Integral University, Lucknow

Effective from Session: 2020-21							
Course Code	BE 603	**Title of the Course**	Colloquium	**L**	**T**	**P**	**C**
Year	2	**Semester**	3	**0**	**0**	**4**	**4**
Pre-Requisite	None	**Co-requisite**	None				
Course Objectives	The main objective of this course is to acquaint the student with various techniques used in contemporary research that will be useful in successful completion of their project work in the final year						

Course Outcomes	
CO1	The students will learn about the basic search engine of scientific journal and indexing
CO2	The students will learn about the different statistical tools for optimizing parameters
CO3	The students will learn about the different manuscript formats, referencing and plagiarism check
CO4	The students will learn about the thesis writing and presentation
CO5	The students will learn about the ethics in conducting research

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	Searching for scientific literature	Searching for scientific literature (Science direct, SCOPUS, Google scholar, exposure to different manuscript forms (Review, Short note, Research Article, Communication	8	1
2	Statistical analysis	Design of experiments in research, Basic statistical analysis (ANOVA, RSM, ANN)	8	2
3	Reference handling	Different manuscript formats and referencing styles (Use of Mendeley, Endnotes)	8	3
4	Writing scientific drafts	Publishing manuscripts (plagiarism check, cover letter, suggesting reviewer etc) Thesis writing and presentation.	8	4
5	Lab visits	Exposure of students to research in laboratory, Ethics in conducting research	8	5

Reference Books:

Gupta, S.P., Statistical Methods; S. Chand & Sons, New Delhi

Jerold H. Zar (2009): Bio-statistical Analysis, 4th Edition, Pearson Education

e-Learning Source:

Sciencedirect:https://www.sciencedirect.com

Mendeley:https://www.mendeley.com

PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	1	2	2				3				3	2	2
CO2	3	3	2	3	3			1	3				3	3	3
CO3	1	3			3			1	3			1	3	3	2
CO4	1	2	2	2	3			1	3	1		1	3	1	1
CO5	1	1	2	1	1			2	1		1	1	1	2	1

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	**Sign & Seal of HoD**

Integral University, Lucknow

Effective from Session: 2020-2021							
Course Code	BE651	**Title of the Course**	Cereal and Bakery Technology	**L**	**T**	**P**	**C**
Year	**2**	**Semester**	3	**2**	**1**	**0**	**3**
Pre-Requisite	None	**Co-requisite**	BE				
Course Objectives	This subject is aimed to impart the basic knowledge about the nutritional value and properties of different cereals and legumes. They will also learn about the technologies behind various products						

Course Outcomes	
CO1	Understand basic composition & structure of food grain
CO2	Understand the basics of milling operations
CO3	Learn processing of food grains into value added products.
CO4	Learn to manage by products utilization.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	**Wheat**	General introduction, Chemical composition of cereals and pulses. Wheat: Types and physicochemical characteristics; wheat milling -products and by-products; Flour milling, extraction rate and milling systems (Flow diagrams). Improvers and bleachers used in flour.	8	1
2	**Rice**	Rice: Classification, physicochemical characteristics; cooking quality; rice milling technology; by- products of rice milling and their utilization; Parboiling of paddy. Rice bran oil and its properties.	8	1
3	**Other cereals and legumes**	Wet and dry milling of maize. Pearling and Malting of Barley. Legumes: composition, anti-nutritional factors, processing and storage. Processing of legumes for protein concentrates and isolates. Milling of pulses.	8	2
4	**Bakery technology**	Technology of bread, biscuit. Cake and noodles. Extruded products, popcorn, oat flakes and dosa preparation. Infant foods.	8	3

Reference Books:

1. Chakrabarty MM. 2003. Chemistry and Technology of Oils and Fats. Prentice Hall.
2. Dendy DAV & Dobraszczyk BJ. 2001. Cereal and Cereal Products. Aspen.
3. Hoseney RS. 1994. Principles of Cereal Science and Technology. 2nd Ed. AACC.
4. Kay DE. 1979. Food Legumes. Tropical Products Institute.
5. Kent NL. 1983. Technology of Cereals. 4th Ed. Pergamon Press.
6. Kulp K & Ponte GJ. 2000. Handbook of Cereal Science and Technology. 2nd Ed. Marcel Dekker.
7. Bernrd . Minife. W. Chocolate, Cocoa and Confectionary. Edition 2003; Springer Science & Business Media
8. Mathur. R.B.L. Handbook of cane sugar technology, Edition 1999; CBS Publishers.
9. Faridi Hamed. The Science of Cookie and Cracker Production. Edition 2003; Springer US.

e-Learning Source:

Journal of Cereal Science | ScienceDirect.com by Elsevier

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)														
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	1	2	2	2	2	1	1	1	2	3	3	3
CO2	2	2	2	1	2	2	2	2	1	1	1	2	3	3	3
CO3	2	2	2	1	2	2	2	2	1	1	1	2	3	3	3
CO4	2	2	2	1	2	2	1	1	1	1	1	2	3	3	3

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	**Sign & Seal of HoD**

Integral University, Lucknow

Effective from Session: 2020-21							
Course Code	**BE- 652**	**Title of the Course**	**Technology of animal foods**	**L**	**T**	**P**	**C**
Year	**2**	**Semester**	3	2	1	0	3
Pre-Requisite	None	**Co-requisite**	None				
Course Objectives	Through this course, students will learn the scientific principles involved in the processing of meat, fish, and poultry.						

Course Outcomes	
CO1	Better insight of production and processing of meat in India.
CO2	Explain the biochemical changes occurring during conversion of muscle to meat.
CO3	Explain the preservation and processing of meat and products.
CO4	Apply the appropriate processing and preservation methods for poultry, egg and fish.

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	Introduction	General introduction, Status of livestock resources. Status of production and processing of meat. Meat quality and safety programme. Regulations for safe meat exports. Standard bovine edible offal. Chemical composition and microscopic structure of meat.	8	1
2	Slaughtering Techniques	Methods of slaughtering & meat processing- Pre-slaughter care, Ante mortem inspection of meat animals. Methods of stunning, slaughtering and dressing of meat animals, Post mortem examinations of meat, Rigor mortis, Measurement of Ageing, Packaging of fresh meat and shelf life.	8	2
3	Processing and preservation	Methods of meat tenderization and its measurement, Meat curing- types and factors affecting quality of cured meats. Preparation of smoked meats, pickled meats, sausages and hamburgers. Methods of meat preservation- refrigeration, refrigeration, thermal processing and dehydration. Packaging of processed meat.	8	3
4	White meat	Poultry processing: slaughtering and dressing. Packaging of poultry meat. Egg processing and quality control. Fish processing and handling.	8	4

Reference Books:

1. Lawrie, R. A. 1975. Lawrie's Meat Science. 2nd Edn. Pergamon Press. Oxford UK.
2. G. C. Mead. 2004. Poultry Meat Processing and Quality. CRC Press
3. A K Biswas and P K Mandal. 2014. Textbook of Poultry, Egg and Fish Processing Technology. Studium Press India Pvt Ltd

e-Learning Source:

Meat Science; https://www.journals.elsevier.com/meat-science

Animal Science Journal; http://onlinelibrary.wiley.com/journal/10.1111/(ISSN)1740-0929

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)																	
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO4	PSO5	PSO6	PSO7
CO1	3	1	1	1	1	1	1	1	1	1	1	3	3	3	3			
CO2	3	1	1	1	1	1	1	3	1	1	1	3	3	3	3			
CO3	3	1	1	1	1	1	1	1	1	1	1	3	3	3	3			
CO4	3	1	1	1	1	1	1	1	1	1	1	3	3	3	3			

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	**Sign & Seal of HoD**

Integral University, Lucknow

Effective from Session: 2020-21							
Course Code	BE-653	**Title of the Course**	Powder technologies	**L**	**T**	**P**	**C**
Year	2	**Semester**	3	2	1	0	3
Pre-Requisite	None	**Co-requisite**	None				
Course Objectives	To understand basic principles of food powder processing and its unit operations.						

Course Outcomes	
CO1	The students will learn the basic principles of grinding.
CO2	The students will learn the physical properties of powdered materials.
CO3	The students will learn the powder transportation methods.
CO4	The students will learn the mixing and separation techniques of powders.

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	Size Reduction	Principles of Size Reduction, Energy Requirements: Comminution Laws; Rittinger's Law, Kick's Law, Bond's Law and Work Index. Size Reduction Equipment, Criteria for Selection of Comminution Processes.	8	1
2	Particle Properties	Particle Size and Shape, Particle Density, Particle Size Distribution, Surface area, Moisture, Flow properties, Reconstitution properties.	8	2
3	Production, Handling, and Processing	Storage, Conveying; Belt conveyors, Chain Conveyors, Screw Conveyors, Pneumatic Conveying.	8	3
4	Mixing and Separation	Mixing Mechanisms, Powder Mixers, Introduction to Dry Separation Techniques, Screening, Dedusting Technology.	8	4

Reference Books:

1. Unit Operations of Agricultural Processing- KM Sahay and KK Singh, Vikas Publishing House Pvt. Ltd., New Delhi.
2. Food Process Engineering and Technology 2nd Edition by Zeki Berk. Publisher Elsevier

e-Learning Source:

Journal of Food Engineering | ScienceDirect.com by Elsevier

Food Engineering Reviews | Home (springer.com)

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)																	
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO4	PSO5	PSO6	PSO7
CO1	3	2	1	1	1	2	1	1	1	1	1	3	3	2	3			
CO2	3	2	1	1	1	2	1	1	1	1	1	3	3	2	3			
CO3	3	2	1	1	1	2	1	1	1	1	1	3	3	2	3			
CO4	3	2	1	1	1	2	1	1	1	1	1	3	3	2	3			

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	**Sign & Seal of HoD**

Integral University, Lucknow

Effective from Session: 2020-21							
Course Code	BE-654	**Title of the Course**	FOOD EXTRUSION TECHNOLOGIES	**L**	**T**	**P**	**C**
Year	2	**Semester**	3	**2**	**1**	**0**	**3**
Pre-Requisite	None	**Co-requisite**	None				
Course Objectives	To acquaint with design aspects of food extruders and with influence of process and feed characteristics on product quality and application of extrusion technology in human foods and animal feeds						

Course Outcomes	
CO1	Compare the design principles of single and twin-screw extruders
CO2	Apply learned principles of raw materials, extruder design, and process control to product development and process operations
CO3	To understand the parameters and variables affecting extruder performance and product properties
CO4	Learn about various structural and nutritional changes in foods caused by extrusion

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	**Introduction**	Definition of extrusion, principle of extrusion, functions and advantages of extruders. Components of an extruder. Classification of extruders: single screw, twin screw, cold extruder, extruder cooker, pressure classification.	8	1
2	**Basics of extruder design**	Rheology of feeds, modeling of feed flow in extruder, isothermal Newtonian flow, corrected flow equation, leakage flow, isothermal non-Newtonian, modeling of input power. Design of die: die characteristics, end effects.	8	2
3	**Composition and physical requirements of extruder feeds**	Preconditioning of extruder feeds: benefits, types of preconditioners (atmospheric and pressurized, single/double shaft, DDDS. Effects of extruder parameters and feed composition on characteristics of extruded products: gelatinization of starch feeds, denaturation of protein feeds.	8	3
4	**Changes caused by extrusion**	Structural changes-expansion, texturization, etc and nutritional changes in carbohydrates, proteins, lipids, vitamins, minerals, anti-nutritional factors. Application of extrusion technology in foods and animal feeds	8	4

Reference Books:

1. Robin Guy (2000), Extrusion cooking Technologies and applications, Woodhead Publishing Limited
2. Jean-Marie Bouvier & Osvaldo H. Campanella (2014), Extrusion Processing Technology, Wiley Blackwell.
3. Leszek Moscicki (2011), Extrusion-Cooking Techniques, Wiley-VCH
4. Mian N. Riyaz (2000), Extruders in Food Applications CRC Press, Taylor and Francis Group.

e-Learning Source:

1. https://onlinecourses.nptel.ac.in/noc22_ag03/preview
2. http://ecoursesonline.iasri.res.in/course/view.php?id=468
3. https://www.youtube.com/watch?v=yyc-78YKjfU
4. https://ifst.onlinelibrary.wiley.com/doi/10.1111/j.1365-2621.2006.01309.x

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)																	
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	2	1	2	1	1	1	1	1	1	1	1	1	3	3	3			
CO2	2	2	1	1	1	1	1	1	1	1	1	1	2	2	3			
CO3	1	1	1	1	1	1	1	1	1	1	1	1	3	3	3			
CO4	1	1	1	1	1	1	1	1	1	1	1	1	2	2	3			

2- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	**Sign & Seal of HoD**

Integral University, Lucknow

Effective from Session: 2021							
Course Code	BE- 655	**Title of the Course**	ADVANCES IN FOOD ANALYSIS	**L**	**T**	**P**	**C**
Year	**2**	**Semester**	3	2	1	0	3
Pre-Requisite	None	**Co-requisite**	None				
Course Objectives	**This subject aims to give students an understanding of laboratory testing which is important for the scientific analysis to identify problems with food products, to compliance with regulations, research and development of new products**						

Course Outcomes	
CO1	To understand principles and types of chromatographic techniques
CO2	To learn the concepts of gas chromatographic techniques
CO3	To understand principles, types, and applications of spectroscopic techniques
CO4	To learn the principles and applications of high-end texture analyzer instruments used to study textural properties of food products

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	**Chromatographic Techniques**	Classification of chromatographic techniques, adsorption and partition, theory of chromatographic separation, distribution coefficient, retention, adsorption, efficiency and resolution, Types of chromatographic techniques: paper, TLC and HPTLC. Types of chromatographic techniques: HPLC, columns, pumps, and detectors.	8	CO1
2	**Gas Chromatography**	Instrumentation, types of columns, retention time, volume, capacity ratio, partition coefficient, theoretical plate & number, separation efficiency, resolution and applications.	8	CO2
3	**Spectroscopy**	General aspects of spectroscopy, applications of molecular symmetry in spectroscopy. Fundamentals and applications of the following methods: Electronic absorption and emission spectroscopy of atoms and molecules,circular dichroism spectroscopy, IR spectroscopy, light scattering and Raman spectroscopy, NMR spectroscopy, EPR spectroscopy, X-ray spectroscopy, Mössbauer spectroscopy, spectroscopy on surfaces.	8	CO3
4	**Textural and Rheometry Techniques**	Textural analysis-Instrumentation, calibration of texture analyzer, measurement of textural property, types of probes, load cells, TPA, presentation of texture analysis graphs, suitability of food material for textural analysis, factors affecting the texture analysis Rheometry-Instrumentation, calibration of rheometer. Viscometry-instrumentation and principle.	8	CO4

Reference Books:

1. Pavia, D.L., Lampman, G.M., Kriz, G.S. and Vyvyan, J.A., 2014. *Introduction to spectroscopy*. Cengage learning.

2. Snyder, L.R., Kirkland, J.J. and Dolan, J.W., 2011. *Introduction to modern liquid chromatography*. John Wiley & Sons.

3. Wilson, K., Hofmann, A., Walker, J.M. and Clokie, S. eds., 2018. *Wilson and Walker's principles and techniques of biochemistry and molecular biology*. Cambridge University Press.

e-Learning Source:

https://www.youtube.com/watch?v=gaBXQW9rCDA , https://www.youtube.com/watch?v=Q9ImV7sqQi0

https://www.youtube.com/watch?v=7jOSbtR8mTs&list=PLzPro5owUhRSV-ezegDDfuNpuJ2uU6jZ0

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)																	
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	2	2	2	2	3	1	1	1	1	1	1	2	2	3	1			
CO2	2	2	2	2	3	1	1	1	1	1	1	2	2	3	1			
CO3	2	2	2	2	3	1	1	1	1	1	1	2	2	3	2			
CO4	3	2	2	2	3	1	1	1	1	1	1	2	2	3	2			

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	**Sign & Seal of HoD**

Integral University, Lucknow

Effective from Session: 2020-2021							
Course Code	BE656	**Title of the Course**	Environmental Engineering and Biowaste Management	**L**	**T**	**P**	**C**
Year	**2**	**Semester**	3	**2**	**1**	**0**	**3**
Pre-Requisite	None	**Co-requisite**	None				
Course Objectives							

Course Outcomes	
CO1	Understand the fundamentals principles of environmental engineering and the problems associated with the environment and ecosystem
CO2	Understand the concepts of micrometeorology and biotechnology and their role in waste management and safet
CO3	Understand the role of pollution collectors, their design and efficiencies
CO4	Understand methods to recover materials, conserve products, and to generate energy from solid and hazardous wastes.

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	**Introduction**	Source of air, water and solid wastes, Ecosystem, Ecosystem Management, Renewable resources, Role of biotechnology in environmental protection, Control and management of biological processes	8	1
2	**Micrometeorology**	Micrometeorology and dispersion of pollutants in environment. Fate of pollutants. Bioreactors; Rural biotechnology; Biocompositing, Biofertilizers; Vermiculture; Organic farming; Biomineralization; Biofuels; Bioethanol and Biohydrogen; Energy management and safety.	8	2
3	**Pollution collectors**	Centrifugal collectors, electrostatics precipitator, bag filter and wet scrubbers. Design and efficiencies. Combustion generated pollution, vehicle emission control. Case studies.	8	3
4	**Characterization of wastes**	Water quality modeling for streams, Characterization of effluents, effluent standards, Measurement of Pollution, Pollution control, remediation and management, Waste water collection; control and management; waste water treatment, sewage treatment through chemical, microbial and biotech techniques, Treatment of waste water from dairy, tannery, sugar and antibiotic industries. Treatment and disposal. Waste recovery system	8	4

Reference Books:

1. L.Canter "Environment Impact Assessment", McGraw Hill.
2. E.P.Odum "Fundamentals of Ecology "V.B.Saunders and Co. 1974.
3. W.J.Weber "Physics-Chemical Process for water quality control, Wiley international Ed.
4. L.L.Gaccio water and water population Handbook Marcel Dekkar, New York

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)														
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	1	2	1	2	1	1	1	1	2	3	3	3
CO2	3	2	2	1	2	1	2	1	1	1	1	2	3	3	3
CO3	3	2	2	1	2	1	2	1	1	1	1	2	3	3	3
CO4	3	2	2	1	2	1	2	1	1	1	1	2	3	3	3

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	**Sign & Seal of HoD**

Integral University, Lucknow

Effective from Session: 2021-22							
Course Code	657	**Title of the Course**	**ADVANCED FOOD PACKAGING**	**L**	**T**	**P**	**C**
Year	2	**Semester**	3	**2**	**1**	**O**	**3**
Pre-Requisite	None	**Co-requisite**	None				
Course Objectives	To acquaint the students with detailed knowledge of modern technology involved in foodpackaging and their applications.						

Course Outcomes	
CO1	Comprehend advanced knowledge of the properties and production of variouspackaging materials.
CO2	Acquire knowledge of the various physical properties of packages, theirsignificance, and the prediction of shelf life.
CO3	To understand the principle and applications of advanced food packaging techniques like active and intelligent packaging, vacuum packaging, ascetic packaging, etc.
CO4	Learn about consumer response to new packaging systems and safety and legislative requirements for various packaging materials.
CO5	Comprehend advanced knowledge of the properties and production of variouspackaging materials.

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	Introduction to conventional food packaging	Food packaging: Definition, Functions of food packaging. Types of packaging materials: Glass, polymers, paper and paper based packaging material, metal packaging.	8	CO1
2	Smart packaging	Introduction, Oxygen scavenging technology, selecting right types of oxygen scavenger, Ethylene scavenging technology, Carbon dioxide and other scavengers, Antimicrobial food packaging.	8	CO2
3	Non-migratory bioactive polymers and Time-temperature indicators(TTIs)	Introduction to Non-migratory bioactive polymers, Classification of Non-Migratory Bioactive Polymers, Applications of polymers with immobilized bioactive compounds. Defining and classifying TTIs (Time-Temperature Indicators), Requirements for TTIs, Current TTI systems	8	CO3
4	Packaging-flavor interactions, Green Plastics, and MAP	Introduction to packaging-flavour interactions: Factors affecting flavour absorption. Green plastics for food packaging, Edible coatings and their application on whole and fresh cut crops. Developments in modified atmosphere packaging (MAP): Introduction, Novel MAP gases.	8	CO4

Reference Books:

1. Robertson, G.L. Food Packaging: Principles and Practice, CRC Press, 2006

2. Pramode, K. Omre, Suman Singh, Kirtiraj K. Gaikwad, Sandhya Madan Mohan. Food Packaging systems, Biotech Books, New Delhi. ISBN978-81-7622-365-2

3.R. Ahvenainen, Novel Food Packaging Techniques, Woodhead Publishing, 2003

4.G. L. Robertson, Food Packaging: Principles and Practices, 2nd ed, CRC, 2005

e-Learning Source:

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)																	
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	3	3	3	2	3	3	3			3	3	3	3			
CO2	3	3	3	3	3	3	3	3	3			3	3	3	3			
CO3	3	3	3	3	3	3	3	3	3			3	3	3	3			
CO4	3	3	3	3	3	3	3	3	3			3	3	3	3			

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	**Sign & Seal of HoD**

Integral University, Lucknow

Effective from Session: 2020-21							
Course Code	BE-658	**Title of the Course**	Technology Of Plantation Crops And Introduction To Nutraceuticals	**L**	**T**	**P**	**C**
Year	**2**	**Semester**	3	**2**	**1**	**0**	**3**
Pre-Requisite	None	**Co-requisite**	None				
Course Objectives	To learn about processing of various spices, tea, coffee, cocoa and spice processing. To impart knowledge about the basic concepts of nutraceuticals.						

Course Outcomes	
CO1	Understand the technological objectives of Tea, cocoa, coffee and chocolateprocessing and the equipment's used in their processing.
CO2	Understand the concept of spice processing, spice essential oils and spice oleoresins with respect to method of extraction, isolation, and encapsulation.
CO3	Understand the concept of nutraceutical science, its relation with otherSciences and its application if food science.
CO4	Understand various physiological and biochemical aspects of life threateningand chronic diseases and nutraceutical as their remedies.

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	Production and Processing of Tea Leaves and Coffee	Black tea, Green tea and Oolong tea. Chemistry of tea manufacturing and tea quality; tea grades; storing of tea. Production and processing of coffee cherries by wet and dry methods to obtain coffee beans, grinding, storage and preparation of brew. Processing of cocoa beans to cocoa butter. Manufacturing process for chocolate: Ingredients, Mixing, Refining, Conching, Tempering, Moulding etc	8	CO1
2	Spices	Types, production, pre-harvest and post-harvest problems in processing, properties, drying, storage and packaging, health benefits; flavouring components. Spice powder and paste: their processing, quality, storage; spice based food additives; volatiles, essential oils and oleoresins: their characteristics, extraction procedure and utilization	8	CO2
3	Nutraceuticals I	Historical perspective, classification, scope & future prospects. Applied aspects of the Nutraceutical Science. Sources of Nutraceuticals. Relation of Nutraceutical Science with food technology. Common nutraceutical components in the food	8	CO3
4	Nutraceuticals II	Nutraceuticals bridging the gap between food and drug, Nutraceuticals in treatment for cognitive decline, Nutraceutical remedies for common disorders like Arthritis, Bronchitis, circulatory problems, hypoglycaemia among others.	8	CO4

Reference Books:

1. Tea Production and Processing. B. Banerjee, Oxford & IBH Pub. Co., 1st Edition,1993.
2. Coffee Technology. M. Sivetz, AVI publishing Co., 1st Edition, 1979.
3. Minor Spices and Condiments: Crop Management and Post Harvest Technology. J.S.Purthi, ICAR publication, 1st Edition, 2001.
4. Major Spices of India: Crop Management and Post Harvest Technology. J.S.Purthi, ICAR publication, 1st Edition, 2003
5. Tree Nuts: Production, Processing, Products. J. G. Woodroof, AVI Pub. Co., 1st Edition, 1979.

e-Learning Source:

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)																	
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	2	2	1	2	1	2	1	1	1	1	2	3	3	3			
CO2	3	2	2	1	2	1	2	1	1	1	1	2	3	3	3			
CO3	3	2	3	1	2	1	3	1	1	1	2	2	3	3	3			
CO4	3	2	2	2	2	1	3	1	1	1	2	2	3	3	3			

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	**Sign & Seal of HoD**

Integral University, Lucknow

Effective from Session: 2020-21							
Course Code	**BE-699**	**Title of the Course**	M. TECH. Dissertation	**L**	**T**	**P**	**C**
Year	**2**	**Semester**	3	0	0	8	4
Pre-Requisite	None	**Co-requisite**	None				
Course Objectives	To acquaint the student with the basic experiments required for research in food technology that will be useful in successful completion of their project work in the fourth semester						

Course Outcomes	
CO1	The students will learn the calibration and validation
CO2	The students will learn the different preservation techniques
CO3	The students will learn the new product development
CO4	The students will learn the nano particle synthesis

Unit No.	**Title of the Experiment**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	Detection, validation and calibration	Detection / Estimation of a food constituent. Validation of methods present in the lab. Calibration of instruments present in the lab.	8	1
2	Preservation	Development of various techniques to increase shelf life of foods. Development and application of edible films.	8	2
3	New product	New product development. Food designing. Waste utilization of food by-products.	8	3
4	Nano	Development of nano food constituents.	8	4

Reference Books:

Post Harvest- Wills, Mc Glasson, Graham, Lee and Hall,CBS Publishers and Distributors,New Delhi.

Gopalan, R., Subramanian, P. S. and Rangarajan, K. (2008). *Elements of Analytical Chemistry*: Sultan Chand & Sons

Sharma, B. K. (1994). *Instrumental Methods of Chemical Analysis*: Krishna, Meerut.

Pomeranz, Y. and Meloan, C. E. (1996). *Food Analysis: Theory and Practice* (3 ed.): CBS Publications, New Delhi.

e-Learning Source:

ACS Nano: https://pubs.acs.org/journal/ancac3b

https://www.ingentaconnect.com/content/intellect/ijfd#Fast

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)																	
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO4	PSO5	PSO6	PSO7
CO1	3	1	1	1	1	1	1	1	1	1	1	3	3	3	3			
CO2	3	3	1	1	1	1	1	1	1	1	1	3	3	3	3			
CO3	3	3	1	3	1	1	1	1	1	1	1	3	3	3	3			
CO4	3	3	1	1	1	1	1	1	1	1	1	3	3	3	3			
CO5																		

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	**Sign & Seal of HoD**

Integral University, Lucknow

Effective from Session: 2021-2022							
Course Code	**BE699**	**Title of the Course**	**M.Tech Project**	**L**	**T**	**P**	**C**
Year	2nd	**Semester**	4th	**0**	**0**	**0**	**16**
Pre-Requisite	None	**Co-requisite**	None				
Course Objectives	To develop individuality and problem analysis skill. To nurture ability to perform literature review. To improve critical thinking ability for formulation of plan. To develop skill to use various engineering and technological tools. To develop skill to think critically on research results. To enhance the writing skill for research paper and dissertation.						

Course Outcomes	
CO1	Capability to work independently on a research-based problem.
CO2	Skill to perform review of available literature effectively to present research gap.
CO3	Aptitude to plan methodology for the attainment of various research objectives.
CO4	Competency to apply of various engineering and technological tools to carry research.
CO5	Ability to conclude work using critical thinking.
CO6	Proficiency in preparing presentation and report.

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)														
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	1	3	3	1	1	3	3	3	1	3	3	3	3
CO2	1	1	1	3	3	1	1	3	3	3	1	3	3	1	3
CO3	1	1	1	2	3	1	1	1	3	3	1	3	1	2	2
CO4	1	1	1	3	3	1	1	1	3	1	1	3	3	3	3
CO5	1	1	1	3	3	1	1	3	3	3	1	3	3	1	3
CO6	1	1	1	2	3	1	1	3	3	3	1	3	1	2	2

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	**Sign & Seal of HoD**