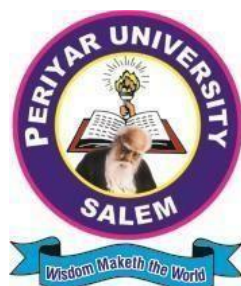


**PERIYAR UNIVERSITY**  
PERIYAR PALKALAI NAGAR, SALEM – 636011



## **SYLLABUS FOR**

### **B.Sc. Food Technology**

**CHOICE BASED CREDIT SYSTEM OUTCOME  
BASED EDUCATION**

(For Candidates admitted in the Colleges affiliated to Periyar  
University from 2023 - 2024 onwards)

### **1. Preamble:**

B.Sc. Food Technology curriculum has been structured in compliance with UGC Model curriculum and TANSCHÉ guidelines. Core courses addresses the science of food, food chemistry, food engineering, food processing and food preservation, food safety and quality assurance, food innovation, food packaging, technology of cereals, pulses, oilseeds, fruits, vegetables, egg, milk, fleshy foods, spices and condiments and food entrepreneurship. The programme empowers the capacity of the students as per the job role specific requirements of food industries.

### **2. Eligibility for Admission**

Candidates for admission to the first year of the Degree of B.Sc. Food Technology shall be required to have passed the Higher Secondary Examinations conducted by the Government of Tamil Nadu or any other equivalent examination.

As per Government Order (2020-2021) G.O.(1D) No.110, Higher Education(G1) Department, dated 18.07.2020.

- General Stream:** Chemistry with Science subjects like Biology/Home Science/Botany and Zoology/Computer Science/Computer Applications/Microbiology/Food Service Management/Nutrition and Dietetics
- Vocational Stream:** Agriculture/Home Science/Engineering and Technology

### **3. Eligibility for the Award of the Degree**

A candidate shall be eligible for the award of the Degree only if she has undergone the prescribed course of study for a period of not less than three academic years, passed the examinations of all the six semesters prescribed.

### **4. Examinations**

Semester pattern is adopted for examinations. Candidates failing in any course will be permitted to appear for such failed course at subsequent examinations. Examinations for I, III and V semesters will be held in November/ December and for II, IV and VI semesters will be held in April / May month of every year.

**Requirement to appear for the examination** A candidate shall be permitted to appear for the university examinations for any semester (practical/theory) if he / she secure not less than 75% of attendance in the number of working days during the semester.

### **5. Passing Minimum**

A candidate who secures not less than 40% in the End Semester Examination(ESE) and 40% marks in the ESE and Continuous Internal Assessment (CIA) put together in any course of Part I, II, III & IV shall be declared to have passed the examination in the course (Theory or Practical).

### **6. 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 declared to have passed the examination in First Class with Distinction provided they pass all the examinations prescribed for the course at the first appearance. Candidates who pass all the examinations (Part I, II, III & IV) prescribed for the course in the **FIRST APPEARANCE ITSELF ALONE** is eligible for ranking.

**7. Maximum Duration for the completion of the programme:** The maximum duration for completion of the UG Programme shall not exceed twelve semesters (6 years).

**8. Commencement of this Regulation:**

These regulations shall take effect from the academic year 2022-2023, i.e. for students who are to be admitted to the first year of the B.Sc.Food Technology programme during the academic year 2022-2023 and thereafter.

**9. Pattern of Question Paper (All Courses)**

Time : 3 Hours Maximum:75 Marks

Part A : 15 x1 =15 (Multiple Choice) (Three questions from each unit) Part B :2 x 5 = 10 (Any Two questions) (One question from each unit) Part C :5 x 10 = 50 (One question from each unit with internal choice)

**10. Evaluation Pattern for Continuous Internal Assessment(CIA)**

**11A. THEORY COURSES**

Component	Time	Appearing marks	CIA marks	Minimum Pass
Test I	2 hours	50	5	40 %
Test II	2 hours	50	5	40 %
Assignment (minimum 2) Assignment 1 - ProblemBased Activities Assignment 2 - Field/Industrial Visit Reports		10	10	40 %
Student Seminar with power point presentation		5	5	40 %
Total Marks for CIA		115	25	10
Total Marks for ESE		75	75	30
Minimum attendance for each theory course to appear for ESE				75%

**11B. PRACTICALS**

Component	Appearing marks (Average)	CIA marks	Minimum Pass
Performance in each experiment	10x5 = 50	20	40 %
Internal Practical Test 1	60	10	40 %
Internal Practical Test 2	60	10	40 %
Total Marks for CIA	170	40	16
Total Marks for ESE	60	60	24
Minimum attendance for each practical course to appear for ESE			75%

<b>LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK GUIDELINES BASED REGULATIONS FOR UNDER GRADUATE PROGRAMME</b>	
<b>Program me:</b>	<b>B.Sc. Food Technology</b>
<b>Program me Code:</b>	<b>UFT</b>
<b>Duration:</b>	<b>3 years [UG]</b>
<b>Program me Outcome s:</b>	<p><b>PO1: Disciplinary knowledge:</b> Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines that form a part of an undergraduate Programme of study</p> <p><b>PO2: Communication Skills:</b> Ability to express thoughts and ideas effectively in writing and orally; Communicate with others using appropriate media; confidently share one's views and express herself/himself; demonstrate the ability to listen carefully, read and write analytically, and present complex information in a clear and concise manner to different groups.</p> <p><b>PO3: Critical thinking:</b> Capability to apply analytic thought to a body of knowledge; analyse and evaluate evidence, arguments, claims, beliefs on the basis of empirical evidence; identify relevant assumptions or implications; formulate coherent arguments; critically evaluate practices, policies and theories by following scientific approach to knowledge development.</p> <p><b>PO4: Problem solving: Capacity</b> to extrapolate from what one has learned and apply their competencies to solve different kinds of non-familiar problems, rather than replicate curriculum content knowledge; and apply one's learning to real life situations.</p> <p><b>PO5: Analytical reasoning:</b> Ability to evaluate the reliability and relevance of evidence; identify logical flaws and holes in the arguments of others; analyze and synthesize data from a variety of sources; draw valid conclusions and support them with evidence and examples, and addressing opposing viewpoints.</p> <p><b>PO6: Research-related skills:</b> A sense of inquiry and capability for asking relevant/appropriate questions, problem arising, synthesising and articulating; Ability to recognise cause-and-effect relationships, define problems, formulate hypotheses, test hypotheses, analyse, interpret and draw conclusions from data, establish hypotheses, predict cause-and-effect relationships; ability to plan, execute and report the results of an experiment or investigation</p> <p><b>PO7: Cooperation/Team work:</b> Ability to work effectively and respectfully with diverse teams; facilitate cooperative or coordinated effort on the part of a group, and act together as a group or a team in the interests of a common cause and work efficiently as a member of a team</p> <p><b>PO8: Scientific reasoning:</b> Ability to analyse, interpret and draw conclusions from quantitative/qualitative data; and critically evaluate ideas, evidence and experiences from an open-minded and reasoned perspective.</p> <p><b>PO9: Reflective thinking:</b> Critical sensibility to lived experiences, with self awareness and reflexivity of both self and society.</p> <p><b>PO10 Information/digital literacy:</b> Capability to use ICT in a variety of learning situations, demonstrate ability to access, evaluate, and use a variety of relevant information sources; and use appropriate software for analysis of data.</p> <p><b>PO 11 Self-directed learning:</b> Ability to work independently, identify appropriate resources required for a project, and manage a project through to completion.</p> <p><b>PO 12 Multicultural competence:</b> Possess knowledge of the values and beliefs of multiple cultures and a global perspective; and capability to effectively engage in a multicultural society and interact respectfully with diverse groups.</p>

	<p><b>PO 13: Moral and ethical awareness/reasoning:</b> Ability to embrace moral/ethical values in conducting one's life, formulate a position/argument about an ethical issue from multiple perspectives, and use ethical practices in all work. Capable of demonstrating the ability to identify ethical issues related to one's work, avoid unethical behaviour such as fabrication, falsification or misrepresentation of data or committing plagiarism, not adhering to intellectual property rights; appreciating environmental and sustainability issues; and adopting objective, unbiased and truthful actions in all aspects of work.</p> <p><b>PO 14: Leadership readiness/qualities:</b> Capability for mapping out the tasks of a team or an organization, and setting direction, formulating an inspiring vision, building a team who can help achieve the vision, motivating and inspiring team members to engage with that vision, and using management skills to guide people to the right destination, in a smooth and efficient way.</p> <p><b>PO 15: Lifelong learning:</b> Ability to acquire knowledge and skills, including „learning how to learn“, that are necessary for participating in learning activities throughout life, through self-paced and self-directed learning aimed at personal development, meeting economic, social and cultural objectives, and adapting to changing trades and demands of work place through knowledge/skill development/reskilling.</p>
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<p><b>Programme Specific Outcomes:</b></p>	<p><b>PSO1 – Placement:</b> To prepare the students who will demonstrate respectful engagement with others' ideas, behaviors, beliefs and apply diverse frames of reference to decisions and actions.</p> <p><b>PSO 2 - Entrepreneur:</b> To create effective entrepreneurs by enhancing their critical thinking, problem solving, decision making and leadership skill that will facilitate startups and high potential organizations</p> <p><b>PSO3 – Research and Development:</b> Design and implement HR systems and practices grounded in research that comply with employment laws, leading the organization towards growth and development.</p> <p><b>PSO4 – Contribution to Business World:</b> To produce employable, ethical and innovative professionals to sustain in the dynamic business world.</p> <p><b>PSO 5 – Contribution to the Society:</b> To contribute to the development of the society by collaborating with stakeholders for mutual benefit</p>
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<b>SECOND SEMESTER</b>						
<b>Course Code</b>	<b>Title of Course</b>	<b>Contact Hr./ Week</b>	<b>Credit</b>	<b>Int. Mark</b>	<b>Ext. Mark</b>	<b>Total mark</b>
	Tamil-II/Language	6	3	25	75	100
	English-II	4	3	25	75	100
NMSDC	Language Proficiency for Employability- Overview of English Communication	2	2	-	-	-
Core paper-II	Fundamentals of Food Technology	5	5	25	75	100
Core practical-II)	Practical-I I Fundamentals of Food Technology Practical	3	3	40	60	100
Chemistry (Allied theory-II)	Chemistry for Biological Sciences -II	4	4	25	75	100
Chemistry (Allied practical-II )	Chemistry Practical for Physical and Biological Sciences II	2	1	40	60	100
NME II	Food Packaging Technology(offered to other departments)	2	2	25	75	100
Skill Enhancement Course–SEC-2	Food Additives	2	2	25	75	100
		<b>30</b>	<b>25</b>	<b>245</b>	<b>555</b>	<b>800</b>

## Syllabus for B.Sc. Food Technology

### SEMESTER I

#### Part III: CORE I – Fundamentals of Food Science and Chemistry

Unit/Module	Intended Learning Chapters	CO(s) Mapped
I	a. Concept of food and nutrients b. Colloidal System in foods- <i>Types &amp; Properties, Sols, Gels, Emulsion and Foams –nature and factors influencing its formation and stability, application of colloidal chemistry to food preparation</i> c. Cooking of food - <i>cooking methods and principles and effect of cooking on constituents of food</i>	CO1
II	a. Water – <i>chemistry, physical properties, free, bound and entrapped water, water activity in food, moisture sorption isotherm of a food, water quality for food processing- drinking water, mineral water and potable water</i> b. Carbohydrates – <i>types of carbohydrates in food, chemical structure, physio-chemical and functional properties, types of starch, resistant starch; role of food carbohydrate/starch in cookery</i>	CO2
III	a. Proteins – <i>classification/types, chemistry and nature of proteins in food, physio-chemical and functional properties of food proteins, role of food proteins in cookery</i> b. Lipids – <i>classification/types of lipids, types of fats and oils in food, chemistry and nature of fats and oils in food, physio-chemical and functional properties of fats and oils in food, role of fats and oils in cookery</i>	CO3
IV	a. Vitamins - <i>classification/types, chemistry and nature of vitamins in food, physio-chemical and functional properties of vitamins in food, effect of cooking on vitamins, pseudo vitamins in food</i> b. Minerals - <i>classification/types, chemistry and nature of minerals in food, physio-chemical and functional properties of minerals in food, effect of cooking on minerals in food</i>	CO4
V	a. Colours/Pigments - <i>classification/types, chemistry and nature of colours/pigments in food, effect of cooking on colours/pigments in food</i> b. Flavours - <i>classification/types, chemistry and nature of flavours in food, effect of cooking on flavours in food</i> c. Enzymes - <i>classification/types, chemistry and nature of enzymes in food, effect of cooking on enzymes in food, enzymatic and non-enzymatic browning reaction in food</i> d. Phytochemicals - <i>classification/types, chemistry and nature of phytochemicals in food, effect of cooking on phytochemicals in food</i>	CO5

#### COURSE OUTCOMES

On completion of the course, the students will be able to	
CO1	Define the chemical constituents and colloidal nature of food
CO2	Explain the nature of water and carbohydrates in food
CO3	Enshrine the scientific principles of food proteins and lipids
CO4	Appraise the nature of vitamins and pseudo vitamins in food
CO5	Enumerate the chemistry and types of macro and micro minerals in food

#### REFERENCES

TEXTBOOKS	
1	John M. deMan., John W. Finley., W. Jeffrey Hurst., Chang Yong Lee., (auth.) (2018), Principles of Food Chemistry, 4 <sup>th</sup> Ed., AN ASPEN Publications, Maryland, Springer
2	Fennema, Owen R. (1996), Food Chemistry, 3 <sup>rd</sup> Ed., Marcel Dekker, New York
3	Norman N. Potter and Joseph H. Hotchkiss, (1998), Food Science, 5 <sup>th</sup> Ed., Springer
4	H.-D. Belitz., W. Grosch., P. Schieberle., (2009), Food Chemistry, 4 <sup>th</sup> and revised Ed., Springer-Verlag Berlin Heidelberg



5	Jan Velisek, (2014), The Chemistry of Food, Wiley Blackwell
<b>REFERENCE BOOKS</b>	
1	Joseph J. Provost., Keri L.Colabroy., Brenda S. Kelly., Mark A. Wallert. (2016), The Science of Cooking: Understanding the Biology and Chemistry behind Food and Cooking, Wiley Blackwell
4	Peter Chi Keung Cheung & Bhavbhuti M. Mehta (eds.). (2015), Handbook of Food Chemistry, Springer Reference
5	B.Sunitha and R.Aruna, Food Chemistry of Macronutrients, Department of Food Chemistry and Nutrition Study Material, Acharya NGRanga Agricultural University College of Food Science & Technology, Bapatla
6	Y. H. Hui and Associate Editors, (2006), Handbook of Food Science, Technology and Engineering, Vol.I to IV, Taylor and Francis (CRC)
<b>JOURNALS AND DOCUMENTS</b>	
1	Food Chemistry, Springer
2	Cereal Chemistry, Springer
3	The Journal of Food Science and Technology, Springer

### Part III: CORE I PRACTICAL – Fundamentals of Food Science and Chemistry Practical

Unit/Module	Intended Learning Exercises	CO(s) Mapped
I	1. Identify the type of colloidal solution and describe on it 2. Tabulate the SOP for different cooking methods by integrating nature of ingredients, technique and method	CO1
II	1. Differentiate the type of water as per quality parameter 2. Identify the type of starch and sugar through qualitative tests and microscopic examination in various food	CO2
III	1. Determine the protein content of food by micro kjeldahl method 2. Experiment the nature of protein denaturation on cooking and processing of milk and egg 3. Determine the total fat content of food suing soxhlet apparatus 4. Determine the FFA, Iodine number and saponification value of fresh fats and oils	CO3
IV	1. Determine the Beta Carotene and vitamin C content of the fresh and processed fruits and vegetables 2. Determine the calcium and iron content of the fresh and processed fruits and vegetables	CO4
V	1. Demonstrate the effect of cooking on colours/pigments in food 2. Determine the browning index of fruits and vegetables and define it nature of browning	CO5

#### COURSE OUTCOMES

On completion of the course, the students will be able to	
CO1	Differentiate different types of solution and methods of cooking food
CO2	Analyse the role of water and carbohydrates in cooking and processing of food
CO3	Determine the type and role of protein and lipid in raw and cooked food
CO4	Evaluate the nature of vitamins and pseudo vitamins in raw and cooked food
CO5	Catalogue the chemistry and types of macro and micro minerals in raw and cooked food

#### REFERENCES

<b>TEXTBOOKS</b>	
1	Connie M. Weaver and James R. Daniel, (2003), The Food Chemistry Laboratory: A Manual for Experimental Foods, Dietetics, and Food Scientists, Second Edition (Contemporary Food Science), Second Edition, CRC Press.
2	ShaliniSehgal, (2016), A Laboratory Manual of Food Analysis, ikbooks.com.
3	MohiniSethi and Eram S. Rao, (2020), e-book edition, Food Science: Experiments and Applications, CBS Publishers and Distributors Pvt. Ltd.
<b>REFERENCE BOOKS</b>	
1	Joseph J. Provost., Keri L.Colabroy., Brenda S. Kelly., Mark A. Wallert. (2016), The Science of Cooking: Understanding the Biology and Chemistry behind Food and Cooking, Wiley Blackwell.
2	M.S.Swaminathan, (1987), Food Science, Chemistry and Experimental Foods, Second edition, Bangalore Print. & Pub. Co., Bangalore.
3	Mississippi State University Extension, (2019), Revised by Courtney Crist, M. W. Schilling, Viodelda Jackson, and J.B. Williams, Experiments in Food Science Laboratory Manual.

### Part IV NME –Food preservation(other majors)

Unit/Module	Intended Learning Chapters	CO(s) Mapped
I	<b>Introduction to Food Preservation</b> <b>Food Spoilage</b> - Definition, causes, microorganisms involved in spoilage of bread, fruits and vegetables, meat, fish, egg, milk, juices and pickles. Classification of foods based on shelf life <b>Food preservation</b> - Definition, principles and importance, classification – bactericidal and bacteriostatic methods.	CO1
II	<b>Preservation by high temperature</b> Methods used- blanching, pasteurization, sterilization, UHT processing, canning, extraction cooking, dielectric heating, Dehydration.	CO2
III	<b>Preservation by low temperature</b> Methods commonly used- refrigeration, freezing, dehydro-freezing-advantages and limitations	CO3
IV	<b>Preservation by drying and non- thermal treatments</b> Preservation by drying, concentration and evaporation: Sun drying, tray or tunnel drying, spray drying, drum drying, freeze drying, fluidized bed drying; advantages and disadvantages.	CO4
V	<b>Preservation by other methods and Food packaging</b> Preservation by addition of sugar, salt, chemicals, smoking, irradiation Food additives used in preservation: Definition, types and functions, and safety aspects; permissible limits of preservatives in fruit and vegetable products. Food packaging- types, advantages and disadvantages; ;Food labeling- types and nutritional information	CO5

#### COURSE OUTCOMES

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

CO's	Description
CO1	Describe the role of microorganisms in food spoilage, principles and importance of food preservation.
CO2	Classify the different food preservation methods and foods based on shelf life
CO3	Apply the various techniques of food preservation to preserve different foods and increase the shelf life
CO4	Evaluate the uses of various food preservation methods and explain the role of packaging in food processing
CO5	Justify the use of various preservation techniques, natural and chemical food additives used for preservation, food labeling and food packaging materials

#### REFERENCES:

1. Arthey D and Ashurst, P.R (1996), Fruit processing, Blackie academic and professional. London.
2. Fellows, P.J (2016): Food Processing Technology: Principles and Practice, 2<sup>nd</sup> edition, CRC Wood head publishing Ltd, Cambridge.
3. Gould. G.W (1995), New methods of food preservation. Blackie academic and professional. London.

4. Manay S and Shadaksharaswamy M (2008) Food Facts and Principles, New Age International Publishers, New Delhi.
5. Rahman M S (2020) Handbook of Food Preservation CRC Press, USA
6. Srilakshmi B (2017) Food Science, New Age International Publications, New Delhi.
7. Suganthi.V and Subaratinam.R (2021) Textbook on Food preservation, Dipti Press (OPC) Pvt. Ltd, Chennai.

#### e- learning resources

- <https://www.sciencedirect.com/topics/agricultural-and-biological-sciences/food-spoilage>.
- <http://ecoursesonline.iasri.res.in/mod/page/view.php?id=111436>
- <http://ecoursesonline.iasri.res.in/mod/page/view.php?id=111435>
- <http://www.homepreservingbible.com/2247-an-introduction-to-the-drying-food-preservation-method/>
- <https://egyankosh.ac.in/bitstream/123456789/12397/1/Unit-15.pdf>

### Part IV FC – Foundations of Entrepreneurship

Unit/Module	Intended Learning Exercises	CO(s) Mapped
I	<b>Entrepreneur and Entrepreneurship</b> - Concept of entrepreneurship, Definition of entrepreneur and entrepreneurship, Objectives of entrepreneurship, Characteristics of entrepreneurship, Qualities of an entrepreneur, Functions of an entrepreneur, Types of entrepreneurs, Problems of an entrepreneur especially women.	CO1
II	<b>Small enterprises</b> - Definition, characteristics, Relationship between small and large units. Role of Small enterprises in economic development, and problems of small-scale industries. Subsidies and incentives. Role of MSMEs	CO2
III	Entrepreneurs as problem solvers Innovations and Entrepreneurial Ventures – Global and Indian Role of Technology – E-commerce and Social Media Social Entrepreneurship – Concept	CO3
IV	<b>Project report</b> - Meaning, significance, Elements of project formulation, planning, commission, guidelines for project report. Formulation of project <b>Creating and Starting the Venture</b> Sources of new Ideas, Methods of generating ideas, creating problem solving, product planning and development process	CO4
V	<b>Institutional Finance to Entrepreneurs</b> - Commercial Banks, Other Financial Institutions- SIDBI, SISI, SIPCOT, IFCI, ICICI, IRBI, DIC, SFCs and NABARD	CO5

**COURSE OUTCOMES**

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

CO's	Description
CO1	Describe the concept of entrepreneur and entrepreneurship
CO2	Understand the problems of entrepreneurs.
CO3	Analyze the role of small enterprises in economic development
CO4	Identify and compare the financial institutions offering finance to entrepreneurs
CO5	Create project report for starting a small-scale enterprise

**REFERENCES**

1. B. Jankiraman, P.V. Raveendra, V.K. Srirama (2010). Role and Challenges of Entrepreneurship Development, Excel Books Publishers
2. Dr. Jayshree Suresh (2012) Entrepreneurial Development, Margham Publications
3. S S Khanka (2011) Entrepreneurial development, S Chand, and company
4. Sunil Gupta, (2018), Small-Scale Industries and Entrepreneurship, ABD Publishers
5. T N Chhabra (2019), Entrepreneurship Development, Sun India Publications
6. Taneja, S. and Gupta, S.L. (1992). Entrepreneurship Development, New Venture Creation, Galgotia Publishing Company, Newage international.

**E-LEARNING RESOURCES**

- <http://www.simplynotes.in/e-notes/mbabba/entrepreneurship-development/>
  - [https://www.iare.ac.in/sites/default/files/lecture\\_notes/IARE\\_Entrepreneurial\\_Development\\_NOTES.pdf](https://www.iare.ac.in/sites/default/files/lecture_notes/IARE_Entrepreneurial_Development_NOTES.pdf)
  - <https://ncert.nic.in/ncerts/l/lbs213.pdf>
  - [https://www.researchgate.net/publication/344413560\\_Small\\_Scale\\_Industries\\_in\\_Entrepreneurship\\_Development\\_of\\_India\\_References](https://www.researchgate.net/publication/344413560_Small_Scale_Industries_in_Entrepreneurship_Development_of_India_References)
  - <https://egyankosh.ac.in/bitstream/123456789/52149/1/Unit-1.pdf>
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**Core Paper II**  
**FUNDAMENTALS OF FOOD TECHNOLOGY**

**(CREDITS:5 THEORY –5Hrs/week)**

**Course Objectives:**

- To understand the history and evolution of food processing.
- To study the structure, composition, nutritional quality and post harvest changes of various plant foods.
- To study the structure and composition of various animal foods.

**Course Contents**

**UNIT I**

**Introduction**

Historical evolution of food processing technology.

**Cereals and Millets**

- Structure and composition of cereals
- heat-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.

**UNIT II**

**Pulses**

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

**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.

**UNIT III**

**Fruits and Vegetables**

- *Classification of fruits and vegetables, general composition, enzymatic browning, names and sources of pigments, Dietary fibre.*
- *Postharvest 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. Factors Affecting the Composition of Milk, Flavours and off- Flavours related to milk ,types of market milk and milk products.

### Reference books

1. Bawa.A.S,O.PChauhanetal.FoodScience.NewIndiaPublishingagency,2013
2. Roday,S.FoodScience,Oxfordpublication,2011.
3. B.Srilakshmi,Foodscience,NewAgePublishers,2002
4. Meyer,FoodChemistry,NewAge,2004
5. DeSukumar.,Outlines ofDairy Technology,Oxford UniversityPress,2007

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

CO No.	CO Statement
CO1	To outline the various processing techniques in the development of cereal and cereal products
CO2	To recognise the structure, nutritional composition, procurement techniques, processing operations of pulses and oil
CO3	To outline the various processing techniques in the development of fruits and vegetables
CO4	To determine the various processing techniques in the preparation of different dairy and meat products baked and sugar related goods.
CO5	To identify the role of raw materials in the production of dairy

### MAPPING (CO/PSO):

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

### PEDAGOGY:

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

## Core Practical II

### FUNDAMENTALS OF FOOD TECHNOLOGY PRACTICAL

#### CREDITS:3 THEORY –3Hrs/week)

1. Study different types of browning reactions :enzymatic and nonenzymatic.
2. To study gelatinization behavior of various starches
3. To study the concept of gluten formation of various flours.
4. To study malting and germination.
5. To study dextrinization in foods.
6. Identification of pigments in fruits and vegetables and influence of pH on them.
7. Quality inspection of animal foods.
8. Estimation of reducing sugar by Fehlings procedure
9. Estimation of salt content in brine
10. Estimation of salt content in butter
11. Preparation of brix solution and checking by hand refractometer
12. Determination of acidity of water
13. Determination of alkalinity/hardness of water

#### Reference Books

1. Bawa.A.S,O.PChauhanetal.FoodScience.NewIndiaPublishingagency,2013
2. Roday,S.FoodScience,Oxfordpublication,2011.
3. B.Srilakshmi,Foodsience,NewAgePublishers,2002
4. Meyer,FoodChemistry,NewAge,2004
5. DeSukumar.,Outlines ofDairy Technology,Oxford UniversityPress,2007

# **NME II**

## **FOOD PACKAGING TECHNOLOGY**

**CREDITS:2 THEORY –2rs/week**

**(Offered to other departments)**

### **Course Objectives**

- Describe the functions of packaging along with the influence of various factors on food.
- Explain the various factors of different packaging materials include metallic cans and glass
- State the types, production and applications of paper, paperboards and polymers in food packaging

### **Course content**

#### **UNIT I - INTRODUCTION TO FOOD PACKAGING**

Functions of packaging, Effect of environmental factors - light, Oxygen, Moisture, Temperature, mechanical forces and biological factors on quality of food. Estimation of shelf life. General Approach, analysis of storage requirement, accelerated storage studies: Vacuum and Inert Gas Packaging: Tests on packaging materials, Mechanical strength (Tension, notch and tearing strengths), Gas and water vapour transmission rates.

#### **UNIT II - METAL CANS AS PACKAGING**

Metallic can types - Tin cans and Aluminum cans. Specialty of Open top sanitary cans, Lacquers and their use, Three piece cans and Two piece cans, Aerosol Cans, Basics of Canning operations – Can Reformer, Flanger, Seaming, Can closures. Glass jars and Bottles in food packaging, Design features and applications, Sterilization of bottles.

#### **UNIT III - FLEXIBLE FILMS PACKAGING**

Formation of Films and pouches, Plastics used and their Specific applications - Polyethylene (LDPE and HDPE), Cellulose, Polypropylene (PP), Polyesters, Polyvinylidene Chloride (PVDC - Diofan, Ixan and Saran), Polyvinyl chloride, Copolymers their applications. Co-extruded films and Laminates. Rigid and Semi rigid plastic packaging – fabrication methods  
– Thermo forming, Blow moulding, Injection moulding, Extrusion – Retort pouch packaging. Laminated Paper board Cartons, Fibre Board and Corrugated Card Board packaging and their applications.

#### **UNIT IV - FILLING AND SEALING OPERATIONS FOR VARIOUS TYPES OF PACKAGES**

Closing and sealing of rigid plastic containers. Filling and sealing of Flexible plastic containers, Seal types-Bead seals, Lap Seals and Fin seals –Differences and advantages, Hot wire sealing, hot bar sealing and impulse sealing – differences and relative advantages, Form fill Seal equipment: Printing on packages, Bar codes, Nutrition labeling and legislative requirements. Filling and Sealing of pouches, pouch from fill seal machines.

#### **UNIT V - INNOVATIONS IN FOOD PACKAGING**

Aseptic Packaging. Active packaging, Moisture control, CO<sub>2</sub> and Oxygen scavenging. Modified atmosphere packaging – principles, applications. Permeability of gases in packs. Antimicrobial Packaging, Edible packaging films and coating. Packaging for non-thermal food processing. Intelligent Packaging – Time-temperature indicators, RFID, Tamper evident packaging.

### **Reference Books**

1. Coles R and Kirwan J. Food and Beverage Packaging Technology. Wiley-Blackwell Publishing. 2<sup>nd</sup> Edition, 2011.
2. Coles, R., Dowell, D.M., Kirwan, J. Food Packaging Technology, Black Well Publishing Ltd, 2009.
3. Gordon L. Robertson. Food Packaging Principles & Practice. CRC Press, 2016.
4. Kit L Yam and Dong Sun Lee. Emerging Food Packaging Technologies: Principles and Practice. Wood head Publishing Ltd, 2012.
5. Jung H. Han. Innovations in Food Packaging. Biogreen Elsevier India, 2<sup>nd</sup> Edition, 2016.



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

<b>CO No.</b>	<b>CO Statement</b>
CO1	Discuss the need and functions of packaging as a solution to various factors affecting food.
CO2	Estimate the shelf life of food packed in different types of packaging materials
CO3	Explain the different packaging materials, their manufacturing process and equipment involved
CO4	Compile the various closures and sealing mechanisms for different packaging materials
CO5	Select the different printing and labeling methods with legislative requirements

**MAPPING (CO/PSO):**

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

**PEDAGOGY:**

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

**SBEC II Food Additives**  
**CREDITS: 2            2hrs/week**

**Course Objectives**

- To teach various types of food additives
- To recognize the type of additive added to a food by reading the label on the packaging of the food.

**UNIT I**

Introduction: Introduction to Food Additives; Scope of food additives; Functions and uses of Food Additives; Classification- Intentional & Unintentional Food additives; Types of food additives Toxicology and Safety Evaluation of Food Additives: Effects of Food Additives; Food Additives generally recognized as safe (GRAS); Tolerance levels & Toxic levels in Foods; Legal safeguard; Risks of food additives.

**UNIT II**

Naturally occurring food additives: Classification; Health Implications; Role in Foods Acidulants: Introduction; Different acidulants; Role in food processing Food colorants: Introduction; Natural & Synthetic food colorants; Classification of Food colorants; Chemical nature; Impact on health.

**UNIT III**

Pigments: Importance; Classification: Utilization as food colour .Food Preservatives : Introduction; Classification- Natural & chemical preservatives, Mode of action.

**UNIT IV**

Antioxidants & chelating agents: Introduction; Role in foods; Types of antioxidants -natural & synthetic; Mode of action of antioxidants in foods; Chelating agents- Naturally & synthetic; Mode of action of chelating agents; Applications of antioxidants and chelating .

**UNIT V**

Sweeteners: Introduction; Classification- Artificial sweeteners & Nonnutritive sweeteners. Classification of flavors- natural & synthetic; Flavor enhancer/ Potentiator; Importance of taste and flavours; Role of flavoring agents in food processing.

**REFERENCES:**

1. Food Additives A Larry Branen, P Michael Davidson and Seppo Salminen CRC Book Press. USA.
2. Food Additives S.N. Mahindru APH Publishing Corporation, Drya Ganj, New Delhi.
3. Food colours, Flavours and Additives Technology Handbook NIIR Board of Consultants and Engineers Natonal Institute of Industrial Research, Kamla Nagar, Delhi
4. Food chemistry H.D. Belitz, W. Grosh and P. Schieberle 4 th Revised & Extended Edition, Springer.

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

<b>CO No.</b>	<b>CO Statement</b>
CO1	To understand and recall the definitions and principles of food additives.
CO2	To analyse the presence of food preservatives, food colours, emulsifiers, food additives and toxic compounds present in food.
CO3	To illustrate the characteristics of food preservatives, flavouring agents, flavour enhancers and their impacts during processing.
CO4	To outline the importance and toxicity of preservatives,
CO5	To explain the role of food additives, chelating agents, leavening agents, and food adulterants.

**MAPPING (CO/PSO):**

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

**PEDAGOGY:**

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