

Part A: Introduction			
Program: Post graduation	Class: M. Sc. (Food Processing and Technology)	Semester – I	Session: 2023-2024
1	Course Code	FPT-411	
2	Course Title	SENSORY EVALUATION OF FOOD PRODUCTS	
3	Course Type	Theory	
4	Pre-requisite (if any)	Nil	
5	Course learning Outcome (CLO)	<p>At the end of this course, the students will be able to:</p> <ul style="list-style-type: none"> • Explain the role of sensory evaluation in product acceptance • Understand definitions associated with sensory analysis and taste panels • Understand what sensory tests can be applied to figure out whether there are differences between a food or ingredient or descriptions of what makes the foods or ingredients different from one another • Understand objective and subjective methods of sensory evaluation • Understand parameters measured by texture profile analysis 	
6	Credit value	Theory : 4+1	
7	Total Marks	Max. Marks: 100	Min Passing marks: 40

Part B: Content of the Course		
Total hours: 60 periods		
Unit	Topics	No. of hours
I	Introduction- definition and importance of sensory evaluation in relation: to consumer acceptability and economic aspects, using the Senses in Sensory Analysis, sensory judges, Terminology related to sensory evaluation- quality, quantity, nutritional and other hidden attributes, sensory quality, appearance, kinesthetics, flavour & odour.	12
II	Evaluation of Sensory qualities, Laboratory Set-up and equipments, Panel selection and training- judging quality. Comparison between subjective & objective evaluations. Mechanical characteristics, geometrical characteristics and other characteristics of texture.	12
III	Difference (Qualitative) test - paired comparison test for trained panelists and untrained panelists, duo-trio test for trained panelists and triangle (triad) test for trained panelists.	12
IV	Rating (Quantitative differences) test - ranking test, single sample (monadic) test, two sample difference test, multiple sample and quality difference test, hedonic test, numerical scoring test and composite test for trained/semi-trained/untrained panelists.	12
V	Sensitivity - Threshold and dilution test for trained/untrained panelists; TPA test - parameters measured by texture profile analysis test (Hardness, Elasticity, Adhesiveness, Cohesiveness,	12

Brittleness, Chewiness and Gumminess), Sensory applications on foods.	
Keywords: Sensory perception, subjective & objective evaluation, difference & rating test	

Part C: Learning Resources	
Textbooks, Reference Books, Other Resources	
Suggested Readings:	
1. Ranganna S. 2001. Handbook of Analysis and Quality control for fruit and vegetable products. 2 nd Edition, Tata-McGraw-Hill Publication 2. Amerine MA, Pangborn RM & Rossles EB. 1965. Principles of Sensory Evaluation of Food. Academic Press. 3. Lawless HT & Klein BP. 1991. Sensory Science: Theory and Applications in Foods. Marcel Dekker. 4. Maslowitz H. 2000. Applied Sensory Analysis of Foods. Vols. I, II. CRC Press 5. Rai SC & Bhatia VK. 1988. Sensory Evaluation of Agricultural Products.	
E-learning Resources	
https://link.springer.com/book/10.1007/978-1-4419-7452-5	
https://www.foodresearchlab.com/blog/rte-rtc/sensory-evaluation-of-food/	
http://ecoursesonline.iasri.res.in/mod/page/view.php?id=6033	

Part D: Assessment and Evaluation		
Suggested Continuous Evaluation Methods:		
Maximum Marks: 100		
Continuous Comprehensive Evaluation (CCE): 25 Marks		
University Exam (UE): 75 Marks		
Internal Assessment:	Class Test	Regular Attendance and
Continuous Comprehensive Evaluation (CCE)	Assignment/ Presentation	Participation in Programs

Part A: Introduction			
Program: Post graduation	Class: M. Sc. (Food Processing and Technology)	Semester – I	Session: 2023-2024
1	Course Code	FPT-412	
2	Course Title	FERMENTATION TECHNOLOGY	
3	Course Type	Theory	
4	Pre-requisite (if any)	Nil	
5	Course learning Outcome (CLO)	At the end of this course, the students will be enable to: <ul style="list-style-type: none"> ➤ Define various modes and techniques of fermentation. ➤ Isolate, identify and develop the microbial inoculum for industrial processing. ➤ Understand the microbial growth and their role in producing commercial metabolites ➤ Understand Upstream and Downstream processing of fermented products ➤ Understand fermented products of beneficial health effects 	
6	Credit value	Theory : 4+1	
7	Total Marks	Max. Marks: 100	Min Passing marks: 40

Part B: Content of the Course

Total hours: 60 periods

Unit	Topics	No. of hours
I	Fermentation, types of fermentation, Fermentation Pathways for Industrial Products: Biochemical pathways of metabolic reactions for utilization of carbon sources and formation of different metabolites by microorganisms; Pure and Mixed Cultures, Strain Isolation and Maintenance, Different microbes culture collections	12
II	Typical media, Media formulation:-Carbon Source, Nitrogen source, Minerals, Growth Factors, Buffers, Precursors and Inhibitors, O ₂ requirement and antifoams, Different types of media	12
III	Fermenter design, Instrumentation and control, Types of fermenters (Shake flask, Batch/stir tank, Continuous, Bubble column, airlift and Tower fermenter), Types of fermentation processes, aeration and agitation (The oxygen requirement for industrial fermentation.	12
IV	Downstream Processing: Various equipment for product recovery; micro-filters and Ultrafiltration systems for separation of cells and fermentation medium and for concentration of medium containing product; chromatographic systems of separation; extraction of product with solvent; evaporation and crystallization; centrifugation, different types of centrifuges; drying techniques; instrumentation and controls. Introduction of Upstream	12
V	Major types of organisms used in Fermentation, Fermentative products: Dairy products, Soy products and Organic acids	12
Keywords: Fermentation, culture, media, fermented products, fermenter		

Part C: Learning Resources

Textbooks, Reference Books, Other Resources

Suggested Readings:

1. Practical Fermentation Technology - B. McNeil and L. Harvey; Wiley.
2. Principle of Fermentation Technology-P.F. Stanbury, A. Whitaker and S.J.Hall – Butterworth, New Delhi.
3. Fermentation Microbiology and Biotechnology-E.M.T. El-Mansi, C.F.A. Bryce and A. Demain; Taylor and Francis, London.
4. Modern Industrial Microbiology and Biotechnology- N. Okafor–CBC Press, New Hampshire.
5. Fermentation Technology- M.L. Srivashava; Alpha Science Intl Ltd.

E-learning Resources:

<https://e-atalgyansangum.ac.in/course/show/1014>

<https://www.youtube.com/playlist?list=PLjS0F9yzigzFsPU99IVp8CKkNiiAWHPgD>

<https://www.youtube.com/watch?v=pFwgqU5Lsv8>

https://www.youtube.com/watch?v=PhWWWn_lmGE

Part D: Assessment and Evaluation**Suggested Continuous Evaluation Methods:**

Maximum Marks: 100

Continuous Comprehensive Evaluation (CCE): 25 Marks

University Exam (UE): 75 Marks

Internal Assessment:

Continuous Comprehensive Evaluation (CCE)

Class Test/

Assignment/ Presentation

Regular Attendance and Participation in Programs

Part A: Introduction

Program: Post graduation

Class: M. Sc. (Food Processing and Technology)

Semester – I

Session: 2023-2024

1	Course Code	FPT-413
2	Course Title	PRINCIPLES OF FOOD PROCESSING
3	Course Type	Theory
4	Pre-requisite (if any)	Nil
5	Course learning Outcome (CLO)	At the end of this course, the students will be enable to: <ul style="list-style-type: none"> • Understand fresh food storage practices • Understand preservation by heat and low temperature method • Understand preservation by drying or other non-thermal methods of preservation
6	Credit value	Theory : 4+1
7	Total Marks	Max. Marks: 100 Min Passing marks: 40

Part B: Content of the Course

Total hours: 60 periods

Unit	Topics	No. of hours
I	Principles of fresh food storage: Nature of harvested crop, plant, storage; effect of cold storage and quality- storage of grains.	12
II	Processing and preservation by heat: Blanching, pasteurization, sterilization and UHT processing, canning, extrusion cooking, dielectric heating, microwave heating, baking, roasting and frying.	12
III	Retort processing of Ready to eat (RTE) products. Drying - water activity, microbial spoiled due to moisture. Dehydration of fruits, vegetables, milk, animal products Newer methods of thermal processing - batch and continuous.	12
IV	Processing and preservation by low Temperature - refrigeration, freezing, CA, MA, and dehydro-freezing. Food irradiation, history and mechanism, the electromagnetic spectrum, forms of radiant energy. Principles of using electromagnetic radiation in food processing. Ionizing and non-ionizing radiations, advantages and disadvantages. Controlling undesirable changes in food during irradiation	12
V	Principles of other food processing such as membrane filtration (ultra, osmosis and reverse osmosis, dialysis), pulsed electric, irradiation and other non-thermal technologies	12

Keywords: Thermal preservation, Low temperature preservation, Radiation

Part C: Learning Resources

Textbooks, Reference Books, Other Resources

Suggested Readings:

1. Das H. "Food Processing Operations Analysis", Asian Books, 2005.
2. Fellows P. J. (2005) Food Processing Technology: Principle and Practice. 2nd Ed. CRC Publishers
3. Jelen P. (1985) Introduction to Food Processing, Prentice Hall.

E-learning Resources:

https://www.youtube.com/playlist?list=PL_a1TI5CC9RGjTrlAFEdxPnFfQn CZ9uI9
<https://ebooks.inflibnet.ac.in/ftp1/chapter/principles-of-food-processing-and-preservation/>
<https://nzifst.org.nz/resources/unitoperations/index.htm>

Part D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks: 100

Continuous Comprehensive Evaluation (CCE): 25 Marks

University Exam (UE): 75 Marks

Internal Assessment:

Continuous Comprehensive Evaluation (CCE)

Class Test
Assignment/ Presentation

Regular Attendance and Participation in Programs

Part A: Introduction

Program: Post graduation	Class: M. Sc. (Food Processing and Technology)	Semester – I	Session: 2023-2024
1	Course Code	STAT-414	
2	Course Title	STATISTICAL METHODS	
3	Course Type	Theory	
4	Pre-requisite (if any)	Nil	
5	Course learning Outcome (CLO)	At the end of this course, the students will be able to: Understand sampling, sample and population Understand different test useful in testing of hypothesis	
6	Credit value	Theory : 4+1	
7	Total Marks	Max. Marks: 100	Min. Passing marks: 40

Part B: Content of the Course

Total hours: 60 periods

Unit	Topics	No. of hours
I	Statistics its meaning and definition, kinds of data, classification of data, variables and attributes, types of statistics, limitation of statistics	12
II	Frequency distribution, graphical representation of data, Measures of central tendency – Arithmetic mean, median, mode, geometric mean, Harmonic mean. Measures of dispersion – Range, Quartile deviation, mean deviation, standard deviation, variance, moments,	12

	skewness and kurtosis	
III	Correlation and Regression- Theory and numericals	12
IV	Sampling method and sampling distribution, Different sampling techniques – simple random sampling, systematic sampling, stratified sampling and cluster sampling, sampling and non-sampling errors	12
V	Testing of Hypothesis, Steps in testing of hypothesis, z-test, Student's t-test, Paired t-test, Variance ratio test (F-test), Chi-square distribution, Analysis of variance (ANOVA) techniques, definitions and assumptions, classification of ANOVA: One way and two way	12
Keywords: Statistics, Mean, sampling methods, Hypothesis testing		

Part C: Learning Resources	
Textbooks, Reference Books, Other Resources	
Suggested Readings	
1. Statistics for Agricultural Sciences by Nageshwara Rao G, Oxford & IBH Publishing Co., New Delhi.	
2. Fundamentals of Mathematical Statistics by S C Gupta & V K Kapoor S. Chand & Sons.	
3. Statistical Methods G. W. Snedecor & W. Cochran Oxford & IBH Publishing Co., New Delhi.	
4 S. M. Shukla and S. P. Sahai 2011 Business Statistics. Sahitya Bhawan Publications	
E-learning Resources	
https://libguides.jcu.edu.au/statistics/training	
https://www.youtube.com/watch?v=IEUTRhyoHNc&list=PLPjSqITyvDeWS9Lxp4jreGJ7eN_sxHxJA8	
https://engineering.purdue.edu/online/courses/statistical-methods	
http://ecoursesonline.iasri.res.in/course/view.php?id=265	

Part D: Assessment and Evaluation		
Suggested Continuous Evaluation Methods:		
Maximum Marks: 100		
Continuous Comprehensive Evaluation (CCE): 25 Marks		
University Exam (UE): 75 Marks		
Internal Assessment:	Class Test	Regular Attendance and
Continuous Comprehensive Evaluation (CCE)	Assignment/ Presentation	Participation in Programs

Part A: Introduction			
Program: Post graduation	Class: M. Sc. (Food Processing and Technology)	Semester – I	Session: 2023-2024
1	Course Code	FPT- 415	
2	Course Title	Advanced Laboratory Course –I	
3	Course Type	Practical	
4	Pre-requisite (if any)	Nil	
5	Course learning Outcome (CLO)	At the end of this course, the students will be enable to: Analyse proximate composition of food	

		Understand sensory perception of food	
6	Credit value	Practical : 5	
7	Total Marks	Max. Marks: 100	Min Passing marks: 40

Part B: Content of the Course		
Total No. of Periods: 60		
Practical List	Note: This is tentative list; the teacher concern can add more experiment as per requirement	
1	Determination of moisture content of food sample on wet and dry basis	
2	Determination of protein content of food	
3	Determination of crude fibre of food sample	
4	Methods of sensory evaluation	
5	Production of ethanol by fermentation	
6	Production of amylase by fermentation	
7	Determination of Vitamin C of fruit sample	
8	Cut-out analysis of canned food	
9	Determination of TPA profile of food sample	
10	Microbiology of Bread production	

Part C: Learning Resources	
Textbooks, Reference Books, Other Resources	
Suggested Readings:	
Food Analysis by S. Suzanne Nielsen Fourth Edition, ISBN 978-1-4419-1477-4 Springer	
A laboratory manual of food analysis by Shalini Sehgal	
Food analysis theory & practice, fourth edition by Pomeranz & Meloan	
E-learning Resources:	
https://egyankosh.ac.in/handle/123456789/88875	
https://www.youtube.com/@MicroChemsExperiments	

Part A: Introduction			
Program: Post graduation	Class: M. Sc. (Food Processing and Technology)	Semester – II	Session: 2023-2024
1	Course Code	FPT-421	
2	Course Title	TECHNOLOGY OF CEREALS AND PULSES	
3	Course Type	Theory	
4	Pre-requisite (if any)	Nil	
5	Course learning Outcome (CLO)	At the end of this course, the students will be enable to: <ul style="list-style-type: none"> Identify different cereals and pulses along with their scientific names Understand milling and processing of different cereals Understand milling and processing of different pulses 	
6	Credit value	Theory : 4+1	
7	Total Marks	Max. Marks: 100	Min Passing marks: 40

Part B: Content of the Course		
Total hours: 60 periods		
Unit	Topics	No. of hours
I	Status, production and major growing areas of cereals and pulses in India and World, Chemical composition of cereals and pulses, Nutrition Importance, Scientific Names of cereals and pulses, Storage of cereals and pulses.	12
II	Wheat: Wheat classification, wheat grain structure, quality and milling, wheat products. Maize: Varieties, Structure, Milling	12
III	Rice: Indian classification of rice, Parboiling, Milling, Rice Products, Byproducts of rice, Brown rice, Basmati rice and glutinous rice	12
IV	Major and minor millets – types, pre-processing & methods to remove toxic factor, nutritional losses during processing storage, Sorghum: Structure and Milling, Barley: Milling and Malting, Millets: Pearl millet and finger millet, Oats and Rye: processing.	12
V	Pulses: Pulse proteins, processing, utilization of pulses, Toxic constituents of pulses, Pulses in human nutrition, nutritional losses during processing, Some important pulses: Bengal gram, Red gram, Black gram, Green gram, Moth Bean, Lentil, Horse gram, Field Bean, Pea and others.	12
Keywords: Cereals, Pulses, Milling, Dry and Wet Processing, Millets		

Part C: Learning Resources	
Textbooks, Reference Books, Other Resources	
Suggested Readings	
1. Sahay K.M. & Singh KK. 1994. Unit operation of Agricultural Processing. Vikas Publ. House.	
2. Hosney RS. 1994. Principles of Cereal Science and Technology, 2 nd Edition AACC	
3. Kent NL. 1983. Technology of Cereals. 4 th Ed. Pergamon Press	
4. Kulp K & Ponte GJ. 2000. Handbook of Cereal Science and Technology. 2 nd Ed. Marcel Dekker.	
5. Lorenz KL. 1991. Handbook of Cereal Science and Technology. Marcel Dekker	
6. Pomeranz Y. 1987. Modern Cereal Science & Technology. VCH Publ.	
E-learning Resources:	
chrome-extension://efaidnbnmnibpcjpcglclefindmkaj/https://fmipa.umri.ac.id/wp-content/uploads/2016/03/Amalendu_Chakraverty_Arun_S._Mujumdar_IiosahalliBookFi.org_.pdf	
https://icc.or.at/	

Part D: Assessment and Evaluation		
Suggested Continuous Evaluation Methods:		
Maximum Marks: 100		
Continuous Comprehensive Evaluation (CCE): 25 Marks		
University Exam (UE): 75 Marks		
Internal Assessment:	Class Test	Regular Attendance and
Continuous Comprehensive Evaluation (CCE)	Assignment/ Presentation	Participation in Programs

Part A: Introduction			
Program: Post graduation	Class: M. Sc. (Food Processing and Technology)	Semester – II	Session: 2023-2024
1	Course Code	FPT-422	
2	Course Title	FATS AND OILS TECHNOLOGY	
3	Course Type	Theory	
4	Pre-requisite (if any)	Nil	
5	Course learning Outcome (CLO)	At the end of this course, the students will be enable to: <ul style="list-style-type: none"> ➤ Understand differences in different plant and animal fats ➤ Understand chemical and physical properties of fats and oil ➤ Understand different extraction methods for various fats and oils ➤ Understand physical and chemical changes during storage or reactions of Fats and Oil 	
6	Credit value	Theory : 4+1	
7	Total Marks	Max. Marks: 100	Min Passing marks: 40

Part B: Content of the Course		
Total hours: 60 periods		
Unit	Topics	No. of hours
I	Lipids: Introduction. Role of lipids in biological systems, Difference in fats and oils, Fats and oils classification, saturated and unsaturated fatty acids, Polymorphism of fats. Fat emulsions.	12
II	Physical characteristics of triglycerides: melting point, specific heat, viscosity, density, solid fat index, titer, cold test and refractive index. Chemical parameters of fats and oils: Acid Value, Free Fatty acid, Peroxide value, Smoke point, Saponification number, Iodine value.	12
III	Processing Technology of fats and oils: Rendering, Expeller pressing and solvent extraction, refining: degumming, neutralization, bleaching deodorization. Hydrogenation, winterizing and fractionation, interesterification, plasticizing and tempering.	12
IV	Fats and oils reactions: hydrolysis and oxidation. Mechanisms of lipid oxidation and antioxidants. Cooking in fat, Deep fat frying: Changes in fats and oils during frying, Flavour reversion	12
V	Different categories of fats and oils: edible oils, dairy fats, Shortening: introduction, manufacturing and uses of shortening, Margarine: manufacturing process and its uses, Mayonnaise and salad dressings.	12
Keywords: Fats and Oil, Rancidity, Refining, antioxidants		

Part C: Learning Resources
Textbooks, Reference Books, Other Resources
Suggested Readings

1. Edible Oil Processing Second Edition, Edited by Wolf Hamm, Richard J. Hamilton and Gijs Calliauw. 2013, Wiley Blackwell
2. Bailey's Industrial Oil and Fat Products, Sixth Edition, Six Volume Set. 2005 John Wiley & Sons, Inc.
3. Food Lipids: Chemistry, Nutrition, and Biotechnology, edited by Casimir C. Akoh and David B. Min. 2002 Marcel Dekker, Inc.
4. Chemistry and Technology of Oils and Fats. M. M. Chakrabarty, Allied Publishers 2003.

E-learning Resources

https://www.youtube.com/watch?v=z0Zr9PG8_xU

<https://www.youtube.com/watch?v=N8Gpm3G-6gQ>

<https://www.youtube.com/watch?v=fQ1hSNGnXYY>

Part D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks: 100

Continuous Comprehensive Evaluation (CCE): 25 Marks

University Exam (UE): 75 Marks

Internal Assessment:

Continuous Comprehensive Evaluation (CCE)

Class Test
Assignment/ Presentation

Regular Attendance and Participation in Programs

Part A: Introduction

Program: Post graduation	Class: M. Sc. (Food Processing and Technology)	Semester – II	Session: 2023-2024
1	Course Code	FPT-423	
2	Course Title	FOOD ENGINEERING	
3	Course Type	Theory	
4	Pre-requisite (if any)	Nil	
5	Course learning Outcome (CLO)	At the end of this course, the students will be able to: Understand mass and energy balance of Food processing operations Understand material handling adopted in food industry Understand fluid flow and transfer of heat for energy conservation in different unit operations of food industry	
6	Credit value	Theory: 4+1	
7	Total Marks	Max. Marks: 100	Min Passing marks: 40

Part B: Content of the Course

Total hours: 60 periods

Unit	Topics	No. of hours
I	Introduction to food process engineering, Material and energy balances: Basic principles, Total mass balance and component mass balance. Material balance calculations involved in dilution, concentration and dehydration. Heat balance calculations.	12
II	Material handling - Theory, classification of various material handling equipments - conveyors (gravity and powered conveyors), elevators (bucket and screw type elevators), trucks (high lift and	12

	pallet trucks), cranes and hoists. Cleaning - types of contaminants found on raw foods, aims of cleaning; methods of cleaning- dry, wet and combination methods. Dry cleaning methods: screening, aspiration, magnetic cleaning and abrasive cleaning. Wet cleaning methods: soaking, spray washing, flotation washing and ultrasonic washing.	
III	Fluid Mechanics: Properties of fluids, nature of fluid and fluid flow, Flow of fluids past a stationary particle for low, medium and high Reynolds numbers; Manometers, Mechanism of on Compressible fluid flow, Reynolds's no, Distribution of velocities, Viscosity, Friction losses in pipe line, Losses in pipe fittings, transportation of fluids. Measurement of fluid flow, Orifice meter and Venturi meter, Pitot tube, Rotameter, Notches and weirs and other miscellaneous meters.	12
IV	Heat transfer: Conduction, Convection: Free & forced convection dimensionless numbers in heat transfer, expressions for calculating heat transfer coefficients, Laminar and turbulent heat transfer inside and outside tubes, annuli finned tubes, Natural convection and its applications. Radiation: Kirchoff's Law, Stephen's Law, Heat flux by radiation.	12
V	Psychrometrics: Properties of dry-air: composition of air, specific volume of air, specific heat of dry air, enthalpy of dry air, dry and wet bulb temperature. Refrigeration: Basic refrigeration cycles and concepts: Elementary vapour compression refrigeration cycle with reciprocating, rotary and centrifugal compressor.	12
Keywords: Material balance, cleaning, heat transfer, fluid flow		

Part C: Learning Resources	
Textbooks, Reference Books, Other Resources	
Suggested Readings	
1. Introduction to Food Engineering by R. P. Singh & D. R. Heldman. Academic Press INC., London	
2. Fundamentals of Food Engineering by R. C. Verma & S. K. Jain. Himanshu Publ. New Delhi.	
E-learning Resources	
https://www.youtube.com/watch?v=ZD3auEylazQ&list=PLbRMhDVUMngd9ZQul3t-OUxD4713C7QCh	
http://www.rpaulsingh.com/course/index.html	

Part D: Assessment and Evaluation		
Suggested Continuous Evaluation Methods:		
Maximum Marks: 100		
Continuous Comprehensive Evaluation (CCE): 25 Marks		
University Exam (UE): 75 Marks		
Internal Assessment:	Class Test	Regular Attendance and
Continuous Comprehensive Evaluation (CCE)	Assignment/ Presentation	Participation in Programs

Part A: Introduction			
Program: Post graduation	Class: M. Sc. (Food Processing and Technology)	Semester – II	Session: 2023-2024
1	Course Code	FPT-424	
2	Course Title	EXTRUSION TECHNOLOGY	
3	Course Type	Theory	
4	Pre-requisite (if any)	Nil	
5	Course learning Outcome (CLO)	At the end of this course, the students will be able to: Understand different types of extruders used in different extruded products Understand ancillary equipment's of an extruder	
6	Credit value	Theory : 4+1	
7	Total Marks	Max. Marks: 100	Min Passing marks: 40

Part B: Content of the Course		
Total hours: 60 periods		
Unit	Topics	No. of hours
I	Definition & Objectives of Extrusion, examples of extruded foods, Function of an extruder, Advantages of Extrusion, Development of extruders, important terminologies, advantages and disadvantages of an extruders.	12
II	Theory, Rheological properties of the food, Operating characteristics, Determination of operating point for a single screw extruder, Operating data for different types of extruder, Types of extruders: Single screw classification- classification based on extent of shear, classification based on heat generation, solid single screw extruders, interrupted-flight extruder-expander, single segmented-screw extruders. Advantages and disadvantages of single screw extruders.	12
III	Twin screw extruders- classification of twin screw extruders (Counter-rotating twin screw extruders & co-rotating twin screw extruders), advantages and disadvantages of twin screw extruders.	12
IV	New generation extruders, advantages of new generation extruders. Preconditioning- Introduction, Benefits of preconditioning, preconditioning hardware and preconditioner operation.	12
V	Ancillary equipment (Preconditioner, Feeder, Pumps, Kneading blocks), Applications of extrusion- Cold extrusion & Extrusion cooking: Confectionery products, Cereal products (Crisp bread & breakfast cereals), Protein-based foods (Texturised vegetable protein (IVP) & Meat and fish products), other developments. Effect on foods (Sensory characteristics & Nutritional value). Future trends in extrusion.	12
Keywords: Extrusion, Types, Parts, Application, Effect of Extrusion		

Part C: Learning Resources
Textbooks, Reference Books, Other Resources
Suggested Readings

1. Riaz Mian N. 2000. Extruders in food applications, Technomic Publishing Company, Inc., Lancaster, USA.
2. Fellows P.J. 2000. Food Processing Technology: Principles and Practices, Second Edition, Woodhead Publishing Limited, Cambridge, England.
3. Extrusion of Food, Vol 2; Harper JM; 1981, CRC Press.
4. Frame ND .1994. *The Technology of Extrusion Cooking*. Blackie Academic.
5. Guy, Robin. 2001. Extrusion cooking: Technologies and applications, Woodhead Publishing Limited, Cambridge, England.

E-learning Resources

<https://www.youtube.com/watch?v=NORtjGv2JgY>

<https://www.youtube.com/watch?v=AM7gwj4oMRk>

<https://www.youtube.com/watch?v=yyc-78YKjFU>

Part A: Introduction			
Program: Post graduation	Class: M. Sc. (Food Processing and Technology)	Semester – II	Session: 2023-2024
1	Course Code	FPT-425	
2	Course Title	Advanced Laboratory Course –II	
3	Course Type	Practical	
4	Pre-requisite (if any)	Nil	
5	Course learning Outcome (CLO)	At the end of this course, the students will be enable to: Determine different oil quality parameters, understand rheological properties of food sample	
6	Credit value	Practical : 5	
7	Total Marks	Max. Marks: 100	Min Passing marks: 40

Part B: Content of the Course		
Total No. of Periods: 60		
Practical List	Note: This is tentative list; the teacher concern can add more Experiment as per Requirement	
1	Determination of refractive index of different oils	
2	Determination of saponification number of fats and oils	
3	Determination of iodine value of different fats and oils	
4	Analysis of FFA and Acid value	
5	Determination of dehusking quality of paddy	
6	Drying of fruit or vegetable and cost estimation	
7	Determination of rheological properties of food sample	
8	Experiment on detection of adulterant	
9	Detection of Food Borne Bacterial Pathogens	
10	Determination of Sorbic acid in food products	
Keywords: Chemical and physical properties of fat and oil, adulterants, drying of food		

Part C: Learning Resources	
Textbooks, Reference Books, Other Resources	
Suggested Readings	
Rapid Detection of Food Adulterants and Contaminants. Theory and Practice. Book • 2016.	

Authors: Shyam Narayan Jha, Publisher – Elsevier Science, 2016
DART book FSSAI
E-learning Resources
https://www.youtube.com/@MicroChemsExperiments/about
https://www.youtube.com/@FoodsafetyinIndia

Part A: Introduction			
Program: Post graduation	Class: M. Sc. (Food Processing and Technology)	Semester – III	Session: 2023-2024
1	Course Code	FPT-511	
2	Course Title	TECHNIQUES OF FOOD ANALYSIS	
3	Course Type	Theory	
4	Pre-requisite (if any)	Nil	
5	Course learning Outcome (CLO)	At the end of this course, the students will be enable to: Analyse chemical properties of food samples	
6	Credit value	Theory : 4+1	
7	Total Marks	Max. Marks: 100	Min Passing marks: 40

Part B: Content of the Course		
Total hours: 60 periods		
Unit	Topics	No. of hours
I	Introduction to Food Analysis - Types of Samples analyzed, Official methods. Sampling and sample preparation, Preparation of samples	12
II	Moisture and Total Solids analysis, pH and titratable acidity	12
III	Ash analysis: Dry and wet ashing. Acid Insoluble ash Fat Analysis: Solvent extraction.	12
IV	Protein analysis, crude fiber analysis	12
V	Vitamin Analysis: Importance of analysis, vitamin units, methods	12
Keywords: moisture analysis, fat, protein, vitamin		

Part C: Learning Resources	
Textbooks, Reference Books, Other Resources	
Suggested Readings	
<ol style="list-style-type: none"> 1. AOAC International. 2003. <i>Official Methods of Analysis of AOAC International</i>. 17thEd. Gaithersburg, MD, USA, Association of Analytical Communities. 2. Kirk RS & Sawyer R. 1991. <i>Pearson's Chemical Analysis of Foods</i>. 9th Ed. LongmanScientific & Technical. 3. Leo ML. 2004. <i>Handbook of Food Analysis</i>. 2nd Ed. Vols. I-III. 4. Linden G. 1996. <i>Analytical Techniques for Foods and Agricultural Products</i>. VCH. 5. Nielsen S. (Eds.). 1994. <i>Introduction to Chemical Analysis of Foods</i>. Jones & Bartlett. 6. Pomrenz Y & Meloan CE. 1996. <i>Food Analysis - Theory and Practice</i>. 3rd Ed. CBS. 7. Ranganna S. 2001. <i>Handbook of Analysis and Quality Control for Fruit and Vegetable Products</i>. 2nd Ed. Tata-McGraw-Hill. 	
E-learning Resources	
https://www.sciencedirect.com/journal/journal-of-food-composition-and-analysis	

<https://libguides.ntu.edu.sg/food-science-technology/eresources>
<https://guides.library.umass.edu/c.php?g=672433&p=4735860>

Part D: Assessment and Evaluation		
Suggested Continuous Evaluation Methods:		
Maximum Marks: 100		
Continuous Comprehensive Evaluation (CCE): 25 Marks		
University Exam (UE): 75 Marks		
Internal Assessment:		
Continuous Comprehensive Evaluation (CCE)	Class Test/ Assignment/ Presentation	Regular Attendance and Participation in Programs

Part A: Introduction			
Program: Post graduation	Class: M. Sc. (Food Processing and Technology)	Semester – III	Session: 2023-2024
1	Course Code	FPT-512	
2	Course Title	DRYING TECHNOLOGY	
3	Course Type	Theory	
4	Pre-requisite (if any)	Nil	
5	Course learning Outcome (CLO)	At the end of this course, the students will be enable to: Understand concept of water activity and sorption isotherm Understand how to comprehend psychrometric chart and interpret values Understand mechanism of drying in different dryers	
6	Credit value	Theory : 4+1	
7	Total Marks	Max. Marks: 100	Min Passing marks: 40

Part B: Content of the Course		
Total hours: 60 periods		
Unit	Topics	No. of hours
I	Drying/Dehydration: Definition, principles of drying, theory of drying, advantages and disadvantages of drying, importance of drying & dehydration over other methods of drying/ dehydration.	12
II	Concept of water activity, dehydration fundamental, drying curve, Equilibrium moisture content (EMC), Importance of EMC, classification of food solids, sorption isotherms, bound and free moisture, end point of drying process; Rehydration.	12
III	Psychrometric charts: Air moisture relationships - dry bulb temperature, wet bulb temperature, dew point temperature, specific volume and humid volumes. Moisture content determination. Effect of drying on foods- Texture, Flavour & aroma, Colour and Nutritional value.	12
IV	Dryer selection, common drying system- sun/ solar drying, atmospheric hot air drying, cabinet or tray dryer, tunnel dryer, conveyor, belt or band dryer, pneumatic conveyor dryer, rotary spray dryer and Fluidized bed dryer.	12
V	Contact dryers - Drum/Roller dryers, vacuum dryer, freeze dryer	12

and foam drying; Novel drying techniques- microwave drying, radio frequency drying, infrared drying, refractance drying and acoustic drying. Dryer performance.	
Keywords: water activity, psychometric charts, dryers,	

Part C: Learning Resources	
Textbooks, Reference Books, Other Resources	
Suggested Readings	
<ol style="list-style-type: none"> 1. Sahay KM & Singh KK. 1994. <i>Unit Operation of Agricultural Processing</i>. Vikas Publ House. 2. Fellows PJ. 2005. <i>Food Processing Technology: Principle and Practice</i>. 2nd Ed. CRC. 3. Potter NN & Hotchkiss 1997. <i>Food Science</i>. 5th Ed. CBS. 4. Salunkhe DK & Kadam SS. 1995. <i>Handbook of Vegetables Science & Technology: Production, Composition, Storage and Processing</i>. Marcel Dekker. 5. Hosahalli Ramaswamy and Michele Marcotte. 2006. <i>Food Processing: Principles and Applications</i>. CRC Press, Taylor & Francis, Raton. 	
E-learning Resources	
https://www.tandfonline.com/journals/ldrt20	
https://www.arunmujumdar.com/e-books.htm	
https://www.youtube.com/watch?v=x2xGIhdAM4E	

Part D: Assessment and Evaluation		
Suggested Continuous Evaluation Methods:		
Maximum Marks: 100		
Continuous Comprehensive Evaluation (CCE): 25 Marks		
University Exam (UE): 75 Marks		
Internal Assessment:	Class Test	Regular Attendance and Participation in Programs
Continuous Comprehensive Evaluation (CCE)	Assignment/ Presentation	

Part A: Introduction			
Program: Post graduation	Class: M. Sc. (Food Processing and Technology)	Semester – III	Session: 2023-2024
1	Course Code	FPT-513	
2	Course Title	EMERGING TRENDS IN FOOD PROCESSING AND TECHNOLOGY	
3	Course Type	Theory	
4	Pre-requisite (if any)	Nil	
5	Course learning Outcome (CLO)	At the end of this course, the students will be able to: Understand emerging trends in food processing which are gentle for food preservation Understand mechanism of SCF, HPP etc.	
6	Credit value	Theory : 4+1	
7	Total Marks	Max. Marks: 100	Min Passing marks: 40

Part B: Content of the Course		
Total hours: 60 periods		
Unit	Topics	No. of hours
I	Membrane technology: Introduction to pressure activated membrane processes: micro- filtration, UF, NF and RO and their industrial application.	12
II	Supercritical fluid extraction: Concept, property of near critical fluids NCF and extraction methods.	12
III	Microwave and radio frequency processing: Definition, Advantages, mechanism of heat generation, application in food processing: microwave processing, sterilization and finish drying.	12
IV	High Pressure processing: Concept and its application in food processing.	12
V	Ultrasonic processing: Properties of ultrasonic, application of ultrasonic as processing techniques, application of technologies of high intensity light, pulse electric field, ohmic heating, IR heating, inductive heating and pulsed X-rays in food processing and preservation.	12
Keywords: Membrane technology, SCF extraction, microwave processing, HPP		

Part C: Learning Resources	
Textbooks, Reference Books, Other Resources	
Suggested Readings	
1. Barbosa-Canovas 2002. Novel Food Processing Technologies. CRC. 2. Frame N D. (Ed.). 1994. The Technology of Extrusion Cooking. Blackie. 3. Gould G W. 2000. New Methods of Food Preservation. CRC.	
E-learning Resources	
https://libguides.reading.ac.uk/food/e-resources	
https://guides.library.iit.edu/c.php?g=474742&p=3248232	
https://www.youtube.com/watch?v=73n2D6-iMcs	

Part D: Assessment and Evaluation		
Suggested Continuous Evaluation Methods:		
Maximum Marks: 100		
Continuous Comprehensive Evaluation (CCE): 25 Marks		
University Exam (UE): 75 Marks		
Internal Assessment:	Class Test	Regular Attendance and
Continuous Comprehensive Evaluation (CCE)	Assignment/ Presentation	Participation in Programs

Part A: Introduction			
Program: Post graduation	Class: M. Sc. (Food Processing and Technology)	Semester – III	Session: 2023-2024
1	Course Code	FPT-514	
2	Course Title	Advanced Laboratory Course –III	
3	Course Type	Practical	
4	Pre-requisite (if any)	Nil	

5	Course learning Outcome (CLO)	At the end of this course, the students will be enable to: Analyse different techniques used for testing quality characteristics of food samples	
6	Credit value	Practical : 5	
7	Total Marks	Max. Marks: 100	Min Passing marks: 40

Part B: Content of the Course		
Total No. of Periods: 60		
Practical List	Note: This is tentative list; the teacher concern can add more Experiment as per Requirement	
1	Determination of total reducing sugar content of honey sample	
2	Determination of cooking properties of different rice samples	
3	Demonstration on osmotic dehydration of food sample	
4	Demonstration of Methylene Blue reductase Test for milk sample	
5	Evaluation of food grains for their physical characteristics	
6	Experiments on the chemistry of cereals	
7	Analysis of properties of milk	
8	Determination of Vitamin A content in Ghee by HPLC	
9	Understanding requirements specific to food testing laboratories – physical and chemical parameters	
10	Understanding requirements specific to food testing laboratories – biological parameters	
Keywords: sugar, cooking properties, grains, cereal		

Part C: Learning Resources	
Textbooks, Reference Books, Other Resources	
Suggested Readings	
Food Chemistry and Analysis Book	
E-learning Resources	
https://www.youtube.com/@e-pgpathshala3966	
https://www.youtube.com/watch?v=ANQGBLYbt0Y	

Part A: Introduction			
Program: Post graduation	Class: M. Sc. (Food Processing and Technology)	Semester – III	Session: 2023-2024
1	Course Code	FPT-515	
2	Course Title	SYNOPSIS AND SEMINAR	
3	Course Type	Practical	
4	Pre-requisite (if any)	Nil	
5	Course learning Outcome (CLO)	At the end of this course, the students will be enable to: Identify and Visualise problems or gaps in different food commodities with respect to shelf life	
6	Credit value	Practical : 5	
7	Total Marks	Max. Marks: 100	Min Passing marks: 40

Part B: Content of the Course

Total No. of Periods: 60		
Practical List	Note: This is tentative list; the teacher concern can add more Experiment as per Requirement	
	Problem Identification	12
	Literature Review	12
	Presentation	12
	Referencing Management	12
	Synopsis Report	12
Keywords: Experimental planning		

Part C: Learning Resources	
Textbooks, Reference Books, Other Resources	
Suggested Readings	
Advanced Micro-Level Experimental Techniques for Food Drying and Processing Applications by Azharul Karim, Sabrina Fawzia, Mohammad Mahbubur Rahman	
E-learning Resources	
Journals and E-library, Google scholar, Sciencedirect	

Part D: Assessment and Evaluation		
Suggested Continuous Evaluation Methods:		
Maximum Marks: 100		
Continuous Comprehensive Evaluation (CCE): 25 Marks		
University Exam (UE): 75 Marks		
Internal Assessment:	Class Test	Regular Attendance and
Continuous Comprehensive Evaluation (CCE)	Assignment/ Presentation	Participation in Programs

Part A: Introduction			
Program: Post graduation	Class: M. Sc. (Food Processing and Technology)	Semester – IV	Session: 2023-2024
1	Course Code	FPT-51	
2	Course Title	MASTER'S RESEARCH	
3	Course Type	Practical	
4	Pre-requisite (if any)	Nil	
5	Course learning Outcome (CLO)	At the end of this course, the students will be able to: Understand research activities for product development and shelf-life extension of food commodities Understand principles of food processing and preservation	
6	Credit value	Practical : 25	
7	Evaluation	Satisfactory/Unsatisfactory	

Part B: Content of the Course	
Total No. of Periods: 90	
Practical	Note: This is tentative list; the teacher concern can add more Experiment as

List	per Requirement	
	Design and presentation of Research plan	
	Implementation of methodology	
	Data analysis	
	Outcome	
	Community benefit of research work	
Keywords: Research, report, presentation, analysis		

Part C: Learning Resources	
Textbooks, Reference Books, Other Resources	
Suggested Readings	
Food Science and Technology Books	
E-learning Resources	
NPTEL, Swayam, Shodhganga	

Part D: Assessment and Evaluation		
Suggested Continuous Evaluation Methods:		
Maximum Marks: Satisfactory / Unsatisfactory		
Continuous Comprehensive Evaluation (CCE): As per Department research evaluation committee		
University Exam (UE): As per Department research evaluation committee with external expert		
Internal Assessment:	Class Test/ Assignment/ Presentation	Regular Attendance and Participation in Programs
Continuous Comprehensive Evaluation (CCE)		