

Theory	Subject	Teaching Hours per week				Exam Marks	Sessional Marks	Total Marks
		L	T	P	C			
Second Semester								
2.1	Food Packaging	3	1	-	4	50	50	100
2.2	Selected topics in Fruits and Vegetable Processing	3	1	-	4	50	50	100
2.3	Food Process Equipment Design	3	1	-	4	50	50	100
2.4	Electives	3	1	-	4	50	50	100
2.5	Food Product Development	3	1	-	4	50	50	100
Practicals								
2.2.1	Food Processing and Analysis	-	-	2	1		25	25
Total		15	5	4	21	250	275	525

- List of Electives (FT 2.4) (Any one to be offered)
 1. Advanced Food Microbiology
 2. Advanced Food Biotechnology
 3. Food Rheology and Texture
 4. Thermal and Non Thermal Processing of Foods
 5. Industrial Pollution Control and Abatement

SCHEME OF TEACHING AND EXAMINATION(THIRD & FOURTH SEMESTER)

Theory	Subject	Teaching Hours per week				Exam Marks	Sessional Marks	Total Marks
		L	T	P	C			
Third Semester		L	T	P	C			
3.1	Analytical Techniques	3		-	3	40	35	75
3.2	Research Methodology	4		-	4	50	50	100
3.3	Preliminary thesis			20	8	-	-	-
Total		7		20	15	90	85	175
Fourth Semester								
4.1	Thesis	-	-	30	12	-	-	-
Total				30	12	-	-	-

#: Preliminary thesis will be evaluated on the basis of seminar presentations and discussions and the candidate shall be awarded ‘S’ grade i.e. satisfactory for continuation or else ‘X’ grade i.e.unsatisfactory.

Course Duration: 60 Lectures of one hour each.

Note for the Examiner: Question No. 1, which is compulsory, will cover the entire syllabus, having ten conceptual questions of one mark each or five questions of two marks each. Rest of the Questions (2 to 9) will be divided into FOUR Units having TWO questions each and candidate is required to attempt at least ONE question from each Unit. The duration of End Term exam will be 3 hrs.

Course objectives

1. Students will gain knowledge of Fermentation processes: Biomass, enzymes and metabolites production, Isolation and Utilization of Enzymes: Purification, immobilization, application of enzyme technology. Kinetics of Enzyme-Catalyzed Reactions.
2. Students will gain knowledge of Design and Analysis of Biological Reactors: The ideal continuous-flow stirred-tank reactor (CSTR), residence time distribution, different types of reactors, relationship between batch and continuous biological reactors and Downstream processing

Course outcome

Students will be able to

1. CO1. implement their knowledge of fermentation process, enzymes, biomass, metabolites production, purification and their utilization and factors affecting their activity, kinetics during application.
2. CO2 apply their knowledge about cellular genetics and their control, growth and reproduction of a single cell and their large scale application.
3. CO3 implement their knowledge in transport phenomena, heat and mass transfer in microbial systems.
4. CO4 apply their knowledge in designing biochemical reactors, prima

candidate is required to attempt at least ONE question from each Unit. The duration of End Term exam will be 3 hrs.

Course Objectives:

1. To understand the need and importance of quality in food processing.
2. To impart knowledge of food safety and various laws associated with it.
3. To gain knowledge about specific issues faced by food industries and various advanced techniques used for quality evaluation.

Course Outcomes:

CO1: Understand the concept of quality & quality control and various methods used for the evaluation of food quality.

CO2: Understand the importance of food safety and different regulating authorities prevalent in India and abroad.

CO3: Assessing the role of various practices followed for ensuring the safety of food along with the knowledge of export policies and patents.

CO4: Gain knowledge about various issues faced by food industries and various advanced techniques used for analysis of food.

UNIT 1

Concept of quality, quality attributes-physical, ch

Reference Books :

1. Krammar and Twigg Quality Control for Food Industry, AVI Publishing, 1979.
2. Herschdoerfer, S.N. Quality Control in Food Industry, Academic Press, U.K.
3. Ranganna : Handbook of Analysis of Fruit and Vegetable Products, Tata McGraw Hill, New Delhi, 1986.
4. Nielsen, S.S, 2004, Introduction to chemical Analysis of foods, CBS Publishers, New Delhi.
5. Ranganna. S., 2001, Handbook of Analysis & Quality control for Fruit & Vegetable Products, Tata McGraw Hill, New Delhi.
6. Pomeranz.Y, Meloan.C.E, 1996, Food Analysis – Theory & Practice, CBS Publishers, New Delhi.
7. Jacobs.M.B., 1999, Chemical Analysis of Food & Food Products, CBS Publishers, New Delhi.
8. Jay.J.M, 1996, Modern Food Microbiology, CBS Publishers, New Delhi

1.4 Selected topics of Cereals, Oilseeds and Pulses

Paper Code: 1.4; Max. Marks 50; Credits: 4; Time: 4 hours

Course Duration: 60 Lectures of one hour each.

Note for the Examiner: Question No. 1, which is compulsory, will cover the entire syllabus, having ten conceptual questions of one mark each or five questions of two marks each. Rest of the Questions (2 to 9) will be divided into FOUR Units having TWO questions each and candidate is required to attempt at least ONE question from each Unit. The duration of End Term exam will be 3 hrs.

adulterations, trans fat. Chemical Adjuncts, lecithin, monoglycerides and derivatives, poly propylene glycol esters, poly glycol esters, shortening. 8h

Manufacture and uses of shortening, types of shortenings, Technology of Margerine manufacture and its uses. Mayonnaise and salad dressings. Confectionary coatings. Peanut butter and vegetable ghee. Packaging and storage of fats and oils. Fat substitutes. 10h

Reference Books:

1. Kent, N.L. : Technology of Cereals, CBS Publisher.
2. Pomeranz, Y. : Wheat Chemistry and Technology, CHIPS Book, USA.
3. Tanley A. Watson & Paul E. Ramstad : Corn Chemistry and Technology, ADCC, USA.
4. Julliano, B.O. Rice Chemistry and Technology, AACC, USA.
5. Pandey, P.H. Post Harvest Technology.
6. Bailey : Fats and Oil, Wiley, USA.
7. Williards, P.N. & Devine, J. : The Chemistry & Technology of Edible Oils & Fats

1.5. Functional Foods and Nutraceuticals

Paper Code : 1.5; Max. Marks 50 ; Credits : 4; Time: 3 hours

Note for the Examiner: Question No. 1, which is compulsory, will cover the entire syllabus, having ten conceptual questions of one mark each or five questions of two marks each. Rest

CO2 : Explain the various physiological and biochemical aspects of life threatening and chronic diseases and the effect of various bioactive components on such diseases.

CO3 :Select the raw material and processing of bioactive components

CO4 :

Inc., 1997.

3. Bioprocess Engineering (Basic Concepts) by M. L. Shuler & F. Kargi, Prentice Hall of India, 2003.

1.1.2. Food Process Engineering

1. Particle size reduction, Milling, Grinding, sieve analysis of cereal and wheat flour
2. Rheological Study and mixing index in a food mixture
3. Thermal processing, Kinetics and design of Retort processing & pasteurization of liquid food
4. Effect of processing conditions and product parameters on quality of fruit products
5. Effect of processing conditions and product parameters on baking of bread & biscuit
6. Effect of Processing conditions and product parameters on quality of dairy products
7. Effect of material and air properties on tray & spray drying of food materials
8. Effect of Non-thermal processing of food
9. Study of extraction of oleoresins from spices
10. Isolation of microorganisms from different source and identification

References Books

1. Fuller, G.W. (2011). New Food Product Development: From Concept to Marketplace, 3rd ed, CRC Press, UK.

SYLLABUS FORM. E. (FOOD TECHNOLOGY)SECOND SEMESTER

2.1 Food Packaging

Paper Code : 2.1; Max. Marks 50; Credits: 4; Time: 4 hours

Course Duration: 60 Lectures of one hour each.

Note for the Examiner: Question No. 1, which is compulsory, will cover the entire syllabus,

Function of a packaging material, the quality and performance including moisture and gas transmission, integration of food and the packaging material

Course : Selected topics in fruits and vegetable processing
Course code 2.2

Course Objective.

This course focuses on the design principles and considerations of agricultural and food processing equipment. Students will learn about the various design factors, such as factor of safety, theories of failure, allowable stresses, and materials of construction. Additionally, the co

Note for the Examiner: Question No. 1, which is compulsory, will cover the entire syllabus, having ten conceptual questions of one mark each or five questions of two marks each. Rest of the Questions (2 to 9) will be divided into FOUR Units having TWO questions each and candidate is required to attempt at least ONE question from each Unit. The duration of End Term exam will be 3 hrs.

Advanced Food Microbiology

Unit I

Relevance of microbiology as a field of Food technology. Historical milestones in microbial food technology. Morphology and physiology of industrial microorganisms (Bacteria, yeasts, molds and actinomycetes). Isolation : identification and quantitative estimation of microorganisms, Microbiological assay in Microbial nutrition.

Unit II

Unique pathways of microbial metabolism: ED, PK pathways, Respiration; Fermentations, Amphibolic pathways, Anaplerotic reactions.

Bacterial cell wall biosynthesis. Photoautotrophy, Chemolithotrophy, Methylotrophy, Calvin cycle.

Unit III

Genetics of some industrial microorganisms, Microbiology of soil, Selection, development and maintenance of cultures.

Chemistry and biosynthesis of microbial products e.g. vitamins, amino acids, enzymes, steroids, antibiotics and polymers. Metabolic regulations in industrial fermentation.

Unit IV

Microbial transformation of alkanes, alkaloids, terpenes, aromatic compounds and naturally occurring polymers.

Microbial food production. Spoilage microorganisms in foods and their control. Applied microbiology in animal nutrition. Mycotoxins Microbial insecticides.

Reference Books:

1. Frazier W.C., Westhoff, D.C. (Ed). (1988). Food microbiology (McGraw-Hill).
2. Admas, M.R., Moss, M.O (2005). Food microbiology (Edition 3, Illustrated Publisher Royal Society of Chemistry).
3. SriLakshmi B. (2003) Food science (New Age International Publishers, India).
4. Jay J.M., M.J. Loessner, D.A. Golden. (2005). Modern food microbiology (Edition 7, Illustrated Publisher Springer).
5. B. Sivasankar (2004). Food processing and preservation (PHI Private Ltd, New Delhi).
6. Michael P. Doyle (1989). Food borne bacterial pathogens (Edition illustrated, Publisher Marcel Dekker).

Advanced Food Biotechnology

Note for the Examiner: Question No. 1, which is compulsory, will cover the entire syllabus, having ten conceptual questions of one mark each or five questions of two marks each. Rest

Production of alcohol, lactic acid and acetic acid from various food materials. Bacteriocin production and its use in food preservation. Biotechnological processes of manufacture of functional foods, nutraceuticals and probiotics.

Unit IV

Biotechnological process for food fortification, prebiotics & oligosaccharides. Application of biotechnology in waste treatment of food industries. Improvement of quality of food by biotechnological processes. Biosensors.

Reference Books:

1. Daniel Charles. Lords of the Harvest: Biotech, Big Money, and the Future of Food (1st Edition). Perseus Books Group, 2001.
2. Adams, M.R. and M.O. Moss. Food Microbiology. Turpin Distribution Service Ltd., Blackhorse Road, Letchworth, Herts SG6 1HN, UK, 1995, 2nd edition.
3. Gauri Mittal. Food Biotechnology: Techniques and Applications. CRC Press, 1992.
4. Banwart, George J. Basic Food Microbiology, 2nd ed. AVI/ Van Nostrand Reinhold Publishing Co, 1989.
5. Cliver, D.D. Foodborne Diseases. Academic Press, Inc, 1990.
6. Food and Drug Administration. Bacteriological Analytical Manual (BAM) (8th Edition). AOAC, Arlington, VA, 1995.
7. Debnath, 2005, Tools & Techniques of Biotechnology, Pointer Publishers, Jaipur.

Food Rheology & Texture

Note for the Examiner: Question No. 1, which is compulsory, will cover the entire syllabus, having ten conceptual questions of one mark each or five questions of two marks each. Rest of the Questions (2 to 9) will be divided into FOUR Units having TWO questions each and candidate is required to attempt at least ONE question from each Unit. The duration of End Term exam will be 3 hrs.

Unit I

Introduction to rheology of foods: Definition of texture, rheology and psychophysics– their structural basis; physical considerations in study of foods; salient definitions –Stress tensor and different kinds of stresses.

Unit II

Microwave and radio frequency processing. Definition, advantages, mechanism of heat

secondary clarification and gravity thickness, aerobic & anaerobic digestion, cake filtration, composting, sludge disposal.

UNIT IV

Air Pollution Control: Temperature inversions, plume behaviour, characterization, stack height, Gaussian Plume design model, Measurement and monitoring

Temperature inversions, plume behaviour, characterization, stack height, Gaussian Plume design model, Measurement and monitoring

Temperature inversions, plume behaviour, characterization, stack height, Gaussian Plume design model, Measurement and monitoring

Temperature inversions, plume behaviour, characterization, stack height, Gaussian Plume design model, Measurement and monitoring

Temperature inversions, plume behaviour, characterization, stack height, Gaussian Plume design model, Measurement and monitoring

Temperature inversions, plume behaviour, characterization, stack height, Gaussian Plume design model, Measurement and monitoring

2.5 Food Product Development

Paper Code : 2.5; Max. Marks 50 ; Credits : 4; Time: 3 hours

Course Duration: 45 Lectures of one hour each.

Note for the Examiner: Question No. 1, which is compulsory, will cover the entire syllabus, having ten conceptual questions of one mark each or five questions of two marks each. Rest of the Questions (2 to 9) will be divided into FOUR Units having TWO questions each and candidate is required to attempt at least ONE question from each Unit. The duration of End Term exam will be 3 hrs.

Course Objectives : Objectives of this course is to impart knowledge about

- Developing new innovation strategy for product success.
- Managing and improving the product development process .

Course outcomes

CO1 : Explain the product success and failure

CO2 : The knowledge base for product development success

CO3 : Understand the basic knowledge about scale up/down

CO4: Understand the consumer needs for product development .

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1. Earle and Earle. 2001. Creating New Foods, Chadwick House Group. Fuller 2004. New food Product development-from concept to market place, CRC.
2. Harry T Lawless and H Leymann. 2010. Sensory evaluation of foods: Principles and Practices. Springer, New York.
3. EL Cussler and GD Moggridge. 2012. Chemical Product Design. Cambridge University Press, UK.
4. Anita R Linneman, Catharina GPH Schroen and MAJS van Boekel. 2011. Food Product Design: An Integrated approach. Wageningen Academic Publishers, Netherland.

Practicals

2.2.1 Food Processing and Analysis

1. Proximate composition in food
2. Analysis of water
3. Analysis of wheat flour; Determination of damaged starch from whole wheat flour
4. Analysis of tea and coffee
5. Analysis of milk and dairy products & Detection of adulterants in milk (liquid)
6. Analysis of Food adulteration with respect to specific foods dairy, cereal, muscles food etc.
7. Microbial and Enzyme assay
8. Discriminative and Descriptive Sensory analysis of Foods
9. Estimation of phenolics, antioxidant activity, chlorophyll and Carotenoids
10. Demo of colorimeter, texture analyzer, DSC, HPLC, GC-MS etc.

Reference Books

1. AOAC International. 2003. Official methods of analysis of AOAC International. 17th Ed. Gaithersburg, MD, USA, Association of Analytical Communities
2. Kirk, RS and Sawyer, R. 1991. Pearson's Chemical Analysis of Foods. 9th Ed. Harlow, UK, Longman Scientific and Technical.
3. Leo ML.2004. Handbook of Food Analysis. 2nd Edition. Vol 1,2 and 3, Marcel Dekker.
4. Linden G. 1996. Analytical Techniques for Foods and Agricultural Products. VCH.

SYLLABUS OF M. E. (FOOD TECHNOLOGY)THIRD SEMESTER

3.1 Analytical Techniques

Unit 1

Thermoanalytical methods: Principle, classification of methods.

Single Factor Experiment: Hypothesis testing, Analysis of Variance components (ANOVA) for fixed effect model; Total,