1	Explain the definition and scope of food science, classify foods into ICMR five food groups, and discuss the functions of nutrients and concept of balanced diet in health.	K2
CO2	Describe the role of water, carbohydrates, proteins, and lipids in foods and interpret day-to-day food changes like gelatinization, denaturation, rancidity, and enzymatic browning.	K2
CO3	Demonstrate the principles of food preservation and apply methods such as heat, cold, dehydration, and chemical preservation to prevent microbial and chemical spoilage.	K3
CO4	Differentiate between food infection and intoxication, analyze common food adulterants using simple detection tests, and examine the role of FSSAI and hygiene in food safety.	K4
CO5	Evaluate food quality through sensory attributes and packaging types, and appraise the importance of functional foods, nutraceuticals, and current trends like organic and RTE foods for consumer health.	K5

MAPPING (CO/PO/PSO):

CO/PO/PS O	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PSO 1	PSO 2	PSO 3
CO1	3	2	1	3	3	1	3	3	3	1	1
CO2	3	2	3	2	1	2	2	3	2	3	1
CO3	2	3	3	1	2	2	1	3	2	3	2
CO4	1	3	2	2	3	3	1	2	2	3	2
CO5	1	2	3	1	3	2	2	1	2	3	2

COURSE OBJECTIVES

- Recall the fundamental concepts, principles, types, and ethical considerations of research, along with methods of data collection and evidence-based nutrition research.
- Explain the procedures involved in classification, tabulation, graphical presentation of data, and various sampling techniques used in research studies.
- Apply appropriate methods of data collection, sampling, tabulation, and statistical techniques for conducting nutrition and health-related research.
- Analyze experimental designs, measures of central tendency, measures of dispersion, and sources of bias in research investigations.
- Evaluate research findings using statistical tests of significance, analysis of variance, and interpretation of research data.

UNIT I

Research- Meaning of research, ethics in nutrition research, types of research and their applications, role of evidence-based nutrition. Methods of collecting data conducting enquiries to collect primary data, sources for secondary data, preparation of schedules and questionnaires, rating scales, checklists, interview, method of enquiry, training of interviewers, Observation, pre-testing of data, editing and coding the data.

UNIT II

Classification and Tabulation of data- Meaning, Objectives, types of classification, formation of frequency distribution.

Tabulation of data- Tabulation schemes, general rules, types of tables and preparation of tabular forms, methods of securing accuracy in tabulation. Representation of the data Graphical and diagrammatic representations- Significance, types of diagrams and types of graphs.

UNIT III

Sampling Methods- Census, sampling, survey methods. Probability sampling (simple random samples, systematic samples, cluster sample, stratified sampling), and Non- probability sampling methods (judgment, quota sample, convenience, snow ball sample), size of sample, sources of bias and methods of reducing bias.

UNIT IV

Design of experiments Meaning, concepts relating to experimental design, Formal experimental design- Completely randomized design, Randomized block design, Latin square design, Factorial design, Informal experimental design.

Measures of central tendency Mean, median, mode, their relative advantages and disadvantages.

Measure of dispersion Mean deviation, standard deviation, standard error, quartile deviation, Coefficient of variation, percentiles and percentile rank.

UNIT V

Tests of significance large and small sample test– ‘t’-test and interpretation, Chi square test and its interpretation, and ‘F’ tests- simple problems, Analysis of variance and interpretation- One – factor analysis of variance, two- factor analysis of variance and applications.

Research report Basic components of research report-pre-factory material, introduction and review of related literature, methodology, results, discussion, conclusion, summary, abstract, bibliography and appendices. Formulation of research proposal and report writing.

Text Books

1. Hojn C., Water low, Andrew M. Tomkins, Sally M. Grantham. MC, Anegor, —Protein Energy Malnutrition, Published by Edward Arnold, 1992.
2. V inodini Reddy, Praihad Rao, GowrinathSastry, J. and Kashinath, K.C., Nutrition Trends in India, N1N, Hyderabad, 1993.
3. Jelliffee, D.D. Pathes, Assessment of Nutritional Status of community, WHO Geneva, 1989.
4. SaralaGopalan (1996), Towards better nutrition for women and children, Problem and Programmes, Department of Women and Child Development, Government of India.

Reference Books

1. Proceedings of the Nutrition Society of India, Vol. 35, 42, 43, 44, 46 and 47, 1999, N1N, Hyderabad
2. S.WalRuchi Mishra, Encyclopedia of Health Nutrition and Family Welfare, Published by Sarup and Sons, New Delhi, 2000.
3. Park and Park, Text book of preventive and social medicine, Banarsidas Published by Jahalpu, 1995.

E - LEARNING RESOURCES

1. epgp.inflibnet.ac.in
2. swayam.gov.in
3. ndl.iitkgp.ac.in
4. www.icmr.gov.in
5. www.nin.res.in

COURSE OUTCOMES

After successful completion of the course the students will be able to:

CO	Course Outcomes	K level
CO1	Define and recall the concepts, types, ethical principles of research, evidence-based nutrition, and methods of primary and secondary data collection.	K2
CO2	Explain the principles of data classification, tabulation, graphical representation, frequency distribution, and various sampling methods used in research.	K2
CO3	Apply appropriate data collection tools, sampling techniques, and statistical methods for conducting nutrition and health-related research studies.	K4
CO4	Analyze experimental designs, measures of central tendency, measures of dispersion, and sources of bias to ensure reliability and validity of research findings.	K5
CO5	Evaluate research data using statistical tests such as t-test, Chi-square test, F-test, and Analysis of Variance (ANOVA) for accurate interpretation and decision-making.	K2

MAPPING (CO/PO/PSO):

CO/PO/PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	2	1	1	3	2	1	1	3	2	1
CO2	3	3	2	2	1	2	1	1	3	3	2
CO3	2	3	3	3	2	2	1	1	3	3	3
CO4	2	3	3	3	2	2	2	1	3	3	3
CO5	2	3	3	3	3	2	2	2	3	3	3

COURSE OBJECTIVES

- Recall the concepts, significance, stages, and regulatory requirements involved in food product development, packaging, and labeling.
- Explain consumer needs, market survey techniques, sensory characteristics, quality evaluation methods, and food product regulations.
- Apply principles of product formulation, standardization, sensory evaluation, pricing, and marketing strategies in the development of food products.
- Analyze factors influencing product quality, shelf life, consumer acceptance, product stability, and success of new food products in the market.
- Evaluate food products using sensory, objective, and quality control techniques while assessing labeling standards and regulatory compliance.

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, aroma, 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

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, markup 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”

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

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.

Text Books

1. 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 publications.
2. Subbulakshmi G and Udipi A Shobha. (2017) .Food processing and preservation .new age publisher . 1st edition.
3. Manay S And Shadaksharamasamy . (2009) .Food: Facts and Principles. New Age International (P) Publishers New Delhi. 1st edition .

Reference Books

1. 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.
2. Fuller G W. (1994). New Food Product Development from Concept to Market Place. RC Press New York. 2nd edition .
3. Man C M D and Jones A A. (1994) . Shelf Life Evaluation of Foods. Blackie Academic and Professional London. 2nd edition.
4. Frewer L And Van Trijp H .(2007). Understanding consumers of food products. Florida USACRC Press.1st edition.

E - LEARNING RESOURCES

1. <https://www.fao.org>
2. <https://www.niftem.ac.in>
3. <https://www.fssai.gov.in>

COURSE OUTCOMES

After successful completion of the course the students will be able to:

CO	Course Outcomes	K level
CO1	Explain the concepts, importance, and stages involved in food product development along with consumer needs and market survey techniques.	K2
CO2	Describe sensory characteristics of food and apply appropriate sensory evaluation methods to assess food quality.	K2
CO3	Analyze product quality, shelf life, pricing strategies, and marketing techniques influencing food product success.	K4
CO4	Evaluate food labeling standards, regulatory requirements, and compliance with food laws and nutrition claims.	K5
CO5	Explain the principles, importance, and types of food packaging materials and packaging technologies.	K2

MAPPING (CO/PO/PSO):

CO/PO/PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PSO 1	PSO 2	PSO 3
CO1	3	2	2	1	1	1	1	1	3	2	1
CO2	3	3	2	2	1	1	1	1	3	3	2
CO3	3	3	3	2	2	1	1	1	3	3	2
CO4	3	3	3	3	2	2	2	1	3	3	3
CO5	3	2	2	2	2	1	1	1	3	2	2

Semester III	Core Theory - FOOD MICROBIOLOGY
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COURSE OBJECTIVES

- Understand the role of microorganisms in food and factors influencing their growth.
- Explain the principles and methods of food preservation used to enhance food safety and shelf life.
- Analyze the causes and prevention of food spoilage in different food commodities.
- Describe the production and significance of fermented foods and probiotics in human health.
- Evaluate food-borne diseases, food safety indicators, and preventive measures to ensure food quality and public health.

UNIT I

Food and Microorganisms – Important microorganisms in food (Bacteria, Mold and yeasts); Factors affecting the growth of microorganisms in food – pH, moisture, oxidation – Reduction potential, Nutrient content and Inhibitory substances and biological structure.

UNIT II

Principles of food preservation – General principles and application methods – Asepsis – Techniques of removal – use of temperature (low & high). Drying, radiation and chemical preservatives.

UNIT III

Spoilage of foods - principles and types of spoilage. Spoilage and preventive measures of Cereals and cereal products , vegetables, fruits, egg and milk & Dairy products, Canned foods and sea foods.

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, algae – characteristics and preventive measures. Indicators of water and food safety and quality.

Text Books

1. Food Microbiology — Adams, M.R., Moss, M.O. and McClure, P.J.; *Food Microbiology*, 5th Edition, Royal Society of Chemistry, 2024.
2. Modern Food Microbiology — Jay, J.M., Loessner, M.J. and Golden, D.A.; *Modern Food Microbiology*, 7th Edition, Springer Science Business Media, New York, 2005.
3. Food Microbiology: An Introduction — Matthews, K.R., Kniel, K.E. and Critzer, F.J.; *Food Microbiology: An Introduction*, 5th Edition, ASM Press, 2024.
4. Food Microbiology: Fundamentals and Frontiers — Doyle, M.P., Diez-Gonzalez, F. and Hill, C.; *Food Microbiology: Fundamentals and Frontiers*, 5th Edition, ASM Press, 2019.
5. Basic Food Microbiology — Banwart, G.J.; *Basic Food Microbiology*, 2nd Edition, Springer, 1989.

Reference Books

1. Food Microbiology — Adams, M.R., Moss, M.O. and McClure, P.J.; *Food Microbiology*, 5th Edition, Royal Society of Chemistry, 2024.
2. Modern Food Microbiology — Jay, J.M., Loessner, M.J. and Golden, D.A.; *Modern Food Microbiology*, 7th Edition, Springer Science Business Media, New York, 2005.
3. Fundamental Food Microbiology — Ray, B. and Bhunia, A.; *Fundamental Food Microbiology*, 5th Edition, CRC Press, 2013.
4. Fundamental Food Microbiology — Ray, B. and Bhunia, A.; *Fundamental Food Microbiology*, 5th Edition, CRC Press, 2013.
5. Food Microbiology: An Introduction — Matthews, K.R., Kniel, K.E. and Critzer, F.J.; *Food Microbiology: An Introduction*, 5th Edition, ASM Press, 2024.

E - LEARNING RESOURCES

1. [e-PG Pathshala \(Food Science and Nutrition\)](#)
2. [National Digital Library of India \(NDLI\)](#)
3. [FAO E-Learning Academy](#)
4. [WHO Food Safety Resources](#)

COURSE OUTCOMES

After successful completion of the course the students will be able to:

CO	Course Outcomes	K level
CO1	Explain the characteristics of food microorganisms and the factors affecting their growth in foods	K2
CO2	Describe the principles and methods of food preservation for improving food safety and shelf life.	K2
CO3	Analyze the causes of spoilage in various food products and recommend suitable preventive measures.	K4
CO4	Evaluate the role of fermented foods, starter cultures, and probiotics in food processing and health promotion.	K5
CO5	Explain food-borne diseases, food poisoning organisms, and indicators used to assess food and water safety.	K2

MAPPING (CO/PO/PSO):

CO/PO/PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PSO 1	PSO 2	PSO 3
CO1	3	2	2	1	1	3	3	3	3	2	3
CO2	3	3	2	1	2	2	2	1	3	3	1
CO3	3	3	3	2	2	1	2	1	3	3	2
CO4	2	2	3	2	1	1	1	1	3	2	3
CO5	3	3	2	1	2	2	1	1	3	3	3

COURSE OBJECTIVES

- Understand the step-by-step process involved in food product development from concept to commercialization.
- Enable students to identify and select appropriate target groups based on nutritional and market needs.
- Develop skills in conducting market surveys and designing effective questionnaires.
- Train students in recipe standardization, preparation techniques, and sensory evaluation of food products.
- Provide practical knowledge on packaging, labeling, shelf-life evaluation, costing, and product promotion.

Developing various food products by students –

1. Introduction.
2. Selection of target group.
3. Market survey.
4. Preparation of a questionnaire.
5. Standardization of recipe, Preparation method, sensory evaluation.
6. Shelf life, packaging, labeling, costing, storage, transportation and distribution, advertising.
7. Report writing and Presentation.

Text Books

1. Earle, M., Earle, R., & Anderson, A. *Food Product Development: Maximising Success*. Woodhead Publishing.
2. Saguy, I. S., & Graf, E. *Food Product Development: From Concept to the Marketplace*. Springer
3. Sharma, A. *Food Product Development*. CBS Publishers

Reference Books

1. Fuller, G. W. *New Food Product Development: From Concept to Marketplace*. CRC Press.
2. Earle, M., Earle, R., & Anderson, A. *Food Product Development: Maximising Success*. Woodhead Publishing.
3. Saguy, I. S., & Graf, E. *Food Product Development: From Concept to the Marketplace*. Springer

4. Sharma, A. *Food Product Development*. CBS Publishers.

E - LEARNING RESOURCES

1. <https://www.fao.org>
2. <https://www.fao.org>
3. <https://nptel.ac.in/courses/126105011>
4. <https://www.edx.org>

COURSE OUTCOMES

After successful completion of the course the students will be able to:

CO	Course Outcomes	K level
CO1	Explain the stages involved in food product development and identify target consumers.	K2
CO2	Apply market survey techniques and develop questionnaires for product analysis.	K2
CO3	Analyze and standardize recipes with appropriate preparation methods and sensory evaluation.	K4
CO4	Evaluate shelf life, packaging, labeling, and costing of developed food products.	K5
CO5	Demonstrate report writing, presentation, and product promotion skills.	K2

MAPPING (CO/PO/PSO):

CO/PO/PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PSO 1	PSO 2	PSO 3
CO1	3	2	2	1	1	1	1	1	3	2	1
CO2	3	3	2	2	1	1	1	1	3	3	2
CO3	3	3	3	2	2	1	1	1	3	3	2
CO4	3	3	3	3	2	2	2	1	3	3	3
CO5	3	2	2	2	2	1	1	1	3	2	2

COURSE OBJECTIVES

- Provide knowledge on food packaging concepts, functions, and recent developments.
- Understand different types of packaging materials and their characteristics and applications.
- Develop knowledge on packaging requirements for fresh and processed foods.
- Familiarize yourself with advanced packaging techniques and package accessories.
- Understand packaging design, regulations, and environmental issues related to packaging.

UNIT I

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

UNIT II

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

UNIT III

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

UNIT IV

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

UNIT V

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

Text Books

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

Reference Books

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

E - LEARNING RESOURCES

1. <https://nptel.ac.in/courses/126105015>
2. FAO – Food Storage and Packaging
3. [Institute of Food Technologists \(IFT\)](#)
4. [Food Safety and Standards Authority of India \(FSSAI\)](#)
5. Coursera – Food Packaging Courses

COURSE OUTCOMES

After successful completion of the course the students will be able to:

CO	Course Outcomes	K level
CO1	Explain the fundamentals of food packaging and its functions.	K2
CO2	Describe different packaging materials and their applications.	K2
CO3	Analyze packaging requirements for various food products.	K4
CO4	Evaluate advanced packaging technologies and packaging systems.	K5
CO5	Summarize packaging design, laws, and environmental concerns.	K2

MAPPING (CO/PO/PSO):

CO/PO/PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PSO 1	PSO 2	PSO 3
CO1	3	2	2	1	1	1	1	1	3	2	1
CO2	3	3	2	2	1	1	1	1	3	3	2
CO3	3	3	3	2	2	1	1	1	3	3	2
CO4	3	3	3	3	2	2	2	1	3	3	3
CO5	3	2	2	2	2	1	1	1	3	2	2

COURSE OBJECTIVES

- Explain the concepts, principles, and applications of functional genomics, systems biology, nutrigenomics, and personalized nutrition.
- Interpret the molecular mechanisms by which genetic variations influence nutrient metabolism and physiological responses.
- Analyze the effects of nutrients on gene expression and epigenetic regulation in health and disease.
- Assess the role of early-life nutrition in metabolic programming and long-term health outcomes.

UNIT I

Introduction to Nutrigenomics

Introduction to Nutrigenomics; History and development of Nutrigenomics; Concepts of Functional Genomics and Systems Biology; Genome, Transcriptome, Proteome and Metabolome; Gene–Nutrient Interactions; Principles and Applications of Personalized Nutrition; Scope and Future Perspectives of Nutrigenomics.

UNIT II

Molecular Basis of Nutrigenomics

Fundamentals of Molecular Biology in Nutrition; Structure and Organization of the Human Genome; Genetic Variations and Nutritional Responses; Genome Determinants of Nutritional Requirements and Metabolic Responses; Nutrient Sensing and Cellular Signaling Pathways; Impact of Nutrient Environment on Gene Function; Introduction to Molecular Diagnostics; Molecular Techniques and Research Tools in Nutritional Genomics; Nutrient–Gene Interaction Studies.

UNIT III

Diet, Gene Expression and Epigenetics

Mechanisms of Gene Expression Regulation; Nutrients as Regulators of Gene Activity; Nutrient-Responsive Transcription Factors; Nutrient Signaling Pathways; Nutritional Epigenetics; DNA Methylation, Histone Modifications and Non-coding RNAs; Nutrients as Epigenetic Modifiers; Epigenetic Regulation of Health and Disease.

UNIT IV

Early-Life Nutrition and Metabolic Programming

Developmental Origins of Health and Disease (DOHaD); Maternal Nutrition and Fetal Development; Nutrition During Pregnancy, Lactation and Infancy; Early-Life Nutritional Influences on Gene Expression; Metabolic Programming and Long-Term Health Consequences; Nutritional Factors Affecting Growth, Development and Disease Susceptibility.

UNIT V

Nutrigenomics in Disease Prevention and Management

Diet as a Risk and Protective Factor in Chronic Diseases; Gene Polymorphisms and Individual Responses to Diet; Nutrigenomics of Cardiovascular Diseases; Nutrigenomics of Cancer; Nutrigenomics of Osteoporosis and Bone Health; Biomarkers of Nutritional Status, Risk and Benefit Assessment; Applications of Nutrigenomics in Disease Prevention, Management and Personalized Nutrition.

Text Books

1. Fenech, M., El-Sohemy, A., Ferguson, L. R., & French, T. A. (2020). Nutrigenetics and Nutrigenomics: Foundations and Applications. Academic Press, Elsevier.
2. Ferguson, L. R. (2014). Nutrigenomics and Nutrigenetics in Functional Foods and Personalized Nutrition. CRC Press, Taylor & Francis.
3. Klug, W. S., Cummings, M. R., Spencer, C. A., & Palladino, M. A. (Latest Edition). Concepts of Genetics. Pearson.

Reference Books

1. Müller, M., & Kersten, S. (2018). Nutrigenomics: Methods and Protocols. Humana Press, Springer.
2. Zeisel, S. H., & da Costa, K. A. (Editors). (2020). Present Knowledge in Nutrition (11th Edition). Academic Press.
3. Vasudevan, D. M., Sreekumari, S., & Kannan, V. (Latest Edition). Textbook of Biochemistry for Medical Students. Jaypee Brothers.

E - LEARNING RESOURCES

1. <https://nutrigenomedb.org>
2. <https://nutritiongenome.com>
3. <https://nutrigenomix.com>

COURSE OUTCOMES

After successful completion of the course the students will be able to:

CO	Course Outcomes	K level
CO1	Explain the concepts, principles, and applications of functional genomics, systems biology, nutrigenomics, and personalized nutrition.	K2
CO2	Interpret the molecular mechanisms by which genetic variations influence nutrient metabolism and physiological responses.	K3
CO3	Analyze the effects of nutrients on gene expression and epigenetic regulation in health and disease.	K4
CO4	Assess the role of early-life nutrition in metabolic programming and long-term health outcomes.	K5
CO5	Design evidence-based personalized nutritional strategies for disease prevention based on nutrigenomic principles and biomarkers	K6

MAPPING (CO/PO/PSO):

CO/PO/PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PSO 1	PSO 2	PSO 3
CO1	3	2	1	1	2	3	2	1	1	2	3
CO2	3	3	2	3	2	3	3	3	3	2	3
CO3	3	3	3	2	3	3	3	2	2	3	3
CO4	2	3	3	2	2	2	3	2	2	3	2
CO5	3	3	3	2	3	3	3	3	2	3	3

COURSE OBJECTIVES

- Familiarize students with food quality attributes and methods of objective and sensory evaluation.
- Develop understanding of food adulteration, food toxins, and methods for ensuring food safety.
- Introduce quality assurance systems, quality control measures, and food safety management practices.
- Provide knowledge of national and international food laws, standards, and regulatory frameworks.
- Enable students to understand food-related legislations and voluntary quality certification systems for consumer protection.

UNIT I

Concept of quality: quality attributes: physical, chemical, nutritional and microbial evaluation. Objective evaluation: Tests used for objective evaluation, application and limit, Instruments used for quality assessment-color & gloss, size & shape, defects, texture, Viscosity & consistency Sensory evaluation: Sensory characteristics of food, sensory requirements, Types of sensory evaluation.

UNIT II

Food adulteration and food toxins: common adulterant in food (milk and milk products, edible oils, cereals & pulses, prepared foods, spices, beverages); simple screening, control of food adulteration Food Toxins: Terms in toxicology; Safety evaluation using traditional and modern approach; Natural anti-nutritional factors, toxic phytochemicals, microbial toxins, toxins from fungi.

UNIT III

Quality assurance, Quality Control, Total Quality Management; GMP, GHP; GLP, GAP; Sanitary and hygienic practices; physical, chemical and biological hazards in foods, HACCP- Principles of HACCP, application of HACCP system, implementation steps for HACCP system ; HACCP-systems for food safety, Quality manuals, documentation and audits

UNIT IV

Food laws and regulation: Mandatory and voluntary food laws, 1 International quality systems and standards like ISO (9000 & 22000) series, Codex, BRC; 3 Indian Food acts-Food Safety and Standards Act, 2006, FSNS Regulations: Regulations on Licensing and Registration, Regulations

on Contaminants, toxins and residues, Food product standards, food additives, Laboratory and sampling analysis; Packaging and 3 13 Labelling; Prohibition and Restriction on sales.

UNIT V

Various food acts- Environment (Protection) Act, 1986, Standards of Weights and Measures Act, 1976, Essential Commodities Act, 1955, The Export (Quality Control and Inspection) Act, 1963, The Insecticides Act, 1968, Consumer Protection Act, 1986. Introduction to various food laws (Voluntary) -Agmark Standards (AGMARK), BIS Standards and Specifications.

Text Books

1. Fundamentals of Quality Control for Food Industry, Krammer and Twigg, Avi Publishing Company, 1966
2. Handbook of Food Toxicology, S.S Deshpande, Marcel Dekker , 2002
3. Food Quality Assurance –Principles and Practices, Inteaz Alli, CRC Press Boca Raton
4. Food Hygiene and Sanitation, Roday S. McGraw Hill Education, 2011
5. An Introduction to Food Science Technology and Quality Management, Bhatt D.K. & Tomar P., Kalyani publishers

Reference Books

1. Sensory Evaluation Techniques, Civillie and Carr, CRC Press, 2015
2. Food Industry Quality Control System, Clute M., CRC Press, 2008
3. Food Safety Management and ISO 22000 –Food Industry Briefing, Early Ralph, Food Industry Briefing Publication
4. Food Safety and Standards Act, Rules & Regulations., Vidhi Jain & Akalank Kumar Jain
5. Orientation for Food Professionals a hand book – PV Suryaprakash Rao.

E - LEARNING RESOURCES

1. <https://www.fda.gov/food>
2. <https://www.brcgs.com>
3. <https://www.bis.gov.in>

COURSE OUTCOMES

After successful completion of the course the students will be able to:

CO	Course Outcomes	K level
CO1	Explain food quality attributes and methods used for objective and sensory evaluation of foods.	K2
CO2	Identify common food adulterants, food toxins, and measures for ensuring food safety.	K3
CO3	Analyze quality assurance systems, HACCP principles, and food safety management practices in food industries.	K4
CO4	Evaluate national and international food laws, standards, and regulatory requirements applicable to food products.	K5
CO5	Examine the role of food legislations and voluntary certification systems in ensuring consumer protection and food quality.	K4

MAPPING (CO/PO/PSO):

CO/PO/PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PSO 1	PSO 2	PSO 3
CO1	3	2	1	2	3	3	1	3	3	2	3
CO2	3	3	2	2	1	2	2	3	2	3	2
CO3	3	3	3	2	2	2	1	1	3	3	2
CO4	2	3	3	1	1	3	1	1	3	3	3
CO5	2	3	2	2	1	3	1	1	2	2	3

Semester IV	Core Theory - PUBLIC HEALTH NUTRITION
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COURSE OBJECTIVES

- Describe the concepts of public health nutrition, health indicators, demographic characteristics, health care delivery systems, and the role of nutritionists in community health services.
- Explain the causes, prevalence, clinical manifestations, prevention, and control measures of major nutritional deficiency disorders and methods of nutritional assessment.
- Apply appropriate nutritional assessment techniques and growth monitoring methods to evaluate the nutritional status of individuals and communities.
- Analyze the objectives, implementation strategies, and impact of national and international nutrition intervention programmes and organizations involved in public health nutrition.
- Evaluate nutrition education programmes, communication methods, and community-based interventions for promoting nutritional well-being among different population groups.

UNIT I

Concept and scope of public health nutrition - Health - definition, dimensions, determinants and indicators of health and nutrition (IMR, CBR, Fertility rate, MMR, U5MR), Vital link between health and nutrition - Review - concept of adequate nutrition and malnutrition. Health care facility - role of public nutritionists in the health care delivery system, primary Health Centre - Concept, functions, organization, current status in India and delivery of service, Taluk level hospital, and immunization. Anganwadi - its management, duties of public nutritionist in anganwadis. Demographic profile - population trends in India, density of population, demographic transition, population structure, sex ratio, family size, literacy and education, morbidity rate and life expectancy.

UNIT II

NUTRITIONAL DEFICIENCIES: Protein energy malnutrition (PEM) - Etiology, types, prevalence, metabolic changes and prevention. Nutritional Anaemia - Definition, causes, types, prevalence, anemia control programme in India. Iodine Deficiency: Causes, prevalence, clinical features and control programme in India. Fluorosis: Causes, prevalence, Clinical features, Fluorosis control programme in India. Vitamin A deficiency : Causes, signs and symptoms, prevention & prophylaxis B complex deficiency: Causes, signs and symptoms, prevention. Assessment of Nutritional Status Dietary survey, biochemical methods, growth monitoring methods, food consumption survey, body composition studies. Test of intelligence related to nutrition.

UNIT III

NUTRITION INTERVENTION PROGRAMMES: Objectives, Special nutrition programme (SNP), Modified Applied Nutrition Programmes (ANP), NIDDCP, Vit A Prophylaxis Programme, Integrated Child Development Services (ICDS), Tamil Nadu Integrated Nutrition programme (TFNP) and Noon Meal Scheme. Role of International Organizations - Food and Agriculture Organization (FAO), World Health Organization (WHO), United Nations International Children's Emergency Fund (UNICEF), Co-operative American Relief Everywhere (CARE) and World Bank. National Organizations National Institute of Nutrition (NIN), National Nutrition Monitoring Bureau (NNMB), Indian Council of Agriculture Research (ICAR), Indian Council of Medical Research (ICMR), Central Food Technological Research Institute (CFTRI). National health mission, NNP, NNAPP.

UNIT IV

NUTRITION EDUCATION: Objectives, definitions, importance of nutrition education to the community. Methods of nutrition education, nutrition education programmes - Planning, implementation and evaluation, training workers in nutrition education programmes, integration of nutrition education with education and extension of works, nutrition and health education for adolescent girls, lactating and pregnant women. Nutrition education in schools and community.

UNIT V

COMMUNITY HEALTH AND COMMUNICABLE DISEASES: Concepts of community Health, National Health Policy, Primary Health Center (PHC)- Concept, organization, current status in India and delivery of service, Taluk level hospitals, Employees State Insurance (ESI) Epidemiology of Communicable Diseases Factors responsible for the spread of communicable diseases, mode of transmission — chicken pox, typhoid fever, tuberculosis, malaria, leprosy, filariasis and AIDS. Prophylaxis and Immunization schedule. Waste disposal system in India.

Text Books

1. Hojn C., Water low, Andrew M. Tomkins, Sally M. Grantham. MC, Anegor, —Protein Energy Malnutrition, Published by Edward Arnold, 1992.
2. Vinodini Reddy, Praihada Rao, Gowrinath Sastry, J. and Kashinath, K.C., Nutrition Trends in India, NIN, Hyderabad, 1993.
3. Jelliffe, D.D. Pathes, Assessment of Nutritional Status of community, WHO Geneva, 1989.
4. SaralaGopalan (1996), Towards better nutrition for women and children, Problem and Programmes, Department of Women and Child Development, Government of India.

5. Sheila Chander Vir (2012) Public health nutrition in developing countries. Vol I&II. Woodhead Publishing India Pvt. Ltd. New Delhi.

Reference Books

1. Proceedings of the Nutrition Society of India, Vol. 35, 42, 43, 44, 46 and 47, 1999, NIN, Hyderabad.
2. S. WalRuchi Mishra, Encyclopedia of Health Nutrition and Family Welfare, Published by Sarup and Sons, New Delhi, 2000.
3. Park K (2011). Park's Textbook of Preventive and Social Medicine, 21st Edition. M/s Banarasidas Bhanot Publishers, Jabalpur, India

E - LEARNING RESOURCES

1. www.nin.res.in
2. www.icmr.gov.in
3. www.mohfw.gov.in
4. www.who.int
5. www.unicef.org
6. www.fao.org

COURSE OUTCOMES

After successful completion of the course the students will be able to:

CO	Course Outcomes	K level
CO1	Recall the concepts, scope, indicators of health and nutrition, demographic characteristics, health care delivery systems, and the role of public nutritionists in community health services.	K2
CO2	Explain the etiology, prevalence, clinical manifestations, prevention, and control measures of major nutritional deficiency disorders and methods of nutritional assessment.	K2
CO3	Apply nutritional assessment techniques, growth monitoring methods, dietary surveys, and health indicators to assess the nutritional and health status of individuals and communities.	K4
CO4	Analyze the objectives, implementation strategies, and impact of national and international nutrition intervention programmes and organizations involved in public health nutrition.	K5
CO5	Evaluate nutrition education programmes, communication methods, health policies, and community-based interventions for improving nutritional well-being among different population groups.	K2

MAPPING (CO/PO/PSO):

CO/PO/PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	2	1	3	3	2	2	1	3	2	1
CO2	3	3	2	1	3	2	2	1	3	3	2
CO3	2	3	3	3	2	2	1	1	3	3	2
CO4	2	3	2	3	2	3	2	2	2	3	2
CO5	2	2	3	2	2	3	3	3	2	3	3

Semester IV	Core PRACTICAL – FOOD QUALITY CONTROL
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Course Objectives

- Students in basic quality control tests for food commodities
- Develop skills in detecting food adulterants using chemical and physical methods
- Enable students to assess food quality as per FSSAI standards

EXPERIMENTS

1. Determination of moisture content in food samples by hot air oven method
2. Detection of adulterants in milk – water, starch, urea, synthetic milk
3. Detection of adulterants in oils and fats – argemone oil, mineral oil, castor oil
4. Detection of adulterants in spices – metanil yellow in turmeric, brick powder in chilli powder, papaya seeds in black pepper
5. Determination of acidity in beverages/fruit juices by titration method
6. Test for rancidity in oils – Kreis test / Peroxide value estimation
7. Platform tests for milk quality – COB, MBRT, specific gravity, fat by Gerber method
8. Sensory evaluation of food products – Hedonic scale, triangle test for biscuits/chips
9. Determination of total soluble solids (TSS) in fruit products using hand refractometer
10. Detection of common adulterants in food grains – stones, ergot, kesari dal, excreta

REFERENCE MANUALS

1. Manual of Methods of Analysis of Foods, FSSAI, 2022 – Free PDF online
2. Ranganna S. Handbook of Analysis and Quality Control for Fruit and Vegetable Products, 2nd Ed., Tata McGraw Hill
3. Laboratory Manual – Food Analysis, Srilakshmi B., New Age International

COURSE OUTCOMES

After successful completion of the course the students will be able to:

CO	Course Outcomes	K level
CO1	Perform basic physico-chemical quality tests like moisture determination, acidity, and TSS in foods using standard laboratory methods and record results with accuracy.	K3
CO2	Detect adulterants in milk, oils, spices, and food grains using qualitative chemical and physical tests and compare observations with FSSAI specifications.	K3, K4
CO3	Examine the degree of food spoilage by conducting rancidity tests in oils and platform tests for milk and classify samples based on quality grades.	K4
CO4	Conduct sensory evaluation of processed foods using hedonic and difference tests and analyze consumer acceptability data using score cards.	K4, K5
CO5	Evaluate the overall quality and safety of market food samples by integrating physico-chemical, adulteration, and sensory test results and appraise compliance with FSSAI standards.	K5

MAPPING (CO/PO/PSO):

CO/PO/PS O	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PSO 1	PSO 2	PSO 3
CO1	3	2	2	3	2	2	3	1	3	3	2
CO2	3	1	3	3	3	2	1	3	3	3	3
CO3	3	1	3	3	3	2	2	2	3	3	2
CO4	2	3	3	2	3	2	3	1	2	2	3
CO5	3	2	3	3	3	3	2	2	3	3	3

Semester IV	Elective Theory – ENTREPRENEURIAL DEVELOPMENT
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COURSE OBJECTIVES

- Recall the fundamental concepts, characteristics, importance, and types of entrepreneurship, including startup, digital, and social entrepreneurship.
- Explain business idea generation techniques, business ownership forms, self-help groups, and government support systems for entrepreneurial development.
- Apply principles of financial and marketing management, including preparation of financial statements, working capital management, break-even analysis, and marketing mix strategies.
- Analyze the procedures, requirements, and institutional support involved in establishing and managing small-scale enterprises.
- Evaluate financial assistance schemes, export procedures, inventory management practices, quality management systems, and intellectual property rights relevant to entrepreneurship.

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.

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, NIMSME,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.

Text Books

1. Saravanel, (2005), Entrepreneurial Development, Ess Pee Key Publishing House, Chennai
2. Vasant Desai, (2004), Project Management, Himalaya Publishing House.
3. S. Saini and S.K., Dhameja, (2011), Entrepreneurship and Small Business Rawart New Delhi.
4. C. Jain, (2012), Handbook for New Entrepreneurs, Oxford University Press.

Reference Books

1. C.B. Gupta & N.P. Srinivasan, Sultan Chand & Sons, New Delhi, 2014.
2. K. Ramachandran, Tata McGraw Hill, New Delhi, 2013.
3. Vasant Desai, Himalaya Publishing House, 2011.
4. Poornima M. Charantimath, Pearson Education, New Delhi, 2014.

E - LEARNING RESOURCES

1. www.msme.gov.in
2. www.startupindia.gov.in
3. www.nimsme.org
4. www.nsic.co.in
5. www.kvic.gov.in

COURSE OUTCOMES

After successful completion of the course the students will be able to:

CO	Course Outcomes	K level
CO1	Define and describe the concepts, characteristics, importance, challenges, and emerging trends in entrepreneurship, including startup, digital, and social entrepreneurship.	K2
CO2	Explain business opportunity identification, idea generation techniques, forms of business ownership, self-help groups, and government assistance available for entrepreneurial ventures.	K2
CO3	Apply financial and marketing management principles, including preparation of accounts, financial statements, break-even analysis, working capital management, and marketing mix strategies.	K4
CO4	Analyze the procedures, institutional support mechanisms, export formalities, inventory management practices, and quality management systems involved in establishing small-scale enterprises.	K5
CO5	Evaluate the role of financial institutions, intellectual property rights, patents, and entrepreneurship support agencies in business development and sustainability	K2

MAPPING (CO/PO/PSO):

CO/PO/PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	2	1	3	2	2	2	2	2	1	2
CO2	3	3	2	1	3	2	2	2	2	2	2
CO3	2	3	3	2	2	2	1	1	3	3	2
CO4	2	3	3	3	2	2	2	2	3	3	3
CO5	2	2	3	3	2	3	3	3	3	3	3

Semester IV	Elective Theory – SPORTS NUTRITION
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COURSE OBJECTIVES

- Gain knowledge on the role of nutrition in physical fitness and sports.
- Understand the relationship between physical training and dietary habits in order to produce optimal performance
- Gain familiarity with the claims and types of ergogenic aids and supplements available in the market
- Evaluate the effect of exercise on health
- Acquire knowledge about the role of food and exercise for sound health

UNIT I

INTRODUCTION TO PHYSICAL FITNESS PHYSICAL FITNESS

Definition, factors affecting physical fitness, components of fitness, fitness testing methods
Physical activity- types of physical activity, determinants of physical activity, benefits of physical activity
Exercise- Classification of exercise, specific exercise for strengthening; health benefits of exercise- yoga its benefits
Body weight and composition for health and sport, Strategies for weight Management

UNIT II

ROLE OF MACRONUTRIENTS IN PHYSICAL FITNESS

Carbohydrates – Utilization of carbohydrate before, during and after exercise, importance of glycogen loading.

Proteins – role of proteins for exercise, requirements before, during and after exercise. Fats – role of fat as a fuel during exercise, Fat loading- effects on exercise performance. Macronutrients Requirements for Power, endurance sports and strength training activities.

UNIT III

NUTRITION AND ERGOGENIC AIDS FOR ATHLETES

Importance of pre-event, during and post-event meals Electrolyte balance-sports drinks. Eating for anaerobic power- aerobic power- timing of meals and snacks Recovery food. Food for power sports, endurance sports, combined power Overview of supplements and sports foods- Use of performance enhancing substances among athletes- Anabolic steroids-Sports foods (cereal bar, sports drinks, carbohydrate gels, Liquid meal replacements, Vitamins), Different types of protein supplements.

UNIT IV

WEIGHT MANAGEMENT

Weight Management - Ideal body weight, weight loss – making weight and rapid weight loss strategies, Nutrition for special population: child athlete, ageing athlete, and athletic diabetes, vegetarian and disabled athlete.

UNIT V

PHYSICAL EDUCATION

Physical education – Meaning and scope, role of gymnastic exercises and yoga in improving health. Difference between yoga and other gymnastic exercises. Health club equipments and activities – Tread mill, hammer strength, steppers, cycles, body sculpting, kick boxing, Reebok ridge rocker, hanging, hand grips, swing, climbing and lifting weight.

Text Books

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

Reference Books

1. B Srilakshmi, V Suganthi, C Kalaivani Ashok, Exercise Physiology and Sports Nutrition, New Age International publishers, 2017.
2. Bean Anita, The Complete Guide to Sports Nutrition, A7C Black Publishers Limited, London, 2009.

3. Crossley.J., Personal Training and Practice, Hodder Arnold, London, 2009. Glendhill.A.Mulligan, C.Saffer#y
4. Fink H.H., Burgoon L.A., Mikesky A.E.(2018) Practical applications in Sports Nutrition.Jones and Bartlett Publishers. Sudbery, Massachusetts.
5. McArdle .W.D., Frank. I. Katch, Victor L Katch (2005) Sports and ExerciseNutrition.Lippincott, Williams and Wilkins, Philadelphia

E - LEARNING RESOURCES

1. American College of Sports Medicine- www.acsm.org
2. <http://sportsmedicine.about.com/od/sportsnutrition/a/carbohydrates.html>
3. Centre for disease control and prevention- www.cdc.gov/ncdphp/ndpa

COURSE OUTCOMES

After successful completion of the course the students will be able to:

CO	Course Outcomes	K level
CO1	Define terms related to physical fitness, nutrients and supplements for exercise	K2
CO2	Describe the benefits of different exercise, significance of body weight and composition parameters, fuel systems engaged in exercise.	K2
CO3	Identify the intertwining relationship between physical training and dietary requirements	K4
CO4	Analyse and select nutrients for optimal performance on the basis of energy pathways involved in a given sporting activity	K4
CO5	Assess the functions of nutrients before, during and after exercise, and recommend meal plans for athletes involved in different sports.	K5

MAPPING (CO/PO/PSO):

CO/PO/PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	2	1	3	2	2	2	2	2	1	2
CO2	3	3	2	1	3	2	2	2	2	2	2
CO3	2	3	3	2	2	2	1	1	3	3	2
CO4	2	3	3	3	2	2	2	2	3	3	3
CO5	2	2	3	3	2	3	3	3	3	3	3