SHIVAJI UNIVERSITY, KOHLAPUR

SYLLABUS
FOR

B.Sc. Food Processing and Packaging (Entire)
Second Year
SEMESTER SYSTEM
III / IV SEMESTERS

Effective from Academic Year
2017-18 onwards

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

COURSE STRUCTURE :

BFPP -II (SEMESTER-III)

SR. NO.	PAPER NO.	SUBJECTS	MARKS	LECTURES /WEEK
1.	BFPP 301	Processing of fruits and vegetables	50	03
2.	BFPP 302	Processing of Milk and milk products	50	03
3.	BFPP 303	Processing of Cereals and pulses	50	03
4.	BFPP 304	Processing of Meat and poultry	50	03
5.	BFPP 305	Processing of Sea foods	50	03
6.	BFPP 306	Food packaging I	50	03
7		Environmental science	Grade	03
		Total	300	21

BFPP -II (SEMESTER-IV)

SR. NO.	PAPER NO.	SUBJECTS	MARKS	LECTURES /WEEK
1	BFPP 401	Processing of seeds and fats	50	03
2	BFPP 402	Processing of Bakery products	50	03
3	BFPP 403	Processing of Confectionary products	50	03
4	BFPP 404	Processing of Food biochemistry	50	03
5	BFPP 405	Processing of Plantation crops and spices	50	03
6	BFPP 406	Food packaging II	50	03
7		Environmental science	Grade	03
		Total	300	21

Note:

1. **Environmental Science Examination pattern as per General B.Sc.**

2. **Practical Examination will be conducted annually.**

Details of Practical:

SR. NO.	SUBJECTS	MARKS	Work load /WEEK
1	Practical –I	90	08
2	Practical-II	90	08
3	Practical-III	90	08
4	Market Survey	20	
5	Industrial Visit	10	
	Total Marks	300	

BFPP 301 : Processing of Fruits and Vegetables

UNIT I Introduction of fruits and Vegetables (10 Lectures)

- Classification and composition of fruits and vegetables;
- Climacteric and no-climacteric fruits;
- Post harvest handling, precooling methods, post harvest treatments, edible coatings.
- Storage of fresh Fruits and Vegetables–Ambient, Refrigerated, Modified atmosphere, evaporative cool storage.

UNIT II JAMS, JELLIES AND MARMALADES (10 Lectures)

- Introduction**,**
- Jam: Constituents, selection of fruits, processing & technology**,**
- Jelly: Essential constituents(Role of pectin, ratio), Theory of jelly formation, Processing & technology, defectsin jelly**,**
- Marmalade : Types, processing & technology, defects

UNIT III FRUITS BEVERAGES (10 Lectures)

- Introduction,
- Processing of fruit juices (selection, juice extraction, deaeration, straining, filtration and clarification),
- Preservation of fruit juices (pasteurization, chemically preserved with sugars, freezing, drying, tetra-packing, carbonation),
- Processing of squashes, cordials, nectars,concentrates and powder.

UNIT IV Tomato products and potato products (10 Lectures)

- Introduction
- Preparation of tomato juice, soup
- Preparation of tomato puree, ketchup
- Potato chips

Recommended Books:

1) Preservation of Fruits and Vegetables – Girdhari Lal, Siddhapa and Tondon, ICAR, New Delhi.
2) Hand Book of Analysis and Quality Control of Fruits and Vegetable Products – S. Ranganna Tata McGraw Hill, New Delhi.
3) Commercial Vegetable Processing–Wood Roof and Lue.
4) Commercial Fruit and Vegetable Processing–W.V. Cruses.
5)Preservation of fruits and vegetables :principles and practices by Dr.Shrivastav and Dr.Sanjeev kumar

BFPP 302 :Processing of Milk and Milk Products

Unit I Introductionof Dairy Technology (10 Lecture)

- Development of milk processing industry in India present status & scope.
- Dairy layout for small scale, Dairy design & sanitation layout
- Dairy equipments & sanitation
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Unit II Introduction of milk & primary processes (10 Lecture)

- Food value & Composition of milk.
- Factors affecting Composition of milk.
- Buying, receiving, collection, Transportation of milk, storage & distribution of milk
- Processing of milk, filtration, clarification, cream separation & heat treatment of milk

Unit III Different Milk products (10 Lecture)

- Milk product Processing – cream, Butter, Khoa , Paneer, Ice-cream, condensed milk & evaporated milk
- Judging & grading of milk & its products
- Manufacturing of Cheddar cheese – Introduction, Manufacturing process, packaging, storage, defects and their prevention
- Dried milk products – Buttermilk powder, Whey Powder, IceCream mix Powder , Infant milk food, WMP& SMP

Unit IV – Byproducts Utilization (10 Lecture)

- Introduction
- Classification & Composition of byproducts
- Principles & methods of Utilization – Whey utilization & whey based beverages like lassi & buttermilk.

Recommend Books

1. outline of Dairy technology by Sukumar De
2. Yarpar, WJ & Hall, C. W. 1975 Dairy technology & Engineering AVI Westport
3. Warner J. M, 1976 Principles of Dairy Processing
4. Rosenthal, 1.1991.Milk &milk products. VCH, Newyork4) Technology of Indian Milk Products by Aneja et al. A Dairy India Publication.
5) PFA Act 1954 & Rules 1955 as amended to date.

BFPP 303 :Processing of Cereals and Pulses

UNIT I Wheat procrssing (10 Lectures)

- Structure and chemical composition of wheat grain.
- Criteria of wheat quality – physical and chemical factors.
- Wheat milling – general principles and operations, cleaning, conditioning and roller milling systems.
- Flour extraction rates and various flour grades and types.
- Criteria of flour quality, dough rheology and its measurement.
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UNIT II Rice processsing (10 Lectures)

- Structure and chemical composition of rice grain;
- Milling of rice – types of rice mill; huller mill, sheller-cum-cone polisher mill;
- Modern rice milling unit operation- dehusking, paddy separation, polishing and grading;
- Factors affecting rice yield during milling; rice bran as rice milling byproducts,
- Rice parboiling technology
-

UNIT III Corn processsing (10 Lectures)

- Structure and composition of corn grain, different types of corn.
- Wet and dry milling of corn, and their products.
- Corn sweeteners (high fructose corn syrups) and their uses.
- Barley malting process: steeping, germination and drying; significance of malting;
- Different types of malts and their food applications.
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UNIT IV Pulses Processing (10 Lectures)

- Structure and composition of pulses.
- Toxic constituents in pulses.
- Processing of pulses- soaking, germination, decortications, cooking and fermentation.
- Milling of pulses- Dry milling,Wet milling.
- Improved milling methods.

Recommended Books

1. Samuel, A.M.(1996) " *The Chemistry and Technology of Cereals as Food and Feed* ", CBS Publisher & Distribution, New Delhi.
2. Pomeranz, Y.(1998) " *Wheat : Chemistry and Technology"*, Vol 1,3" Am. Assoc. Cereal Chemists. St. Paul, MN, USA.
2. Eliasson, A.C. and Larsson, K.(1993) "*Cereals in Breadmaking"*, Marcel Dekker. NewYork.
4. Honeney, R.C.(1986) " *Principles of Cereal Science and Technology"*, Am. Assoc. Cereal Chemists, St. Paul, MN, USA.
5. Pomeranz, Y. (1976*) " Advances in Cereal Science and Technology",* Am. Assoc. Cereal Chemists St.Paul, MN, USA.
6. Juliano, B.O.(1685*). " Rice Chemistry and Technology",* Am. Assoc. Cereal Chemists, St. Paul, MN,USA.
7. Blanshard J.M.V., Frazier, P.J. and Galliard, T. Ed. 1986. *Chemistry and Physics of Baking.* Royal Society of Chemistry, London.
7. Chakraverty, A. 1988. *Postharvest Technology of Cereals, Pulses and oilseeds*. Oxford and IBH, New Delhi.
8. Durbey, S.C. 1979. *Basic Baking: Science and Craft.* Gujarat Agricultural Universty, Anand (Gujrat).
10. Kent, N.L. 1983. *Technology of Cereals.* 3rd Edn. Pergamon Press, Oxford, UK.

BFPP 304 : Processing of Meat and Poultry

UNIT I Introduction of meat products (10 Lectures)

- Introduction & Importance of meat products in India
- Chemical Composition & microscopic structure of meat
- Transportation, feeding of animal before slaughtering

UNIT II Meat: (10 Lectures)

- Ante-mortem examination of meat animals,
- Pre –slauthering operation
- Scientific techniques of slaughtering,
- Post-portem inspection,
- Storage
- Preservation

UNIT III Egg & egg products (10 Lectures)

- Egg: Structure, composition and nutritive value, Storage and shelf life problems
- Quality evaluation of eggs
- Egg products: egg powder, value added egg products
- Preservation

UNIT IV Poultry processing (10 Lectures)

- Poultry products: types, chemical and nutritive value of poultry meat.
- Slaughtering and evaluation of poultry carcasses.
- Poultry cut-up parts and meat/bone ratio.
- Preservation of poultry meat.

Recommended Books:

1) Lawrie R A, Lawrie's Meat Science, 5th Ed, Woodhead Publisher, England, 1998
2) Parkhurst & Mountney, Poultry Meat and Egg Production, CBS Publication, New Delhi, 1997
3) Pearson & Gillet Processed Meats,3 Ed, CBS Publication, New Delhi, 1997
4) Shai Barbut,Poultry Products Processing,CRC Press 2005
5) Stadelman WJ, Owen J Cotterill Egg Science and Technology, 4th Ed. CBS Publication New Delhi, 2002
6) Joshi, B. P. (1994). Meat Hygiene for Developing Country, Shree Almora Book Depot, India.
7) William J. & Owen J., (1977). Egg Science & Technology, AVI Publishing Company, INC. Westport, Connecticut.
8) Mead, G. (2004). Poultry Meat Processing and Quality. Woodhead Publishers.
9) Panda, P.C. (1992). Text Book on Egg and Poultry Technology, Vikas Publishers

BFPP 305 :Processing of Sea Food

UNIT I **(10 Lectures)**

- Introduction, fisheries resources of the world.
- Types of fish, water activity and shelf-life, Factors affecting quality of fresh fish.
- Fish processing: manufacturing of fish paste and sauces, fish oil, fish protein concentrate and fish meal.
- By-products of fish industry and their utilization.

UNIT II Chilling and Freezing of fish **(10 Lectures)**

- Relationship between chilling and storage life, MAP, general aspects of freezing
- Freezing systems (air blast freezing, plate or contact freezing, spray or immersion freezing)
- Changes in quality in chilled and frozen storage, thawing.

UNIT III Fish Curing and Smoking **(10 Lectures)**

- Drying and salting of fish, , salting process,
- Salting methods (brining, pickling, kench curing, Gaspe curing),
- Dried and salted fish products- pindang, fishwood, dried shrimp.
- Preservation by smoking, smoke production , smoke components, quality, safety and nutritive value of smoked fish, processing and equipment, pre-smoking processes, smoking process control.
- Traditional chimney kiln, modern mechanical fish smoking kiln, examples of smoked and dried products.

UNIT IV Canning of fish **(10 Lectures)**

- Principles of canning , classification based on pH groupings,
- Effect of heat processing on fish,
- Storage of canned fish,
- Pre-process operations and post process operations,
- Cannery operations for specific canned products.(Tuna, Mackerel, Sardine)

BFPP 306 :Food Packaging I

UNIT-I Introduction (10 Lectures)

- Definition and functions of Food packaging.
- Properties of packaging material in relation to these functions, package design.
- Tests for flexible packaging materials.
- Materials used in packaging- rigid, semi rigid and flexible.
- Types of containers- primary & secondary, flexible & rigid, hermetic & non hermetic.

UNIT II Wood And Paper Packaging (10 Lectures)

Packaging materials:

- Wood- structure, types, properties and wooden containers used in packaging, types of wooden boxes.
- Paper and paper board- structure, making, properties, types and uses of paper and paper board, CFB boxes and their comparison with wooden containers.

UNIT III Glass And Metal Packaging (10 Lectures)

Packaging materials:

- Glass – composition, properties, structure, types & manufacture of glass containers, their uses, breakage in glass, closure for glass containers.
- Metals- properties of metals, different metals used in food packaging, steel plate and functions of various constituents of steel, formation of two piece and three piece cans, tinning process, tin free steel, aluminium containers, lacquering –type and applications, aluminium foil, corrosion of metal cans

UNIT IV Packaging Methods (10 Lectures)

- Aseptic packaging of foods: sterilization of packaging material, food contact surfaces & aseptic packaging systems.
- Active food packaging – definition, scope, physical and chemical principles involved,
- Edible films and coatings.

Recommended Books:

1) Fundamentals of Food Packaging by F.A. Paine.
2) Packaging of Food Beverages by F.T. Day.
3) Food Packaging by Saccharow and Grifith.
4) Flexible Packaging of Foods by A.L. Brandy.
5) Principles of Food Packaging by R. Heiss.
6) Robertson, G.L.(2006). Food Packaging: Principles and Practice (2nd ed.), Taylor & Francis
7) Sacharow, S. and Griffin, R.C. (1980) Principles of Foods Packaging, 2nd Ed., Avi,Publication Co. Westport, Connecticut, USA.
8) Athalye, A.S. (1992), Plastics in Packaging, Tata McGraw –Hill Publishing Co., New Delhi.
9) Rooney, M.L. (1995). Active Food Packaging, Blackie Academic & Professional, Glasgow,UK.

10) Bakker, M. (1986) The Wiley Encyclopaedia of Packaging Technology, John Willey & Sons. Inc; New York.
11) Food Packaging Technology Handbook. NIIR Board, National Institute of Industrial Research, 2003
12) Ahvenainen, R. (Ed.) Novel Food Packaging Techniques, CRC Press, 2003
13) Han, J.H. (Ed.) Innovations in Food Packaging, Elsevier Academic Press, 2005
14) Coles, R., McDowell, D. and Kirwan, M.J. (Eds.) Food Packaging Technology, CRC Press, 2003.

BFPP 401 :PROCESSING OFOILS AND FATS

UNIT-I Introduction

- Sources; chemical composition; physical and chemical characteristics;
- Functional and nutritional importance of dietary oils and fats.
- Post-harvest handling storage
- Processing of oilseeds for directs use and consumption.

UNIT-II Extraction

- Extraction of oil by mechanical expelling and solvent extraction and obtaining deoiled cakes suitable for edible purposes.
- Processing of other plant sources of edible oils and fats like coconut, cottonseed, rice bran, maze germ, etc.

UNIT-IV Refining

- Refining: Clarification, degumming, neutralization (alkali refining), bleaching, deodorization techniques / processes. Blending of oils.
- Processing of refined oils: Hydrogenation, fractionation, winterzation, inter-esterification etc. For obtaining tailor-made fats and oils.

UNIT-V Processing of butter

- Production of butter oil, lard, tallow, Margarine, Cocoa butter equivalents, shortenings, low fat spreads, peanut butter etc.
- Speciality fats and designer lipids for nutrition and dietetics,especially by biotechnology.

Books Recommended

1. Bailey's Industrial Oil & Fat Products, 4th ed.John Wiley & Sons.
2. The Industrial Chemistry of Facts & Waxes 3rd. by Balliere,Tindall & Cox.
3. Handling & Storage of Oiseeds,Oils,Fats & Meal by Paterson, HBW.
4. Modern Technology in the Oils & Fats industry by S.C. Singhal,OTA (I).

BFPP 402 :Processing of Bakery Products

Unit I Introduction of Bakery Products (10 Lectures)

- Introduction and Importance of bakery
- Principle involved in bakery products
- working ,principles, application of Dough mixer, moulding machine, oven
- Machines and equipment for batch and continuous processing of bakery products.

Unit II Raw Material Of Bakery Products (10 Lectures)

- Ingredients used in Bakery products and their functions
- Types and quality of flour
- Various dough and their use
- Process parameters
- Heat transfer in baking ,time temperature relationship in baking,

Unit III Processing Of Bakery Products (10 Lectures)

- Fermentation and proofing,
- Procedures of Different types of bakery products - bread, cookies, crackers, cake and biscuits
- cooling and packaging of baked products.
- defects of baked products and preventive measures, specialized baked products (diabetic baked products, pizza, Passover products)

Unit IV Preservation Of Bakery Products (10 Lectures)

- Preservation of baked product -
- Freezing & frozen storage of baked product, equipment for frozen storage
- Canned bakery product
- Quality aspect of preserved baked products
- Maintenance, safety and hygiene of bakery plants.

Recommended Readings

1) Extrusion of Food, Vol 2; Harper JM; 1981, CRC Press.
2) Bakery Technology & Engineering; Matz SA; 1960; AVI Pub.
3) Up to-date Bread Making; Fance WJ & Wrogg BH; 1968, Maclasen & Sons Ltd.
4) Modern Cereal Chemistry; Kent-Jones DW & Amos AJ; 1967, Food Trade Press Ltd
5) John Kingslee: A professional text to bakery and confectionary, New Age International Publication.
6) NIIR Board: The complete technology book on bakery products
7) W.P. Edwards : Science of Bakery Products.
8) Emmanueal Obene : Chocolate science and Technology

BFPP 403 :Processing Of Confectionary Products

Unit – I Introduction Of Confectionary Products

- Importance of confectionery in food industry
- Principle involved in confectionery products
- Classification of confectionary
- Types of confectionary products
- Characteristics of confectionary products

UNIT- II Choclate Processsing

- Chocolate Processing - Ingredients used in chocolate,
- Cocoa butter substitutes,
- Processing of cocoa beans,
- Chocolate refining, conching and molding, enrobing, panning.

UNIT-III Sugar Confectionary

- Sugar confectionary: Types of sugar- production , storage , alternative bulk sweeteners, corn syrup and glucose syrup, sorbitol, xylitol, maltitol, isomalt, lactitol, mannitol, polydextrose
- Chewing gum and Bubble gum- Ingredients, functions ,manufacture.

Unit – IV Boiled And Gelatin Sweeets

- Boiled Sweets - Hard and soft boiled sugar confectionary: fondant, fudge, caramel, toffee, nut brittles
- Gelatine Sweets - Fruit chews, jellies, gums,
- Defects in confectionary: sugar bloom, Fat bloom.

BFPP 404 :Processing of Plantation Crops and Spices

Unit-I Plantation crops

- Importance of plantation crops , chemical composition,
- Processing of Tea leaves: Black tea, Green tea and Oolong tea, Instant tea.
- Processing of coffee : coffee beans, grinding, storage, Soluble /Instant coffee, Use of chicory in coffee, decaffeinated coffee.
- Processing of coconut and cashew nut

Unit-II Spices

- Definition , Classification, , Properties
- Spice oil and Oleoresins — Definition, Technology of Manufacturing
- Use of Spices.
- Production of spices in India
- Adulteration of spices

Unit-III Major spices

- Production and processing of Major Spices -
  Pepper, Cardamom, Ginger, Chillies, Turmeric, onion

Unit-IV Minor spices

- Production and processing of Minor spices –
  Ajwan, coriander, cumin, cinnamon, fenugreek, garlic, mustard, saffron,
, tamarind, cloves, mint, vanilla, asafetida and spice production

BFPP 405 :Food Biochemistry

UNIT-I Enzyme

- Enzyme: Classification, nomenclature, activation energy, Michaelis-Menten equation, Lineweaver Burk Plot, factors affecting enzymes action, mechanism of enzyme action.
- Coenzymes: Classifications (metabolite derived/vitamin derived) function of various types , structure of NAD+, NADP+, FAD & FMN,

UNIT-II Protein

- Proteins: Utilization of protein in body proteins products of protein metabolism.
- Disorders inmetabolism, clinical proteins associated with excess and deficiency of proteins.
- Nucleic acids: Nucleotides, Nitrogenous Bases- Purines and Pyrimidines; tautomers of bases, nucleotide derivatives, nucleotides as regulating molecules, different types of DNA and RNA

UNIT-III Carbohydrates

- Utilization of carbohydrates in body metabolism of carbohydrates
- Disorder in metabolism.

UNIT-IV Lipid

- : Utilization of fats, biosynthesis of fatty acids and fats,
- Clinical disorders associated with fats.

Books Recommended :

1. Food :Facts and Principles-N. Shakuntala Manay, N.Shadksharawamis.
2. Food Science-B.Srilakshmi
3. Fundamentals of Nutrition-L Loyd McDonald
4. Principles of Biochemistry-Lehninger

BFPP 406 :Food Packaging II

UNIT-I Plastic Packaging (10 Lectures)

- Plastic packaging materials: classification of polymers, functional and mechanical properties of thermoplastic polymers;
- Processing and converting of thermoplastic polymers
  testing of plastic packages.

UNIT-II Techniques & methods used for Packaging (10 Lectures)

- Techniques & methods used for Packaging of cereals and cereal product, fruits and vegetables & their products, milk and milk products and meat and meat products, beverages.
- Shelf life evaluation of packed products.

UNIT-III Oxygen absorbents (10 Lectures)

- Classification and main types of oxygen absorbents, factors influencing the choice of oxygen absorbents,
- Application of oxygen absorbents for shelf-life extension of food and advantages and disadvantages of oxygen absorbents.

UNIT-IV Safety considerations in food packaging (10 Lectures)

- Types of food safety problems associated with package, package labeling and food safety.
- Food packaging & environment-recycling, composting, thermal treatment & land fill.

Recommended Books:

1. Fundamentals of Food Packaging by F.A. Paine.
2. Packaging of Food Beverages by F.T. Day.
3. Food Packaging by Saccharow and Grifith.
4. Flexible Packaging of Foods by A.L. Brandy.
5. Principles of Food Packaging by R. Heiss.

BFPP II PRACTICALS

Practical I: FOOD PROCESSING I

1.Judging the maturity indices of important fruits
2. Judging the maturity indices of important vegetables
3.Identification of equipment required for fruit and vegetable processing
4. Preparation of instant fruit juice, soup mix, vegetable juice
5. Preparation of squash, RTS ,Juice, Nectar, Cordial, Crush, Syrup Jam ,Jellies ,Marmalade
6,Preparation of Preserve and Candied Fruit
7.Preparation of Pickle
8.Preparation of food product by drying:
(Onion flakes ,Raw mango powder / Leafy vegetable powder, Potato chips,Vegetables)
9.Platform tests in milk.(Acidity,COB,MBRT,specific gravity,SNF
10. Estimation of milk fat by Gerber method.
11Adulteration tests for different foods: Milk and milk products
12. Preparation of Skim Milk and Whole Milk Powder
13.Preparation of Flavoured milk using additives
14.Preparation of Condensed milk
15.Preparation of instant kheer mix
16.Preparation of Ice-cream and Kulfi mix
17.Preparation of Paneer and instant rasgulla
18.Preparation of Khoa and instant gulab jamun mix
19. Preparation of Curds and Shrikhand
20.Slaughtering and dressing of meat animals.
21.Study of post-mortem changes in meat
22Preservation of meat by different methods
23.Estimation of moisture content of meat
24. Analysis of frozen meat/meat emulsion products (Chemical and Microbial)
25. To study shelf-life of eggs by different methods of preservation
26 Evaluation of eggs for quality parameters(market eggs,branded eggs)
27. To perform freezing of yolk/albumen
28. Meat/Egg product formulation
29.Quality evaluation of fish/prawn.
30Preparation of instant fish products

Practical II FOOD PROCESSING II

1) Physical characteristics of Wheat.
2) Estimation of Polenske Value of flour.
3) Estimation of Potassium Bromate in flour.
4) Physical and cooking characteristics of Rice .

5) Determination of sedimentation power of flour
6) Identification of whole spices.
7) Determination of Essential oil in spices.
8) Detection of Adulteration in Spices
9) Determination of the effect of heat on sugar solution
10) To study the process of inversion, melting and caramelization in sucrose.
11) Preparation of pizza base and assessment of its quality
12) Preparation of bread and assessment of its quality.
13) Preparation of butter cake , sponge cake , instant cake mix and assessment of its quality.
14) Preparation of biscuits and cookies and assessment of quality.
15) Preparation of fondant, fudge and brittles.
16) Preparation of candy and toffee and their quality assessment tests.
17) Preparation of instant dhokla, upma ,Pakoda mix
18) Preparation of instant dosa, idli, sambar mix
19) Preparation of Chocolate
20) .Preparation of instant coffee,tea

Practical III PACKAGING AND BIOCHEMISTRY

1. To determine basis weight of paper and paper board
2. To determine thickness of paper and paper board
3. To determine Cobb's value of a paper board
4. To find out the uniformity and amount of wax on wax paper
5. To determine the thermal shock resistance of a glass container
6. To find out the porosity of tin plate.
7. To find out the tin coating weight.
8. To identify the different types of packaging materials
9. Shelf life studies of packaging foods.
10. To determine grease resistance of packaging materials.
11. To see the chemical resistance of packaging material.
12. Determination of water vapour transmission rate of various packaging materials
13. To study the different layers of a laminate
14. Estimate the quantity of ascorbic acid, thiamine, Riboflavin, Vitamin A in food sample.

15 .Estimate the quantity of iron, phosphorous, copper, lead & arsenic in food sample.
16.Estimate the quantity of amino acid, carotenoids & chlorophyll by paper and column chromatography method.
17. Study of thin layer chromatography
18.Study of paper chromatography
19.To estimate the quantity of enzyme activity
20. To study the effect of temperature, pH and substrate concentration on enzyme activity.

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- Market Survey
- Industrial Visit

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Syllabus of Environmental Studies

(as a Compulsory Paper for all Undergraduate Courses)

1. Nature of Environmental Studies : (2 lectures)

Definition, scope and importance.
Multidisciplinary nature of environmental studies
Need for public awareness.

2. Natural Resources and Associated Problems : (8 lectures)

a) Forest resources: Use and over-exploitation, deforestation, dams and their effects on forests and tribal people.
b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.
c) Minral resources: Usage and explolitation. Environmental effects of extracting and using mineral resources.
d) Food resources: World food problem, changes caused by agriculture effect of modern agriculture, fertilizer-pesticide problems.
e) Energy resources: Growing energy needs, renewable and nonrenewable energy resources, use of alternate energy sources. Solar energy , Biomass energy, Nuclear energy,
e) Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification.
Role of an individuals in conservation of natural resources.

3. Ecosystems : (8 lectures)

Concept of an ecosystem.
Structure and function of an ecosystem.
Producers, consumers and decomposers.
Energy flow in the ecosystem.

Ecological succession.
Food chains, food webs and ecological pyramids.
Introduction, types, characteristics features, structure and function of the following ecosystem :-
a) Forest ecosystem, b) Grassland ecosystem, c) Desert ecosystem, d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

4. Biodiversity and its conservation : (8 lectures)

Introduction- Definition: genetic, species and ecosystem diversity.
Bio-geographical classification of India.
Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values.
India as a mega- diversity nation.
Western Ghat as a biodiversity region.
Hot-spots of biodiversity.
Threats to biodiversity habitat loss, poaching of wildlife, man- wildlife conflicts.
Endangered and endemic species of India.
Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

5. Environmental Pollution : (8 lectures)

Definition: Causes, effects and control measures of: Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards.
Solid waste Management: Causes, effects and control measures of urban and industrial wastes.
Role of a individual in prevention of pollution.

6. Social Issues and the Environment : (8 lectures)

Disaster management: floods, earthquake, cyclone, tsunami and landslides
Urban problems related to energy.
Water conservation, rain water harvesting, watershed management.
Resettlement and rehabilitation of people; its problems and concerns.
Environmental ethics: Issue and possible solutions.
Global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust.
Wasteland reclamation.
Consumerism and waste products.

7. Environmental Protection : (8 lectures)

From Unsustainable to Sustainable development
Environmental Protection Act.
Air (Prevention and Control of Pollution) Act.
Water (Prevention and control of Pollution) Act
Wildlife Protection Act
Forest Conservation Act
Population Growth and Human Health, Human Rights.

8. Field Work : (10 lectures)

Visit to a local area to document environmental assets-
River/forest/grassland/hill/mountain.

or

Visit to a local polluted site – Urban/Rural/Industrial/Agricultural

or

Study of common plants, insects, birds.

or

Study of simple ecosystems - ponds, river, hill slopes, etc.
(Field work is equal to 10 lecture hours)

References :

1) Agarwal, K.C.2001, Environmental Biology, Nidi Pubi. Ltd., Bikaner.
2) Bharucha Erach, The Biodiversity of India, Mapin Publishing pvt. Ltd., Ahmedabad 380013, India, Email:mapin@icenet.net (R)
3) Brunner R.C.,1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p
4) Clank R.S. Marine Pollution, Clanderson Press Oxford (TB)
5) Cunningham, W.P. Cooper, T.H.Gorhani, E. & Hepworth, M.T.2001, Environmental Encyclopedia, Jaico Publ. Hpise, Mumbai, 1196p
6) De A.K., Environmental Chemistry, Wiley Wastern Ltd.
7) Down to Earth , Cebtre fir Scuebce and Environment (R)
8) Gleick, H.,1993, Water in crisis, Pacific Institute for studies in Dev., Environment & Security. Stockholm Env. Institute. Oxford Univ. Press 473p
9) Hawkins R.e., Encyclopedia of Indian Natural History, Bombay Natural History Society, Bombay (R)
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11) Jadhav, H.& Bhosale, V.M.1995, Environmental Protection and Laws, Himalaya Pub. Hcuse, Delhi 284p.
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Nature of question paper and distribution of marks
Food processing and packaging
(Semester III and IV)

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

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Practical Examination	**Marks**
(90 Marks for each Practical course)	
Q.1 Major Experiment	20
Q. 2 Major Experiment	20

Q.3 Minor Experiment	15
Q.4 Minor Experiment	15
Q.5 Spotting	10
Q.6 Journal	10

	90

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Industrial Visit : 10

Market Survey: 20

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