Assessment and Grading:

Assessment in this course will be multifaceted and may include the following components:

Examinations: Regular quizzes, mid-term exams, and a comprehensive final exam will assess your understanding of course materials.

Assignments: Homework assignments, research papers, or case studies will be assigned to reinforce theoretical knowledge and analytical skills.

Class Participation: Active engagement in class discussions, presentations, and group activities will be considered in the evaluation.

Grading Criteria (Note: These percentages are subject to adjustment based on the course structure):

Examinations: 80%

Class Participation: 5%

Assignments: 10%

Attendance: 5%

Feedback and Assessment Criteria:

- Constructive feedback will be provided on assignments and exams to help you understand your performance and areas for improvement.

- Clear assessment criteria, rubrics, and expectations will be provided at the beginning of the course to guide your work.

- Please feel free to seek clarification on grading and assessment-related questions throughout the course.

- Students with special needs may contact the concerned teacher beforehand.

FT23201CR

Semester II

Food Analysis and Quality Assurance (4+0+0)

Course description

The "Food Analysis and Quality Assurance" course at the master's level is designed to provide an in-depth understanding of the principles and techniques used in food analysis and quality control. This comprehensive course covers various analytical methods and quality assessment approaches employed in the food industry to ensure the safety, quality, and compliance of food products with national and international standards. Students will gain practical insights into instrumental analysis, sensory evaluation, and quality management systems.

Unit I

➢ Principle and interferences of Flame photometry.

➢ Atomic absorption spectroscopy – Principle, working, instrumentation and applications. ICP.

➢ X-ray analysis of foods– Properties, production & detection, x- ray tubes, detectors sources, application in food industry.

➢ Mass spectroscopy– Instrumentation and interpretation.

Learning outcomes:

By the end of this course, students should be able to:

• Understand the principles and potential interferences of Flame photometry.

• Explain the principles, working, instrumentation, and applications of Atomic absorption spectroscopy.

• Discuss the role of X-ray analysis in food quality assessment, including properties, production, detection, sources, and applications.

• Describe the instrumentation and interpretation of Mass spectroscopy.

Unit II

➢ Chromatography– Principles of different chromatographic separations. Instrumentation and working of HPLC &GC.

➢ Nuclear magnetic resonance (NMR) – Principle, Components, Interpretation of NMR spectra, application of NMR.

➢ Immunoassays and Nucleic acid-based techniques: ELISA & PCR.

➢ Tri stimulus color system & hunter color lab CDM

Learning outcomes:

By the end of this course, students should be able to:

- Differentiate between various chromatographic separations and understand the principles behind them.

- Examine the instrumentation and operation of High-Performance Liquid Chromatography (HPLC) and Gas Chromatography (GC).

- Interpret Nuclear Magnetic Resonance (NMR) spectra and assess their applications in food analysis.

- Explore Immunoassays and Nucleic acid-based techniques, including Enzyme-Linked Immunosorbent Assay (ELISA) and Polymerase Chain Reaction (PCR).

- Understand the Tri-stimulus color system and its application in food color assessment using the Hunter color lab CDM.

Unit III

➢ Objectives, importance and functions of quality control.

➢ Methods of quality assessment-Subjective & objective methods.

➢ Statistical quality control-X & R charts, steps for developing control charts.

➢ National & international Food laws– Food Safety and Standards Act 2006, Codex Alimentarius Commission, grades and standards. Labeling of foods.

Learning outcomes:

By the end of this course, students should be able to:

- Recognize the objectives, importance, and functions of quality control in the food industry.

- Differentiate between subjective and objective methods of quality assessment.

- Apply Statistical Quality Control techniques, such as X & R charts, and understand the steps for developing control charts.

- Discuss national and international food laws, including the Food Safety and Standards Act 2006 and Codex Alimentarius Commission, and their impact on food quality and labeling.

Unit IV

➢ General hygiene and sanitation in food industry– GMP, HACCP, QMS

- ➢ Sensory evaluation and panel screening
- ➢ Sensory evaluation methods/training– Difference tests (Paired comparison, Duo Trio, Triangle), Rating (ranking, single sample, two-sample, multiple samples, hedonic), sensitivity threshold test.
- ➢ **Quality evaluation of foods** – Fruits, vegetables, cereals, dairy products, meat, poultry, egg and processed food products.

Learning outcomes:

By the end of this course, students should be able to:

- Demonstrate knowledge of general hygiene and sanitation practices in the food industry, including Good Manufacturing Practices (GMP), Hazard Analysis and Critical Control Points (HACCP), and Quality Management Systems (QMS).

- Conduct sensory evaluation and panel screening to assess the sensory attributes of food products.

- Apply various sensory evaluation methods, including difference tests (Paired comparison, Duo Trio, Triangle), rating (ranking, single sample, two-sample, multiple samples, hedonic), and sensitivity threshold tests.

- Evaluate the quality of different food categories, such as fruits, vegetables, cereals, dairy products, meat, poultry, eggs, and processed food products.

References:

1. Principles of Sensory Evaluation of Foods by M.A. Amerine, R. M. Rangborn and E.B. Roessler 2013, Elsevier.
2. Quality Control in Food Industry 1st Edition - January 1, 1968, Hershoerfer
3. Fundamentals of Quality Control for the Food Industry by Amihud Kramer, Bernard A. Twigg,1962
4. Food Quality Evaluation by Eram S. Rao,Variety Book Publishers' Distributors, 2013
5. Pomeranz, Y. and Meloan, C.E. (2000) Food Analysis: Theory and Practice. 3rd Edition, AN Aspen Publication, Silver Spring.
6. Nielsen, S. Suzanne, ed. Food analysis laboratory manual. New York, NY, USA:: Kluwer Academic/Plenum Publishers, 2003.

7. Paré, J. R. J., and J. M. R. Bélanger, eds. *Instrumental methods in food analysis*. Elsevier, 1997.

FT23202CR

Fruit and vegetable Technology (4+0+0)

Course Description:

The "Fruit and Vegetable Technology" course at the master's level explores the science and technology behind the postharvest handling, processing, and preservation of fruits and vegetables. This comprehensive course delves into the key aspects of fruit and vegetable quality, including maturity, ripening, and nutritional assessment, and covers various methods for extending the shelf life of horticultural produce. Students will gain knowledge of cold chain management, storage techniques, processing methods, and preservation approaches essential for the fruit and vegetable industry.

UNIT-I

➤ Fruit maturity and ripening indices. Postharvest changes in fruits and vegetables.
➤ Post-harvest losses in fruit and vegetable
➤ Non-destructive techniques for assessing the nutritional quality of Fruits and Vegetables.
➤ Ethylene biosynthesis, mode of action, ethylene management.
➤ Handling of fresh fruits and vegetables.

Learning Outcomes:

By the end of this course, students should be able to:

• Understand the concepts of fruit maturity and ripening indices and postharvest changes in fruits and vegetables.

• Analyze the factors contributing to postharvest losses in fruit and vegetable handling.

• Evaluate non-destructive techniques for assessing the nutritional quality of fruits and vegetables.

• Explain the biosynthesis of ethylene, its mode of action, and ethylene management in postharvest fruit and vegetable storage.

• Demonstrate proper handling practices for fresh fruits and vegetables.

UNIT-II

➤ Cold chain management.
➤ Storage: Definition & functions. Types of storage: low cost and high-cost storage systems

- ➢ Controlled atmospheric storage: structural design of storage room and gas control systems.
- ➢ Monitoring Volatiles during storage of fruits and vegetables.
- ➢ Physiology and biochemistry of fresh cut fruits.
- ➢ Coating of fresh horticulture produce

Learning outcomes:

By the end of this course, students should be able to:

- Implement cold chain management practices to maintain fruit and vegetable quality.
- Define storage and its functions, distinguishing between low-cost and high-cost storage systems.
- Design controlled atmospheric storage rooms and manage gas control systems.
- Monitor volatile compounds during the storage of fruits and vegetables.
- Examine the physiology and biochemistry of fresh-cut fruits and explore the concept of coating fresh horticultural produce.

UNIT-III

- ➢ Principles and methods of preservation of fruits and vegetables.
- ➢ Preparation and preservation of Jam, Jellies, Marmalades. Theories of gel formation.
- ➢ Fruit & vegetable alcoholic and non-alcoholic beverages: Preparation & preservation of juice, cordial, Squash, crush, nectar, RTS.
- ➢ Canning: Principle and Process.

Learning outcomes:

By the end of this course, students should be able to:

- Apply the principles and methods of preservation to fruits and vegetables.
- Prepare and preserve various products such as jams, jellies, marmalades, and understand the theories of gel formation.
- Produce fruit and vegetable-based alcoholic and non-alcoholic beverages, including juice, cordials, squash, crush, nectar, and ready-to-serve (RTS) beverages.
- Describe the principles and processes involved in canning fruits and vegetables.

UNIT-IV

- ➢ Preserve, candied and crystallized fruits and vegetables.
- ➢ Tomato Processing- Juice, ketchup, puree, paste.

➢ Browning reactions and discoloration during processing.

➢ Enzymes used in fruit and vegetable industry.

Learning outcomes:

By the end of this course, students should be able to:

- Create preserved, candied, and crystallized fruits and vegetables.

- Process tomatoes into juice, ketchup, puree, and paste.

- Analyze browning reactions and discoloration phenomena during processing.

- Examine the enzymes used in the fruit and vegetable processing industry and their applications.

Reference:

1. Postharvest Technology of Fruits and Vegetables, Harvesting, Handling and Storage, 2nd Edition by A.K. Thompson,2003

2. Postharvest Technology of Fruits & Vegetables by Verma & Joshi 2000. Indus publications, New Delhi

3. Yahia, Elhadi M., and Armando Carrillo-Lopez, eds. Postharvest physiology and biochemistry of fruits and vegetables. Woodhead publishing, 2018.

4. An introduction to Postharvest Technology by RBH Wills. 2003

5. Preservation of fruits & Vegetables by Siddappa etal 1999. ICAR, New Delhi

6. Preservation of Fruits& Vegetables by Srivastava & Kumar, 1996. Intl. Book publishing Co. Lucknow

7. Handbook of Vegetables and Vegetable Processing by Y. H. Hui 2011. Wiley Blackwell

8. Handbook of Fruits and Fruit Processing by Y. H. Hui 2006. Wiley Blackwell

FT23203CR

Technology of Meat, Fish & Poultry (4+0+0)

Course Description:

The "Technology of Meat, Fish & Poultry" course at the master's level provides a comprehensive understanding of the meat, fish, and poultry industry, with a special focus on the context of Jammu and Kashmir (J&K). This course explores the sources, composition, and nutritive value of meat, covering topics such as ante-mortem handling, slaughterhouse operations, and meat inspection. Additionally, it delves into the structure and functions of muscle, postmortem changes, and factors affecting meat quality. The course also covers poultry and egg processing, as well as fish composition, preservation, and processing techniques. Students will gain insights into traditional meat products and modern preservation methods.

UNIT-I

- ➢ Scope of meat industry with special reference to J&K
- ➢ Sources, composition and nutritive value of meat.
- ➢ Ante-mortem handling and inspection of meat animals.
- ➢ Slaughtering and processing equipment: Plant location and facilities; stunning methods; sticking/bleeding; dressing methods; offal inspection and processing.
- ➢ Structure and functions of muscle: Microstructure, contraction and relaxation mechanism, muscle metabolism.

Learning Outcomes:

By the end of this course, students should be able to:

- • Understand the scope of the meat industry, particularly in the context of J&K.
- • Analyze the sources, composition, and nutritive value of meat.
- • Demonstrate knowledge of ante-mortem handling and inspection of meat animals.
- • Explain the processes and equipment used in slaughtering and meat processing, including stunning, sticking/bleeding, dressing, and offal inspection.
- • Comprehend the microstructure, contraction, relaxation mechanism, and metabolism of muscle tissue.

UNIT-II

- Postmortem changes in muscle: Biochemical alterations, physical alterations-rigor mortis; shortening; unusual patterns of postmortem metabolism. Factors affecting post mortem changes in meat.
- Eating quality of meat: Colour, WHC, flavour, tenderness and texture. Meat quality evaluation.
- Meat tenderization and aging.
- Mechanical deboning
- Principles of various preservation techniques: Refrigeration, freezing, curing, smoking, canning, dehydration and irradiation of meat.
- Traditional meat products

Learning Outcomes:

By the end of this course, students should be able to:
- Analyze the postmortem changes in muscle, including biochemical and physical alterations such as rigor mortis and shortening.
- Evaluate factors influencing postmortem changes in meat.
- Assess meat quality, including color, water-holding capacity (WHC), flavor, tenderness, and texture.
- Understand meat tenderization and aging processes.
- Examine the concept of mechanical deboning.
- Discuss the principles of various meat preservation techniques, including refrigeration, freezing, curing, smoking, canning, dehydration, and irradiation.
- Explore traditional meat products.

UNIT-III
- Poultry slaughtering, carcass evaluation and cutting.
- By product utilization of poultry.
- Structure composition, nutritive value and functional properties of egg.
- Factors affecting egg quality
- Methods of preservation.

Learning Outcomes:

By the end of this course, students should be able to:

- Describe poultry slaughtering processes, carcass evaluation, and cutting techniques.
- Examine the byproduct utilization of poultry.
- Analyze the composition, structure, nutritive value, and functional properties of eggs.
- Identify factors that affect egg quality.
- Discuss methods of egg preservation.

UNIT-IV

- Composition and structure of fish.
- Post mortem changes in fish
- Preservation of fish by freezing, glazing, canning, smoking, freezing, irradiation and dehydration.
- Surmi- Chemistry, preparation and microbiology.
- Technology of production of fish products- fish sausage, fish meal and fish oil.

Learning Outcomes:

By the end of this course, students should be able to:

- Understand the composition and structure of fish.
- Analyze postmortem changes in fish.
- Explore various preservation methods for fish, including freezing, glazing, canning, smoking, freezing, irradiation, and dehydration.
- Examine surimi chemistry, preparation, and microbiology.
- Discuss the technology of producing fish products such as fish sausage, fish meal, and fish oil.

References:

1. Lawre. R. A. & Ledward, D. A. (2006). Lawres Meat Science 7th Ed. Woodhead Publishing Company, Cambridge, England.
2. Thornton's meat hygiene by J. F. Gracey. Bailliere Tindall, 7th edn,1982
3. Aberle, Elton D.., Forrest, John C.., Gerrard, David E.., Mills, Edward W.. Principles of Meat Science. United States: Kendall Hunt Publishing Company, 2020.

4. Lawrie, R. A.. Meat Science. United Kingdom: Elsevier Science, 2013..

5. Pearson, A.M.., Gillett, T.A.. Processed Meats. Netherlands: Springer, 1996..

6. Hall, G. M.. Fish Processing Technology. United Kingdom: Springer US, 2012.

7. Fish Processing Technology by GopalkumarK,New Delhi Indian Council of Agricultural Research 2006.

FT23204CR

Skill development in Fruits and Vegetables (Practical) (0+0+2)

Course Description:

This practical course is designed to provide hands-on experience and develop skills in various aspects of handling, processing, and preserving fruits and vegetables. Students will gain knowledge in quality evaluation, canning, dehydration, preparation and preservation of various fruit and vegetable products, and analysis techniques. Through a combination of practical exercises and laboratory work, students will acquire the skills necessary for the efficient handling and processing of fruits and vegetables.

1. Quality evaluation of fruits and vegetables (color, TSS, acidity, texture etc)
2. Canning of fruits & vegetables.
3. Testing of can, cut out analysis.
4. Preparation and analysis of syrups and Brines.
5. Experimental dehydration of fruits and vegetables (Dehydration and rehydration ratio) using solar drier, vacuum assisted microwave drier, cabinet drier.
6. Preparation and preservation of juices.
7. Preparation and preservation of squashes and RTS.
8. Preparation and preservation of Jam, Jellies and marmalades.
9. Preparation and preservation of pickle and vinegar.
10. Preparation of tomato ketchup and sauce.

Learning outcomes:

Upon completion of the unit the student should be able to:

- Evaluate the quality of fruits and vegetables based on attributes such as color, Total Soluble Solids (TSS), acidity, and texture.
- Demonstrate the complete canning process for fruits and vegetables, including preparation, sealing, and sterilization.
- Conduct tests on canned products, including can inspection and cut-out analysis, to ensure quality and safety.
- Prepare and analyze syrups and brines for fruit and vegetable preservation.

- Perform experimental dehydration of fruits and vegetables, calculating dehydration and rehydration ratios using various drying methods such as solar drying, vacuum-assisted microwave drying, and cabinet drying.

- Create and preserve juices, squashes, and Ready-to-Serve (RTS) beverages.

- Develop and preserve a variety of products, including jams, jellies, marmalades, pickles, vinegar, and tomato ketchup and sauce, following recommended preservation techniques and safety measures.

References:

1. Ranganna, S.. Hand Book of Analysis And Quality Control For Fruit And Vegetable Products. India: Tata McGraw-Hill Publishing Company Limited, 2005.

2. Preservation of fruits & Vegetables by Siddappa etal 1999. ICAR, New Delhi.

3. Manual of AOAC, 1990.

FT23205DCE

Skill development in Meat technology (Practical) (0+0+2)

Course Description:

This practical course is designed to provide students with hands-on experience and practical skills in meat technology. Students will learn about the entire meat processing chain, from slaughtering and dressing of meat animals to the preparation and preservation of various meat and fish products. They will also gain expertise in evaluating the quality and freshness of meat and fish. Through a combination of practical exercises and laboratory work, students will acquire the skills necessary for meat and fish processing and preservation.

1. To study slaughtering and dressing of meat animals.
2. Study of post-mortem changes.
3. Meat cutting and handling.
4. Preparation of various meat products such as: Meat pickle & cured meat
5. Preparation and evaluation of traditional meat products.
6. Slaughtering of poultry.
7. Determination of meat to bone ratio in Chicken.
8. To evaluate freshness of fish.
9. To determine meat to bone ratio of fish.
10. Dressing of fish and calculation of dressing percentage.
11. Preparation of fish products such as fish cutlets, pickle, curry, tandoori fish.
12. Experiments in dehydration, freezing, canning, smoking and pickling of fish and meat.
13. Preservation of eggs.

Learning outcomes:

Upon completion of the unit the student should be able to:

- Demonstrate proficiency in the entire meat processing chain, including slaughtering, dressing, and cutting of meat animals.
- Understand and analyze post-mortem changes in meat to ensure product quality and safety.
- Master the preparation of a diverse range of meat products, including meat pickles, cured meats, and traditional meat products.

- Effectively evaluate the quality and freshness of both meat and fish through sensory and analytical techniques.
- Apply proper techniques for dressing poultry and calculating meat-to-bone ratios in both chicken and fish.
- Develop expertise in handling and processing fish, including dressing, calculation of dressing percentages, and creating various fish products.
- Explore a variety of preservation techniques, including dehydration, freezing, canning, smoking, and pickling, for both meat and fish products.

References:

1. Lawre. R. A. & Ledward, D. A. (2006). Lawres Meat Science 7th Ed. Woodhead Publishing Company, Cambridge, England.
2. Aberle, Elton D.., Forrest, John C.., Gerrard, David E.., Mills, Edward W.. Principles of Meat Science. United States: Kendall Hunt Publishing Company, 2020
3. Lawrie, R. A.. Meat Science. United Kingdom: Elsevier Science, 2013
4. Pearson, A.M.., Gillett, T.A.. Processed Meats. Netherlands: Springer, 1996..

FT23206DCE

PLANTATION CROPS & SPICES (2+0+0)

Course Description:

This course provides a comprehensive understanding of plantation crops and spices, their significance in the national economy, and their role in the export industry. Students will explore the chemical composition, processing methods, and various products derived from plantation crops such as tea, coffee, and cocoa. Additionally, they will delve into the world of spices, including their classification, quality specifications, and the processing of major and minor spices in India. Extractives of spices, such as oleoresins and essential oils, as well as simple seasoning blends, will also be covered.

UNIT –I

➢ **Plantation Crops:** Definition and role of plantation crops in national economy and export potential.

➢ **Tea:** Composition and processing of tea. Tea products such as tea concentrate, decaffeinated tea and flavoured tea. *Kashmiri kehwa.*

➢ **Coffee:** Chemical composition,processing, roasting and brewing of coffee. Coffee products such as decaffeinated coffee and instant coffee.

➢ **Cocoa:** Chemical composition, processing of cocoa and cocoa beverages.

Learning outcomes:

Upon completing Unit I, students will be able to:

• Define plantation crops and explain their significance in the national economy and export potential.

• Describe the composition and processing of tea, including the production of tea products like tea concentrate, decaffeinated tea, flavored tea, and Kashmiri kehwa.

• Explain the chemical composition of coffee and detail its processing, roasting, brewing techniques, along with the production of decaffeinated coffee and instant coffee.

• Understand the chemical composition and processing of cocoa and cocoa beverages.

UNIT II

- ➢ **Spices:** Definition, classification and functions.
- ➢ Quality specifications for spices.
- ➢ **Major & minor spices of India:** Chemical composition, processing, uses and special attributes of different spices like saffron, chillies, cumin, coriander, turmeric, fennel, fenugreek, pepper, cinnamon, cloves, ginger, mint and cardamom.
- ➢ **Extractives of spices:** oleoresins and essential oils. Simple seasoning blends.

Learning outcomes:

Upon completing Unit II, students will be able to:

- • Define spices, classify them, and explain their functions.
- • Identify quality specifications for spices.
- • Analyze the chemical composition, processing methods, and uses of major and minor spices in India, including saffron, chillies, cumin, coriander, turmeric, fennel, fenugreek, pepper, cinnamon, cloves, ginger, mint, and cardamom.
- • Describe the extraction processes for spice products like oleoresins and essential oils.
- • Create simple seasoning blends using various spices.

References

- • Chakraverty, A.; Mujumdar, A. S.; Raghavan, G. S. V.; Ramaswamy, H., 2003. Handbook of postharvest technology: cereals, fruits, vegetables, teas, and spices. Marcel Dekker Inc. New-York/Basel
- • Purseglove, J. W. *et al* (1998). Spices 'Vol. I and II. Logman publishers.
- • Peter, K. V. (2004). Handbook of Herbs and Spices Vol. I and II. Woodhead Publishing Limited, Cambridge, England.
- • Raghavan, S. (2007). Handbook of Spices, Seasonings and Flavourings. CRC Press (Taylor and Francis Group).
- • Voilley, A. &Etivant, P. (2003). Flavour in Food. Woodhead Publishing Limited, Cambridge, England.
- • Ho, C-T., Lin, J-K., & Shahidi, F. (2009). Tea and Tea products. CRC Press (Taylor and Francis Group).

FT23207DCE

Statistics and Computer Applications (2+0+0)

Course Description:

This course introduces students to the fundamental concepts of statistics and its practical application using statistical software tools. In Unit I, students will learn about sampling techniques, measures of dispersion, correlation, regression, hypothesis testing, and analysis of variance. Unit II will provide an introduction to statistical software such as R, SPSS, Mini-tab, and MS Excel, enabling students to analyze data and draw meaningful conclusions using these tools.

Unit I

➢ Sampling: Steps and techniques, size of sample. Sampling and non- sampling errors.

➢ Measures of dispersion: Quartile deviation, Mean Deviation, Standard deviation,

➢ Correlation and regression

➢ Testing of hypothesis: Chi- square, t-test and F- test

➢ Analysis of variance: Concept and assumptions, Computation of one way and two way analysis of Variance

Learning outcomes:

By the end of this unit, the student should be able to:

• Understand the steps and techniques involved in sampling, including sample size determination.

• Identify and differentiate between sampling and non-sampling errors.

• Calculate and interpret measures of dispersion, including quartile deviation, mean deviation, and standard deviation.

• Analyze and interpret correlation and regression relationships between variables.

• Apply hypothesis testing techniques, including Chi-square, t-test, and F-test.

• Grasp the concept and assumptions behind analysis of variance and perform computations for one-way and two-way analysis of variance.

Unit – II

➢ Introduction to statistical software

➢ R software

➢ SPSS and Mini-tab

➢ MS Excel

Learning outcomes:

Upon completing Unit II, students will be able to:

- Gain an introduction to statistical software and its relevance in data analysis.

- Utilize R software for statistical data analysis, including data manipulation and visualization.

- Familiarize themselves with SPSS and Mini-tab for performing various statistical analyses.

- Master the use of MS Excel as a versatile tool for data analysis, visualization, and hypothesis testing.

References

1.Gupta, S. C. Fundamentals of Statistics. India: HIMALAYA Publishing House, 2013.

2. Mann, Prem S.., Lacke, Christopher Jay. Introductory Statistics. United

Kingdom: Wiley, 2010.

3. Gupta, S. P.. Statistical Methods. India: Sultan Chand & Sons, 2011.

4. Hays, William Lee. Statistics. United Kingdom: Harcourt Brace College Publishers, 1994.

FT23208DCE

Recent Developments in Food Science and Technology (2+0+0)

Course Description:

This course explores the latest advancements in food science and technology, focusing on innovative techniques, emerging trends, and their impact on the food industry. In Unit I, students will delve into micro and nano encapsulation techniques for retaining and controlling the release of bioactive compounds, nanotechnology applications in food processing and packaging, the concept of nano sensors, and the role of artificial intelligence in food science. In Unit II, the course will cover alternative proteins for meat, dairy, and egg products, the production and processing of cultured meat, 3D food printing, personalized nutrition, and the crucial topic of food sustainability.

Unit I

➢ Micro and nano encapsulation techniques for retention and controlled release of bioactive compounds like Microfluidization, electrospinning, Spray drying, extrusion, Coacervation, freeze drying, wet milling and emulsification.

➢ Nanotechnology applications in food processing and packaging.

➢ Concept of nano sensors.

➢ Artificial intelligence in food science.

Learning outcomes:

Upon completing Unit I, students will be able to:

• Understand and apply various micro and nano encapsulation techniques, including Microfluidization, electrospinning, Spray drying, extrusion, Coacervation, freeze drying, wet milling, and emulsification, for the retention and controlled release of bioactive compounds.

• Explore the applications of nanotechnology in food processing and packaging.

• Comprehend the concept of nanosensors and their role in food science.

• Evaluate the impact and utilization of artificial intelligence in food science, from product development to quality control.

Unit II

➤ Alternate proteins for Meat, dairy and egg.

➤ Production and processing of cultured meat.

➤ 3D food printing and personalized nutrition.

➤ Food sustainability

Learning outcomes:

Upon completing Unit II, students will be able to:

- Analyze the use of alternative proteins in the context of meat, dairy, and egg products, considering their nutritional, environmental, and ethical implications.

- Understand the production and processing methods involved in cultured meat production.

- Explore the technology and applications of 3D food printing, including its role in personalized nutrition.

- Discuss the principles of food sustainability and its importance in modern food systems.

References

1.Handbook of Food Preservation, Second Edition. India: Taylor & Francis, 2007.

2. Alternative Proteins: Safety and Food Security Considerations. United States: CRC Press, 2022.

FT23002GE

Encapsulation Technology in Food Systems (2+0+0)

Course Description:

This course delves into the intricate field of encapsulation technology within food systems. It explores the requirements for effective encapsulation systems and the selection of appropriate wall materials for microencapsulation of bioactive compounds, flavors, and probiotics. In Unit I, students will learn various micro and nano encapsulation techniques, including Liposomes, Microfluidization, electrospinning, Spray drying, extrusion, Coacervation, freeze drying, wet milling, and emulsification. The course also addresses release kinetics of bioactive compounds. In Unit II, students gain insights into industry perspectives on the advantages and disadvantages of different bioactive and flavor delivery systems, as well as properties and applications of various probiotic delivery systems.

UNIT 1

➢ Requirements for encapsulation systems

➢ Wall materials used for microencapsulation of bioactive compounds, flavors and probiotics

➢ Micro and nano encapsulation techniques of bioactive compounds, flavors and probiotics like Liposomes, Microfluidization, electrospinning, Spray drying, extrusion, Coacervation, freeze drying, wet milling and emulsification.

➢ Release kinetics of bioactive compounds

Learning outcomes:

Upon completing Unit I, students will be able to:

• Identify and explain the essential requirements for effective encapsulation systems.

• Recognize and select appropriate wall materials for the microencapsulation of bioactive compounds, flavors, and probiotics.

• Understand and apply various micro and nano encapsulation techniques, including Liposomes, Microfluidization, electrospinning, Spray drying, extrusion, Coacervation, freeze drying, wet milling, and emulsification.

• Analyze release kinetics to predict the controlled release of bioactive compounds.

UNIT II

➢ An industry perspective on the advantages and disadvantages of different bioactive delivery systems

➢ An industry perspective on the advantages and disadvantages of different flavor delivery systems

➢ Properties and applications of different probiotic delivery systems

Learning outcomes:

Upon completing Unit II, students will be able to:

- Assess the advantages and disadvantages of different bioactive delivery systems from an industry perspective.

- Evaluate the pros and cons of various flavor delivery systems in the context of the food industry.

- Describe the properties and applications of different probiotic delivery systems and their relevance in food products.

References

1. Garti, N., McClements, D.J., 2012. Encapsulation Technologies and Delivery Systems for Food Ingredients and Nutraceuticals. Elsevier Science.
2. Handbook of Food Preservation, Second Edition. India: Taylor & Francis, 2007

FT23002OE

Functional Foods for Human Health (2+0+0)

Course Description:

This course explores the fascinating world of functional foods and their impact on human health. In Unit I, students will gain an understanding of phytochemicals and antioxidants, including their introduction and their role in combating free radicals and oxidative stress. The course will also cover the biosynthesis pathways of common phytochemicals and delve into the chemistry, sources, and health benefits of compounds such as flavonoids, carotenoids, ascorbic acid, lycopene, and capsaicinoids. In Unit II, students will explore the therapeutic effects of specific functional foods, including garlic, tea, soybean, and olives, as well as their composition and associated health benefits.

Unit – I

> Phytochemicals and Antioxidants – Introduction
> Free radicals and oxidative stress
> Biosynthesis of common phytochemicals-Shikmic acid and mavalonic acid pathway
> Chemistry, sources and health benefits - Flavonoids, Carotenoids, Ascorbic acid, Lycopene, Capsaicinoids

Learning outcomes:

Upon completing Unit I, students will be able to:

- Define and explain the concept of phytochemicals and antioxidants.
- Understand the role of free radicals and oxidative stress in human health.
- Examine the biosynthesis pathways of common phytochemicals, including the Shikmic acid and mevalonic acid pathways.
- Identify, describe, and discuss the chemistry, sources, and health benefits of important phytochemicals, such as flavonoids, carotenoids, ascorbic acid, lycopene, and capsaicinoids.

Unit – II

> Garlic-composition and its therapeutic effects.
> Tea and its health benefits.
> Soybean as a functional food.

➢ Health benefits of olives

Learning outcomes:

Upon completing Unit II, students will be able to:

- Analyze the composition of garlic and evaluate its therapeutic effects on human health.

- Assess the health benefits of tea and its components in promoting well-being.

- Examine the nutritional profile of soybean and its role as a functional food.

- Evaluate the health benefits associated with olives and olive-derived products.

References

1. Goldberg, I.. Functional Foods: Designer Foods, Pharmafoods, Nutraceuticals. United States: Springer US, 2012.

2. Handbook of Nutraceuticals and Functional Foods. United Kingdom: CRC Press, 2019.

3. Functional Foods: Biochemical and Processing Aspects byJohn Shi, G. Mazza, Marc Le Maguer, CRC Press,2006.

4. Lockwood, Brian. Nutraceuticals: A Guide for Healthcare Professionals. United Kingdom: Pharmaceutical Press, 2007.

5. Postharvest Physiology and Biochemistry of Fruits and Vegetables. United Kingdom: Elsevier Science, 2018.