Estd. 1962
NAAC 'A' Grade

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दुरध्वनी (ईपीएबीएक्स) २६०९००० (अभ्यास मंडळे विभाग– २६०९०९४)
फॅक्स : ००९१-०२३१-२६९१५३३ व २६९२३३३.e-mail:bos@unishivaji.ac.in

SU/BOS/Science/ 9469 **Date:** 27/8/2018

To,

The Principal,
Y.C. Institute of Science,
Satara.

Subject: Regarding syllabi of **B.Sc. Part- III Food Processing and Packaging (Entire)** degree programme under the Faculty of Science and Technology.

Sir/Madam,

With reference to the subject mentioned above, I am directed to inform you that the university authorities have accepted and granted approval to the revised syllabi, Nature of question paper and equivalence of **B.Sc. Part- III Food Processing and Packaging (Entire)** under the Faculty of Science and Technology.

This syllabi and equivalence shall be implemented from the academic year 2018-2019 (i.e. from June 2018) onwards. A soft copy containing the syllabus is attached herewith and it is also available on university website www.unishivaji.ac.in (Online Syllabus)

The question papers on the pre-revised syllabi of above mentioned course will be set for the examinations to be held in October /November 2018 & March/April 2019. These chances are available for repeater students, if any.

You are, therefore, requested to bring this to the notice of all students and teachers concerned.

Thanking you,

Yours faithfully,

Dy Registrar

Copy to:

1	The Dean, Faculty of Science & Technology	7	P.G.Seminar Section
2	Director, Board of Examinations and Evaluation	8	Computer Centre
3	The Chairman, Respective Board of Studies	9	Affiliation Section (U.G.)
4	B.Sc. Exam	10	Affiliation Section (P.G.)
5	Eligibility Section	11	P.G.Admission Section
6	Appointment Section		

SHIVAJI UNIVERSITY, KOHLAPUR

SYLLABUS

FOR

B.Sc. Food Processing and Packaging (Entire)
Third Year
SEMESTER SYSTEM
V /VI SEMESTERS

Effective from Academic Year
2018-19 onwards

Syllabus for Bachelor of Science Part III: Food Processing and Packaging (Entire)

COURSE STRUCTURE: BFPP -III (SEMESTER-V)

SR. NO.	PAPER NO.	SUBJECTS	MARKS	LECTURES /WEEK
1.	BFPP 501	Food Biotechnology	50	03
2.	BFPP 502	Nutraceutical And Functional Food	50	03
3.	BFPP 503	Entrepreneurship Management	50	03
4.	BFPP 504	Food Product Development And Marketing Strategy	50	03
5.		English for Communication	50	04

COURSE STRUCTURE: BFPP -III (SEMESTER-VI)

SR. NO.	PAPER NO.	SUBJECTS	MARKS	LECTURES /WEEK
1	BFPP 601	Food Quality And Sensory Evaluation	50	03
2	BFPP 602	Food Safety and Plant Sanitation	50	03
3	BFPP 603	Food Engineering	50	03
4	BFPP 604	Food Fermentation Technology	50	03
5		English for Communication	50	04

Details of Practical:

SR. NO.	SUBJECTS	MARKS	Work load /WEEK
1	Practical –I	40	04
2	Practical-II	40	04
3	Project	100	08
4	Industrial Training	20	02
	Total Marks	200	

Note: 2.Practical Examination will be conducted annually.

BFPP 501 FOOD BIOTECHNOLOGY

UNIT – I **(10 Lectures)**

Biotechnology - Definition, Scope, Application. Genetically modified foods- Definition, examples of GM foods and its production, advantages and disadvantages, ethical and legal concerns – safety aspects of foods produced by biotechnology and genetic engineering.

UNIT – II **(10 Lectures)**

Introduction:
Components of Molecular Biotechnology,Gene cloning – steps and technique involved in gene cloning Recombinant DNA Technology, Restriction Endonucleases, Cloning Vectors, Polymerase Chain Reaction

UNIT – III **(10 Lectures)**

Genetic Modification of microorganisms and crops:
Genetically modified crops for food production, Future trend of GM crops, Food ingredients, processing aids, dietary supplements derived from GM microorganisms, Risk of GMOs and GM Foods to Human Health and Environment

UNIT – IV **(10 Lectures)**

Applications of Food Biotechnology:
Plant Biotechnology for Food Production, Improvement of Plant Nutritional and Functional Quality, Plant Proteins, Lipids, Saturated Fatty Acids, Unsaturated Fatty Acids, Carbohydrates, Plant Vaccines, Milk Proteins, Reconstitution of Human Milk Proteins in Food Plants, Carotenoids, Vitamins, Minerals, Manipulation of Fruit Ripening,

References

1. Owen Pward, Fermentation Biotechnology Principles, processes and products, Prentice H New Jersey, 1989.
2. Frazier and West Hoff , Food Microbiology, Tata McGraw Hill publishing company Ltd, New Delhi, 1995.
3. Dubey, R.C , Text book biotechnology S.Chand and Co Ltd,New Delhi, 2001.
Gupta, P.K, Elements of biotechnology, Rostogi and Co, Meerut, 1996.
4. Gary Walsh and Denis R. Headen, Protein Biotechnology John Willey & Sons England.
Dubey, R.C and Maheswari, D.K, A Text book of Microbiology, S.Chand and Co, Ltd, New Delhi (2003).
5. Stanbur, P.F and Allan, W. (1984): Principles of fermentation technology, Pergamon Press oxford
6. Lee, B.H . (1996), Fundamentals of food biotechnology, VCH publishers, Inc. New york.
7. Herzaka, A. and R.G. (1981), Food industry wastes, disposal and recovery, Applied Science Publishers, London
8. Lawrence K.W. and Wang, MUS (1992), Handbook of Industrial waste treatment, Marcel 25

BFPP 502 Nutraceuticals and Functional Foods

Unit I **(10 Lectures)**

- Concept on Nutraceuticals : Nutraceutical and functional foods
- Biological significance of nutraceuticals,
- Nutraceuticals and dietary supplement,
- World market for nutraceuticals, regulatory issues
- Nutrigenomics: nutrigenomics an introduction and its relation to nutraceuticals.

Unit II **(10 Lectures)**

- The role of nutraceuticals-
  Functional foods in disease prevention: angiogenesis and cardiovascular diseases, cancer, diabetes, cholesterol management, obesity and inflammation dosage levels,

Unit III **(10 Lectures)**

- Health benefits of nutraceuticals
- Pigments :
  Natural pigments (chlorophyll, chlorophyllin, carotenoids),
  Anthocyanins, Glucosinolates, Isoflavonoids, Phytoestrogens,
- Omega-3 and Omega-6 fatty acids, Antioxidants, Phytosterols
- Dosage for effective control of disease or health benefit with adequate safety

Unit IV **(10 Lectures)**

- Development of functional foods, isolation, storage, processing and stability of phyochemicals / bioactive compounds.
- Prebiotics and probiotics : usefulness of probiotics and prebiotics in gastro intestinal health and other benefits, beneficial microbes; prebiotic ingredients in foods;
- Types of prebiotics and their effects on gut microbes, resistant starch, fructo-oligosaccharides as probiotic food components

Recommended Books:

1) Brigelius-Flohé, J & Joost HG. (2006). Nutritional Genomics: Impact on Health and Disease. Wiley VCH.
2) Cupp J & Tracy TS. (2003). Dietary Supplements: Toxicology and Clinical Pharmacology. Humana Press.
3) Gibson GR & William CM. (2000). Functional Foods - Concept to Products.
4) Goldberg I. (1994). Functional Foods: Designer Foods, Pharma Foods.
5) Losso JN. (2007). Angi-angiogenic Functional and Medicinal Foods. CRC Press
6) Neeser JR & German BJ. (2004). Bioprocesses and Biotechnology for Nutraceuticals.Chapman & Hall.
7) Robert EC. (2006). Handbook of Nutraceuticals and Functional Foods. 2nd Ed. Wildman.
8) Shi J. (2006). Functional Food Ingredients and Nutraceuticals: Processing Technologies. CRC Press.
9) Webb GP. (2006). Dietary Supplements and Functional Foods. Blackwell Publ.

BFPP 503: Entrepreneurship Management

Unit 1. **(10 Lectures)**

- Entrepreneurship Definition, need, scope and characteristics of entrepreneurship;
- entrepreneurship development, and employment promotion;
- identification of opportunities;
- Business environment for the entrepreneur;
- Government of India policy towards promotion of entrepreneurship.
- Exposure to demand based, resource base, service base, import substitute and export promotion industries.

Unit 2. **(10 Lectures)**

- Project formulation Need, scope, and application for project formulation,
- market survey techniques, criteria for principles of product selection and dev, choice of technology
- Major steps involved in setting up a small scale unit – project identification, formulation, resources mobilization;
- Institutions, financing procedure and financial incentives Financial ratios and their significance. Books of accounts, financial statements, funds flow analysis

Unit 3. **(10 Lectures)**

- Techno eco feasibility of the project Critical path method, project evaluation, rev techniques as planning tools for establishment of SSI;
- Plan layout & process planning for the product establishing the unit

Unit 4. **(10 Lectures)**

- Innovation & Marketing Creativity and innovation problem solving, personnel management; Marketing and Sales Management
- Legal Issues Legislations (licensing, registration, municipal laws, business ethics, income tax, lab law app, consumer complaint redressal)
-

References:

1. Deshpande V (1984) 'Entrepreneurship of small scale food industries. Concept, Growth and Management ' Deep and Deep Pub, New Delhi.

2. Parek U and Rao T V (1978) 'Personal efficacy in developing entrepreneurship' Learning systems, New Delhi.

3. Rao T V and Parekh LU (1982) 'Developing Entrepreneurship. A Handbook' Learning Systems, New Delhi.

BFPP 504 FOOD PRODUCT DEVELOPMENT AND MARKETING STRATEGY

UNIT I **(10 Lectures)**

- New food products – definition, classification, factors shaping new
- Product development – social concerns, health concerns, impact of market place influence and technology, reason for new food
- Product development- corporate, market place, technological and governmental influences.

UNIT II **(10 Lectures)**

- Steps in food product development- Market and literature survey to identify the concepts of new products based on special dietary requirements, functionality, convenience and improvisation of existing traditional Indian foods, Screening of product concept on the basis of techno-economic feasibility,
- Development of prototype product and Standardization of formulation process, Proximate Analysis of New Product, Packaging, labeling and shelf-life studies, Cost analysis and Final Project Report.

UNIT III **(10 Lectures)**

- Criteria for formulation of new food products for infants, pre-school children, adolescents, pregnant and nursing mothers, old age, sports persons, armed sources personnel, emergencies and therapeutic uses
- Standard and safety of food and food products; criteria for ingredients and finished products laid down in the FSSAI regulations, 2011.

UNIT – IV **(10 Lectures)**

- Concept of market and marketing –Market promotion and positioning of food products, role of advertisement and technologies in promotion of new products.
- Export potential for selected Indian food products, Role of export promoting agencies and Export Quality control and Inspection Act, 1963.

Sub: English for Communication

‘

SEMESTER-V

Section I: Communication Skills

Unit 1:- Developing Vocabulary

Unit 2:- Avoiding Errors in Written English

Unit 3:- Organizing a Passage

Section II: Reading Comprehension

Unit 4:- Nation Building requires Commitment – Sam Pitroda

Unit 5:- The Tiger in the Tunnel- Ruskin Bond

Unit 6:- The Prophet who taught India How to Win- Shashi Tharoor

Unit 7:- A Psalm of Life- Henry Wordsworth Longfellow

Unit 8:-Daffodils- William Wordsworth

BFPP 601 FOOD QUALITY AND SENSORY EVALUATION

UNIT 1 Introduction to quality attributes of food and Gustation (10 Lectures)

- Appearance, flavor, textural factors and additional quality factors.
- Introduction and importance of gustation
- Structure and physiology of taste organs- tongue, papillae, taste buds, salivary glands.
- Mechanism of taste perception
- Chemical dimensions of basic tastes- sweet, salt, sour, bitter and umami
- Factors affecting taste, reaction time, taste modification, absolute and recognition Threshold
- Taste measurement Techniques and Electronic Tongue
- Taste abnormalities

UNIT2 Olfaction (10 Lectures)

- Introduction, definition and importance of odour and flavor
- Mechanism of odour perception
- Theories of odour classification, chemical specificity of odour
- Odour Measurement Techniques and Electronic Nose
- Olfactory abnormalities

UNIT 3 Colour (10 Lectures)

- Introduction and importance of colour
- Dimensions of colour and attributes of colour; gloss etc.
- Perception of colour.
- Colour Measurement: Munsell colour system, CIE colour system, Hunter colour system
- Colour abnormalities

UNIT 4 Texture (10 Lectures)

- Introduction, definition and importance of texture
- Phases of oral processing
- Texture perception, receptors involved in texture perception
- Rheology of foods
- Texture classification
- Texture measurement – basic rheological models, forces involved in texture measurement and recent advances in texture evaluation.

- **Recommended Readings**

- 1. Deshpande S S(2002) 'Handbook of Food Toxicology' CRC Press, Woodhead Publishing Ltd, Cambridge.

- 2. Helferich William and Winter Carl K (2000) ‘Food Toxicology’ CRC Press, CRC Woodhead Publishing Ltd., Cambridge.
- 3. Mahindru S.N. (2000) ‘Food Additives : Characteristics, Detection and Estimation’ Tata McGraw Hill, New Delhi,
- 4. Saxena Madhu and Khanna Sri Ram (2003)’ Food Standards and Safety in a Globalised World: The Impact of WTO and Codex ‘ New century Publications, New Delhi,
- 5. Shibamoto Takayuki, Bjeldanes Leonard F and Taylor Steve (Eds) (2005) ‘Introduction to Food Toxicology Food Science and Technology’, Academic Press, New York,
- 6. Tõnu Püssa (2007) ‘Principles of Food Toxicology’ CRC Press, Woodhead Publishing Ltd., Cambridge,
- 7. Vaclavik V.A. (2003) ‘Essentials of Food Science’, 2nd Edition, Springer, New York,

BFPP 602 Food Safety And Plant Sanitation

UNIT 1 Introduction to Food Safety and Food related hazards (10Lectures)

• Definition
• Types of hazards, biological, chemical, physical hazards
• Factors affecting Food Safety
• Importance of Safe Foods

- Biological hazards –
- physical hazards
- microbiological considerations in food safety.
- Risk assessment and risk benefit Indices of human exposure, acute toxicity, mutagencity and carcinogenicity, reproductive and developmental toxicity, neurotoxicity and behavioural effect, immunotoxicity.

UNIT 2 Food Safety Management Tools (10 Lectures)

• Basic concept
• Prerequisites- GHPs ,GMPs,
• HACCP
• ISO series
• TQM - concept and need for quality, components of TQM, Kaizen.
• Risk Analysis
• Accreditation and Auditing

UNIT 3 Food laws and Standards (10 Lectures)

- AGMARK and Bureau of Indian standards
- Additional food laws – Federal Poultry products Inspection Act of 1957,
- Federal Trade Commission act,
- Infant formula Act of 1986,
- Nutrition labeling and education act of 1990
- Consumer protection Act,
- Food Safety and Standards 2006
- HACCP
- Other laws and standards related to food

UNIT 4 Food Plant Hygiene and Sanitation (10 Lectures)

- Waste disposal, Control methods using Physical and Chemical Agents, Pest and Rodent Control, ETP Design and Layout.
- Food storage sanitation, transport sanitation and water sanitation.
- By-products utilisation obtained from dairy plant, egg& poultry processing industry and meat industry.
- Wastewater and solid waste treatment: - Waste-types-solid and liquid waste characterization, physical, chemical, biological, aerobic, anaerobic, primary, secondary and tertiary (advanced) treatments.

- **Recommended Readings**

- 1. Entis Phyllis (2007) ‘Food Safety: Old Habits, New Perspectives’, ASM Blackwell Publishing, Washington
- 2. Mehta Rajesh and George J (2005) ‘Food Safety Regulations Concerns and Trade : The Developing Country Perspective’, Macmillan, New Delhi.
- 3. Mortimone Sara and Wallace Carot (2007) ‘HACCP’ (Food Industry Briefing Series), Blackwell Science, Oxford, UK.
- 4. Paster Tara (2006) ‘The HACCP: Food Safety Training Manual’, John Wiley, Oxford.
- 5. Schmidt Ronald H and Rodrick G.E (2005) ‘Food Safety Handbook’, Wiley Interscience, UK.

BFPP 603 FOOD ENGINEERING

UNIT I **(10 Lectures)**

Design of food plant
Important considerations for designing of food plants
• Types and layout
Grinding and Mixing
Principle and equipments used in food industry
Mixing-different type of mixers used in food in industry, continuously stirred mixing tanks.

UNIT II **(10 Lectures)**

Fluid Flow in food Processing
• Liquid Transport systems
• Properties of Liquids
• Newton's Law of Viscosity
• Principle of Capillary tube and rotational viscometer
Filtration- batch filtration, continues filtration, ultra filtration, reverse osmosis
Clarification and concentration process- evaporation, diffusion concentration, single and multiple stage freeze concentration, reverse osmosis

UNIT III **(10 Lectures)**

Heat and Mass Transfer
• Systems for heating and cooling food products
• Thermal Properties of Food
• Modes of heat transfer
• Membrane separation systems-Electrodialysis system , Reverse Osmosis
• Membrane System, and Ultrafiltration Membrane System
• Membrane devices used for RO and UF: Plate and Frame, Tubular, Spiral wound and hollow fiber devices.

UNIT IV **(10 Lectures)**

Mechanical operations
Mechanical separation- sedimentation, centrifugation, filtration, phase separation, distillation
Thermal processing of packaged foods- retort/ autoclave sterilization, UHT
radiation treatment – electron beam X-ray and gamma rays

Recommended Readings
1) Rao DG. 2010. Fundamentals of food engineering. PHI learning private ltd.
2) Singh RP and Heldman DR.1993, 2003, 2009. Introduction to food engineering. Academic press 2nd, 3rd and 4th edition.
3) Rao C G 2006 Essentials of food process engineering. B S publications
4) Fellow P. 1988 Food processing technology

BFPP 604 Food Fermentation Technology

UNIT I Food Fermentation (10 Lectures)

- Batch and continuous process,
- Fermenter design, , operation, measurement and control in fermentation,
- Aeration and agitation in fermentation: Oxygen requirement, measurement of adsorption coefficients, sterilization of air and media; scale up in fermentation, solid substrates fermentation, instrumentation and control, criteria used in media formulation, downstream processing,

UNIT II Enzyme technology in food industry (10 Lectures)

- Industrial enzymes (with respect to food processing industry)
- Immobilized plant cells for production of food flavors and colours,
- Immobilized enzymes in food processing,
- Development of novel sweeteners,
- Production of food additives and supplements.

UNIT III (10 Lectures)

Microbial products - Primary, secondary metabolites, Vit B12, Citric Acid, Penicillin & alcohol. Microbial biomass production- baker's yeast, single cell protein and mushroom..

UNIT IV (10 Lectures)

Production of fermented products - beer, wine and vinegar, Traditional fermented foods like idli and dosa.
Principles of down stream processing and Product recovery.
Production of alcohols, organic acids.

Suggested Readings

Stanburry P.P. and Whitaker, A. 1984. Principles of Fermentation Technology. Pergamon Press, Oxford UK.
Steinkraus, K.H. 1983. Handbook of Indigenous Fermented Foods. Marcel Dekker, New York.

Sub: English for Communication

SEMESTER-VI

Section I: Communication Skills

Unit 9: Interacting in a group Discussion

Unit 10: Writing Reports

Unit 11:- Writing officials letters

Section II: Reading Comprehension

Unit 12: Let's Make Indian a Better Country- Sudha Murty

Unit 13: Kusum- Khushwant Singh

Unit 14: Indian Folk Culture and Reverence for Nature-
Malini Awasthi and Reena Agrwal

Unit 15: An Ode to Death- Rup Narayan Das

Unit 16: She walks in Beauty – Lord Byron

(Nature of question paper will be as per general B.Sc. Part III)

Practical I

1. Isolation of DNA from micro-organisms.
2. Colorimetric estimation of DNA
3. Colorimetric estimation of RNA..
4. . Digestion of DNA by Restriction Endonucleases.
5. Estimation of chlorophyll content of green vegetable
6. Determination of lycopene in fruit/vegetable
7. Determination of total pectin in plant material
8. Estimation of crude fiber/dietary fiber content in cereals and their products
9. Estimation of anthocyanin in food sample
10. . Training of sensory panel for flavor perception
11. To perform sensitivity tests for four basic tastes
12. Recognition tests for various food flavors.
13. . To identify a few chemicals and related odors
14. . Sensory evaluation of milk and detection of flavor defects in milk.
15. Textural evaluation of various food products using Texture Analyzer
16. Simple tests for detection of common adulterants- formaldehyde, starch, cane sugar, hydrogen peroxide, sodium bicarbonate in milk.
17. . Colour estimation by Tintometer

Practical II

1. . Sterilization of equipments used in the laboratory by using heat and chemicals.
2. . Determination of physico-chemical properties of water.
3. Testing of sanitizers and disinfectants.
4. Determination of BOD (biological oxygen demand)/ COD in waste water.
5. . Preparation of different types of culture media (complex, differential and selective)
6. Enumeration of aerial microflora using PDA,NAD
7. Microbiological Examination of milk,bread,
8. Bacteriological Analysis of Water
9. . Assessment of surface sanitation by swab/rinse method
10. Scheme for the detection of food borne pathogens
11. . Identification of Molds by lactophenol blue staining Negative Staining
12. . Bacteriological Analysis of Water by MPN method
13. Microbiological Examination of food
14. Determination of drying characteristic
15. . Study of effect of temperature on viscosity
16. Study of evaporation process
17. Freezing time calculation
18. Psychrometrics- use and application.
19. . Determination of freezing characteristics
20. Production of Baker's Yeast
21. Production of yoghurt using DIV cultures
22. Development of a fermented food/drink utilizing plant products /animal products or byproducts as substrate

PROJECTS

- Student has to submit a typed and bound copy of seminar and project dissertation.

Nature of question paper and distribution of marks
Food processing and packaging (Except English)
(Semester I and II)
Theory Examination Marks

Q.1 Objective type	10
(The multiple choice – 10 questions)	
Q.2 Attempt Any Two	20
(A) Descriptive question	
(B) Descriptive question	
(C) Descriptive question	
Q.3 Attempt Any 4 out of 6 (Short Notes / Answers)	20

	50

Practical Examination Marks

Q.1 Major Experiment	15
Q.2 Minor Experiment	10
Q.3 Minor Experiment	10
Q.4 Journal	05

Total marks –	40

(Nature of question paper of English will be as per general B.Sc. Part III)

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Project -100 Marks
Industrial Training - 20 Marks

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