

YASHAVANTRAO CHAVAN INSTITUTE OF SCIENCE, SATARA (Autonomous)

**Draft Syllabus Structure for M.Sc.-I Food Processing and Packaging
(2021-22)**

YASHAVANTRAO CHAVAN INSTITUTE OF SCIENCE, SATARA									
COURSE STRUCTURE UNDER CHOICE BASED CREDIT SYSTEM (CBCS)									
M.Sc. Food Processing and Packaging (ENTIRE)									
M. Sc. ISEMESTER– I(Duration– 6Months)									
Sr. No.	SUBJECT CODE	PAPERNO AND TITLE	TEACHINGSCHEDULE						
			Theory			Practical			
			No. oflectures	Hours	Credits	Subject	No. oflectures	Hours	Credits
1	MFPT 101	Post-Harvest Technology of Fresh Horticulture Produce	4	4	4	MFPP 105: Post Harvesting of Horticulture Produce and New food product development	8	8	4
2	MFPT 102	New Food Product Development	4	4	4				
3	MFPT 103	Introduction to paper and paperboard ,Plastics and Polymer	4	4	4	MFPP--106: Paper and paperboard, Plastics and Polymer packaging and Research Methodology.	8	8	4
4	MFPT 104	Research Methodology	4	4	4				
Total of SEMI			16	16	16		16	16	8

YASHAVANTRAO CHAVAN INSTITUTE OF SCIENCE, SATARA
COURSE STRUCTURE UNDER CHOICE BASED CREDIT SYSTEM (CBCS)

M.Sc. Food Processing and Packaging (ENTIRE)

M. Sc. ISEMESTER– II (Duration– 6Months)

Sr. No.	SUBJECT CODE	PAPER NO AND TITLE	TEACHING SCHEME						
			Theory			Practical			
			No. of lectures	Hours	Credits	Subject	No. of lectures	Hours	Credits
1	MFPT 201	Technology of Cereals, Legumes and Oil Seeds	4	4	4	MFPP 206:Technology of Cereals, Legumes and Oil Seeds and Meat and Instrumentation and Process Control	8	8	4
4	MFPT 202	Food Plant Layout	4	4	4				
4	MFPT 203	Packaging Laws and Regulation	4	4	4	MFPP 207:Packaging Laws and Regulation and Instrumentation and Process Control	8	8	4
4	MFPT 204	Instrumentation and Process Control	4	4	4				
Total of SEM II			16	16	16		16	16	8

YASHAVANTRAO CHAVAN INSTITUTE OF SCIENCE, SATARA
COURSE STRUCTURE UNDER CHOICE BASED CREDIT SYSTEM (CBCS)

M.Sc.Food Processing and Packaging (ENTIRE)

M.Sc. II SEMESTER– III (Duration– 6 Months)

Sr. No.	SUBJECT CODE	PAPERNO ANDTITLE	TEACHINGScheme						
			Theory			Practical			
			No. oflectures	Hours	Credits	Subject	No. oflectures	Hours	Credits
1	MFPT 301	Quality Evaluation of Supply chain of Fresh produce	4	4	4	MFPPP 305 :Quality Evaluation of Fresh produce and Advanced food packaging	8	8	4
2	MFPT 302	Advanced Food Packaging	4	4	4				
3	MFPT 303	Climate Smart and Food Security	4	4	4	MFPP 306 : Research Project	8	8	4
4	MFPT 304 A	Cold Storage and Refrigeration	4	4	4				
5	MFPT304B	Green Storage Technology	4	4	4				
Total of SEMIII			16	16	16		16	16	08

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COURSE STRUCTURE UNDER CHOICE BASED CREDIT SYSTEM (CBCS)

M.Sc. Food Processing and Packaging (ENTIRE)

M.Sc. II SEMESTER – IV (Duration – 6 Months)

Sr. No.	SUBJECT CODE	PAPER NO AND TITEL	TEACHING SCHEME						
			Theory			Practical			
			No. of lectures	Hours	Credits	Subject	No. of lectures	Hours	Credits
1	MFPT 401	Snack Food and Extrusion Technology	4	4	4	MFPP 405: Status Paper cum seminar	8	8	4
2	MFPT 402	Renewable energy in Food Processing	4	4	4				
3	MFPT 403	Packaging Design Concepts and application of computer in Packaging Design	4	4	4	MFPP 406: Internship	8	8	4
4	MFPT 404A	Marketing Management in Food Sector	4	4	4				
5	MFPT 404B	Entrepreneurship in Food Processing	4	4	4				
Total of SEMIV			16	16	16		16	16	8

SEMESTER I

MFPT-101 Post Harvest Management of Fresh Horticulture produces

Learning Objective: Students should-

1. Understand and learn the relevance of post harvest management of fruits and vegetables.
2. Impart knowledge about best practices in fruits and vegetables to reduce post harvest losses.
3. Understand and learn evaluation and management of quality.
4. Understand export regulations and requirement for fresh fruits.

UNIT-I: Introduction of post harvest technology

(15 Lectures)

Introduction of post harvest technology (India and abroad); Need of post-harvest technology. Effect of pre-harvest factors (soil, water, climatic factors etc.) on the quality of fresh horticultural produce; Postharvest biology of horticultural crops; Maturity, Maturity indices, ripening, climacteric phenomena and senescence; Harvesting and harvesting systems

UNIT-II: General post-harvest considerations

(15 Lectures)

Effects of temperature on post harvest life of horticultural produce (impact of temperature, cooling of produce, methods of cooling); Storage atmosphere (oxygen & carbon dioxide, storage in plastic films, hypobaric storage, ethylene in storage and management.

UNIT-III Packing house unit operations

(15 Lectures)

Needs of a packing house Safety and hygiene sanitation; on farm food safety for fresh produce; Evaluation and management of Quality; Packinghouse operations; Quality selection and size-grading, Special treatments after packaging.

UNIT-IV Post harvest handling operations

(15 Lectures)

Post-harvest handling for fruits; Preparation for market; Measuring quality; Evaluation and management of quality; Methods for determining quality of fresh commodities, Export regulations and requirement for selected fresh fruits - banana, pomegranate, citrus, mango, guava, apples, lichi and selected vegetables of national importance - lady finger, chilies, tomato, sweet corn.

Recommended Readings:

1. Roberston G.L. 2006. Food Packaging: Principles and Practice. Taylor and Francis.
2. Mattsoon B. and Sonesson U. 2000 Environment-friendly food processing. Woodhead Publishing Ltd.
3. Ahevenainen R. 2003. Novel Food Packaging Techniques. Woodhead Publishing Ltd.
4. J. F. Hanlon, R. J. Kelsey, and H. R. Forcinia, 1985 Handbook of Packaging Engineering, 3ded., Technomic Publishing, Basel.
5. Postharvest Technology of Horticultural Crops by Adel Kader

6. Postharvest by R. Wills, B. McGlasson, D. Graham, and D. Joyce
7. Fruits and Vegetable Preservation : Principles and Practices by R.P. Shrivastava and SanjeevKumar
8. Postharvest Physiology, Handling and Utilization of Tropical and Sub-Tropical Fruits andVegetables by E.B. Pantastico
9. Postharvest Technology of Fruits and Vegetables by L.R. Verma
10. IIHR-ICAR document on postharvest losses
11. Handling of fresh fruits, vegetables and root crops - Agricultural Marketing Improvement Prepared By Gaetano Paltrinieri Senior Food Technology and Agro-industries Officer

Course outcomes.

Unit I: After completion of the unit, Student are able to

1. Understand the need for post-harvest technology
2. Understand the harvest and harvesting techniques.

Unit II: After completion of the unit, Student are able to

1. Understand the effect of temperature on post-harvest horticulture produce.
2. Understand the storage and its management.

Unit III: After completion of the unit, Student are able to

1. Evaluate the need, safety and sanitation of fresh produce.
2. Understand the special treatments after packaging

Unit IV: After completion of the unit, Student are able to

1. Understand the know technologies of extending shelf life of fresh horticulture produce
2. Understand Share information about recent trends in research and sharing of domain knowledge and protocols for storing fruits and vegetables.

MFPT 102: New Food Product Development

Learning Objective: Student should:

1. Define New Product, Classification, and reason for food product development.
2. Understand product development process, Product launch process.
3. Understand the nutritional and sensory analysis, shelf life study of new product.
4. Understand the marketing of food product.

UNIT-I: Introduction and Definition of New food Product

(15 Lectures)

Introduction, Definition of New Products, Reason for new food product development, Types new product, Concept of Novel food, Life cycle for a food product, Ideas for the development of a New Food Product: internal and external sources, Advantages and disadvantages of new product development process, Marketplace studies- Focus groups, Interviews, Consumer testing.

UNIT-II: Process of product development

(15 Lectures)

Concept of product development - product success and failure, factors for success, , managing for product's success. Innovation strategy. Product development process - product strategy, product design and process development, product commercialization, product launch and evaluation.

UNIT-III: Analysis and Legal requirement for new product

(15 Lectures)

Nutritional and sensory evaluation of a new product, Shelf life testing- Static, accelerated and use/abuse tests, Packaging requirements of new product, Cost estimation, Direct and indirect costs, Legal aspects to be applied in New Food Product Development - Composition, labelling and claims.

UNIT-IV: Marketing of new product

(15 Lectures)

Role of consumers in product development, managing the product development process, improving the product development process - evaluating product development, innovative matrices, striving for continuous improvement, improving success potential of new products, market exploration and acquisition, legal aspects of new product launch.

Recommended Readings-

1. Clarke & Wright W. Managing New Product and Process Development, (Free Press, 1999.)
2. Earle and Earle, Creating New Foods, (Chadwick House Group, 2001)
3. Earle R, Earle R & Anderson A, Food Product Development, (Wood head Publ. 2001)
4. Fuller. New Food Product Development, (Concept to Market Place. CRC. 2004)
5. Moskowitz, Howard R. An Integrated Approach to New Food Product Development,(CRC Press, 2009.)

Course outcomes.

Unit I: After completion of the unit, Student are able to

3. Define new product, its classification.
4. Understand the reason and shelf life study of new product.

Unit II: After completion of the unit, Student are able to

3. Understand the product success and failure.
4. Understand the process of product development, product launch and evaluation.

Unit III: After completion of the unit, Student are able to

3. Evaluate the product on the basis of nutritional and sensory analysis.
4. Understand the legal aspects to be applied in New Food Product Development.

Unit IV: After completion of the unit, Student are able to

1. Understand the role of consumers in product development process.
2. Understand improving success potential of new products

MFPT 103 Introductions to Paper and Paperboard, Plastics and Polymer

Learning Objectives: Students should:

1. Understand the fundamentals of polymer science.
2. Study paper and their manufacturing process
3. Study the different types of plastics and their associated properties.
4. Understand the various testing methods employed on plastic materials

UNIT I: Introduction to Polymers

(15 Lectures)

Introduction to Historical Background of Polymer Science, Various applications of polymers, Raw materials, Market and future of polymers, India in global scenario, Classification of Polymers

Classification based on structure, origin, fabrication, properties, Introduction to polymeric blends and composites: Significance of polymeric blends and composites, miscellaneous materials used in blending and preparation of composites, applications of polymeric blends and composites.

UNIT II: Introduction to paper**(15 Lectures)**

Types of papers, Paper properties: Optical properties – Color, brightness, smoothness, gloss, opacity and rub resistance, Strength properties–thickness, grammage, tensile, tear, bursting strength, stiffness, Grain direction, Wire and Felt sides Paper based packaging: Paper bags & Applications- Types of bags- Multiwall Paper bags – Composite containers, Manufacturing & Applications convolute/ spiral/lap winding –Fiber drums- Regenerated Cellulosic films.

UNIT III: Paper Board Manufacture, cartons and Boxes**(15 Lectures)**

Paper Board Manufacture: Forming section, wet pressing, drying, and calendaring, paperboard properties and their control during manufacture Folding Cartons – Styles and Applications- Designing and manufacturing-Set up box applications and manufacturing process- Corrugated Fiber Board(CFB) – structure and materials ,Types of flutes and their characteristics- Manufacturing process of CFB- Making of CFB box- Styles of boxes- Properties of CFB Solid Fiber board box manufacturing, materials and applications. Moulded pulp board – moulding process, applications.

UNIT IV: Commodity Plastics in Packaging**(15 Lectures)**

Polyethylene (PE): Types, Properties and Applications. Polypropylene(PP): Varieties, Properties and Applications. Polyvinyl Chloride (PVC): Properties, Compounding and Applications. Polystyrene (PS): Types, Properties and Applications. Copolymerization, Alloying and Blending, Applications of Amino plastics (Urea Formaldehyde and Melamine Formaldehyde), Phenolic, Epoxies, Unsaturated Polyesters, Polyurethane. Brief introduction on Biodegradable plastics / Bio plastics.

Recommended Readings-

1. Gullichsen J. and Paulapuro H., *Papermaking Science and Technology, Book 12: Paper And Paperboard Converting* (Ed. Savolainen A.),(Finnish Paper Engineers' Association and TAPPI. 2012)
2. Gullichsen J. and Paulapuro H., *Papermaking Science and Technology, Book 13: Printing* (Ed. Oittinen P. and Saarelma H.), (Finnish Paper Engineers' Association and TAPPI.2012)
3. Gullichsen J. and Paulapuro H., *Papermaking Science and Technology, Book 17: Pulp and Paper Testing* (Ed. Levlin J.-E. and Söderhjelm L.), (Finnish Paper Engineers' Association and TAPPI. 2012)
4. Mark R. E., *Handbook of Physical and Mechanical Testing of Paper and Paperboard*, (Vol. 1&2, Marcel Dekker. 2002)
5. Campbell I.M., *Introduction to synthetic polymers*, (Oxford University Press)

Course outcomes.**Unit I: After completion of the unit, Student are able to**

1. Understand the polymers and its market importance.
2. Understand the applications of polymeric blends.

Unit II: After completion of the unit, Student are able to

1. Understand the papers and types of papers.
2. Understand the applications of various paper bags.

Unit III: After completion of the unit, Student are able to

1. Understand the manufacturing of paper boats, folding cartons, etc
2. Understand the applications of all the manufacturing process.

Unit IV: After completion of the unit, Student are able to

1. Understand the polyethylene and its types.
2. Understand the applications of plastics in packaging.

MFPT 104 Research Methodology

Learning Objectives: Students should:-

1. Get basic knowledge on the fundamentals of research methodology.
2. Learn how to present research in scientific manner.
3. Get acquainted with different bio statistical tools in modern research.
4. Understand the relationship between statistics and biological research.

UNIT I: Introduction to Research Methodology I (15 Lectures)

A) Research Methods vs. Methodology

- i) Introduction.
- ii) Types: Library research, field research, laboratory research.

B) Defining a Research Problem

- i) Concept.
- ii) Selecting the research problem.
- iii) Techniques involved in defining problem.
- iv) Conclusion of the problem.

C) Research Design

- i) Need for research design.
- ii) Concept in research design.
- iii) Types of research design.

D)Developing a Research Plan

- i) Need.
- ii) Essential characteristics of research plan.

UNIT II: Introduction to Research Methodology II (15 Lectures)

A)Reporting Practical and Project Work

- i) Structure of report
- ii)Title, authors and their institution,abstract, keywords, abbreviations.
- iii) IMRAD technique
 - a) Introduction
 - b) Material and methods
 - c) Result discussion and conclusion
 - d) Acknowledgements.

B)Preparing a Grant Proposal for Research Project

C)Manuscript Submission to Research Journals

- i) Statement of proposal.
- ii) Ethical considerations.
- iii) Publishing editorial issues.
- iv) Preparation and submission.

UNIT III: Descriptive Statistics (15 Lectures)

A)Importance of statistics in Biology

- i) Samples and Population
- ii) Types of data, random sampling methods and sampling errors, scales andvariables, accuracy and precision.

B)Measures of Central Tendency

- i) Mean (arithmetic, geometric, harmonic), median, percentile and mode.
- ii) Measures of dispersion – mean deviation, standard deviation and variance.
- iii) Measures of a) Skewness b) Kurtosis.

UNIT IV: Hypothesis Testing (15 Lectures)

A) Introduction to Hypothesis Testing

- i) Null hypothesis

ii) Alternate hypothesis.

B) Statistical Tools

i) Significance level, type I and type II errors, p-value, one tailed and two tailed tests.

ii) Distribution of sample means, standard error and confidence interval,

Degrees of freedom

iii) Equality of two population means, proportions: t-tests and z test

iv) Chi-square test - test for goodness of fit, independence and homogeneity

v) F test and ANOVA

Recommended Readings

1. N. Gurumani, Scientific thesis writing and paper presentation (Chennai, MJP Publishers, 2010)

2. C. R. Kothari, Research Methodology; Methods and Techniques, 2ndEd, (New Delhi, New Age International Publishers,2004)

3. Irfan Ali Khan and Atiya Khanum, Fundamentals of Biostatistics. 3rdEd. (Hyderabad, Ukaaz Publications)

4. Robert R. Sokal and F. James Rohlf Introduction to Biostatistics,2ndEd, (New York, Dover Publications, INC. Mineola, 1969)

5. P.N. Arora, P. K. Malhan, Biostatistics, (Mumbai, Himalaya Publishing House, 2006)

Course outcomes.

Unit I: After completion of the unit, Student are able to

1. Understand the types of research.
2. Understand research design.

Unit II: After completion of the unit, Student are able to

1. Understand the reporting of practical and project work.
2. Understand the manuscript submission to research journals.

Unit III: After completion of the unit, Student are able to

1. Understand the importance of statistics in biology.
2. Understand the measures of central tendency.

Unit IV: After completion of the unit, Student are able to

1. Understand the hypothesis testing.
2. Understand the statistical tools

MFPP--105: Post Harvesting of Horticulture Produce and New food product development

Learning Objectives: Students should:

1. Estimate shelf life of packaged fruits and vegetables.
2. Understand active modified atmosphere packaging.
3. Understand the process of standardization of product.
4. Understand the sensory evaluation and marketing of product.

Practicals

1. Estimation of shelf life of packaged fruits and vegetable
2. Non-enzymatic browning and estimation of polyphenol oxidase
3. Active modified atmosphere packaging studies of fruits
4. Determine of Water activity
5. Artificial ripening for fruits
6. Market survey of existing products
7. Idea generation and selection of topic
8. Cost analysis of product
9. Standardization of product
10. Development of new product
11. Proximate Analysis of new products
12. Sensory evaluation
13. Marketing
14. Visit to Startup Company
15. Consumer feedback studies

Recommended Readings

1. Ahevenainen R. Novel Food Packaging Techniques. Woodhead Publishing Ltd. 2003.

2. J. F. Hanlon, R. J. Kelsey, and H. R. Forcinia, 1985 Handbook of Packaging Engineering, 3rd ed., Technomic Publishing, Basel.
3. Adel Kader Postharvest Technology of Horticultural Crops
4. R. Wills, B. McGlasson, D. Graham, and D. Joyce Postharvest
5. R.P. Shrivastava and Sanjeev Kumar, Fruits and Vegetable Preservation : Principles and Practices,
6. B. Pantastico Clarke & Wright W., Postharvest Physiology, Handling and Utilization of Tropical and Sub-Tropical Fruits and Vegetables E1999. Managing New Product and Process Development. Free Press.
5. Earle and Earle 2001. Creating New Foods. Chadwick House Group.
6. Earle R, Earle R & Anderson A. 2001. Food Product Development. Woodhead Publ.
7. Fuller 2004. New Food Product Development - from Concept to Market Place. CRC.
8. Moskowitz, Howard R. An Integrated Approach to New Food Product Development. CRC Press. 2009

Course outcomes.

After completion, Student are able to:

1. Estimate shelf life of packaged fruits and vegetables.
2. Perform active modified atmosphere packaging.
3. Standardize the product formulation.
4. Evaluate the product by sensory evaluation methods

MFPP 106: Paper and paperboard, Plastics and Polymer packaging and Research Methodology

Learning Objectives: Students should:

1. Understand the determination of Grammage , Bursting strength , Tearing strength of packaging material.
2. Identify flute types, Dimensions, and RCT of packaging material.
3. Understand abstract writing.
4. Understand E-Poster presentation.

Practicals

1. Determination of Grammage and thickness of paper, paperboard and plastic films.

2. Determination of grain direction, felt and wire side of paper.
3. Determination of Cobb value of paper and board.
4. Determination of Bursting strength and burst factor of paper and CFB.
5. Determination of Tearing Strength of paper.
6. Determination of Stiffness of board.
7. Identification of flute types and dimensions of CFB.
8. Determination of individual grammage of CFB plies.
9. Determination of Box Compression strength of a CFB
10. Determination of RCT of paper and ECT of CFB
11. Determination of tensile strength on paper and plastic films.
12. Determination of Dart Impact Test on Plastic Films.
13. Estimation of specular gloss of plastics / paper / paperboard
14. Abstract writing.
15. Review Writing.
16. E-poster Presentation.
17. Determination of measures of central tendency: a) Mean, b) Median, c) Mode
18. Determination of measures of dispersion – a) Mean deviation, b) Standard deviation, c) Coefficient of variation.
19. Estimation of confidence interval for a normal distribution.
20. T-test and chi-square with test on sample data

Recommended Readings

1. Gullichsen J. and Paulapuro H., “Papermaking Science and Technology, Book 12: Paper And Paperboard Converting (Ed. Savolainen A.)”, Finnish Paper Engineers’ Association and TAPPI. 2012
- . Handbook of Analysis and Quality control for fruits and vegetable products S. Ranganna published by McGraw Hill Education (India) PVT. LTD, Chennai, 2 nd edition
2. Food Packaging Technology Richard coles, Derek McDowell and Mork JKirwan. Published Blackwell publishing CRC Press.
3. Novel Food Packaging Techniques, Raija Ahvenainen, WOODHEAD PUBLISHING LIMITED
4. Determination of water absorptive of corrugated fiberboard (Cobb test)- FEFCO TESTING METHOD- April 1986 amended in 1985, 1994, March 1997 TAPPI Standards: Regulations and Guidelines. Revision of T410m-08.
5. TAPPI Standards: Regulations and Guidelines. Revision of T411m-97.1. N. Gurumani (2010) Scientific thesis writing and paper presentation, MJP Publishers, Chennai – UNIT I, II.
2. C. R. Kothari (2004) Research Methodology; Methods and Techniques, 2nd Ed, New Age International Publishers, New Delhi –

3. Irfan Ali Khan and AtiyaKhanum, Fundamentals of Biostatistics. 3rdEd.Ukaaz, Publications, Hyderabad –
4. Robert R. Sokal and F. James Rohlf (1969) Introduction to Biostatistics,2ndEd, Dover Publications, INC. Mineola, New York –
5. P.N. Arora, P.K.Malhan (2006) Biostatistics, Himalaya Publishing House, Mumbai.

Course outcomes.

After completion, Student are able to:

1. Determine Grammage , Bursting strength , Tearing strength of packaging material.
2. Identify flute types, Dimensions, and RCT of packaging material.
3. Write abstract.
4. Present E-Poster.

SEMESTER II

MFPT 201 TECHNOLOGY OF CEREALS, LEGUMES AND OIL SEEDS AND FOOD PLANT LAYOUT

Learning Objectives: Students should:-

1. Get basic knowledge of wheat processing
2. Get basic knowledge of Riceprocessing.
3. Understand the processing of Corn, Barley and Oats.
4. Understand the processing for production of edible oil,

UNIT -I : Wheat Processing

(15 Lectures)

Wheat: Types and physicochemical characteristics; wheat milling -products and byproducts; factors affecting quality parameters; physical, chemical and rheological tests on wheat flour; additives used in bakery products; flour improvers and bleaching agents; manufacture of bakery products, pasta products and various processed cereal-based foods; manufacture of whole wheat atta, blended flour and fortified flour. Production of starch and vital wheat gluten.

UNIT –II: Rice Processing

(15 Lectures)

Rice: Classification, physicochemical characteristics; cooking quality; rice milling technology; by- products of rice milling and their utilization; Rice bran stabilization, oil extraction and refining, parboiling methods of rice criteria of quality of rice: aging of rice – quality changes; processed products based on rice

UNIT –III: Corn, Barley and Oats

(15 Lectures)

Corn: Types and nutritive value; dry and wet milling, processing of corn in breakfast cereals, snacks, tortilla etc., production of

glucose syrups, dextrose, high fructose corn syrups, modified starches. Barley: composition, milling, malting of barley, chemical and enzymatic changes during malting, uses of malt. Oat: composition, processing of oat, byproducts of oatmeal milling.

UNIT -IV : Legumes and oilseeds

(15 Lectures)

Legumes and oilseeds: composition, anti-nutritional factors, processing and storage; processing for production of edible oil, meal, flour, protein concentrates and isolates; extrusion cooking technology; snack foods; development of low cost protein foods. Oil extraction process – mechanism, solvent, SCE, oil refining, utilization of byproducts of oil milling.

Recommended Readings

1. Chakrabarthy, M.M. (2003). Chemistry and Technology of Oils and Fats. Prentice Hall.
2. Dendy, D.A.V., & Dobraszczyk, B.J. (2001). Cereal and Cereal Products. Aspen.
3. Hamilton, R.J., & Bhati, A. (1980). Fats and Oils - Chemistry and Technology. App. Sci. Publ.
4. Hosoney, R.S. (1994). Principles of Cereal Science and Technology. 2nd Ed. AACC.
5. Kay, D.E. (1979). Food Legumes. Tropical Products Institute. 6. Kent, N.L. (1983). Technology of Cereals. 4th Ed. Pergamon Press

Course outcomes.

Unit I: After completion of the unit, Student are able to

1. Understand the need for wheat processing
2. Understand the manufacture of bakery products.

Unit II: After completion of the unit, Student are able to

1. Understand the Rice Processing
2. Understand the criteria of quality of rice

Unit III: After completion of the unit, Student are able to

1. Evaluate the need, safety and sanitation of fresh produce.
2. Understand the special treatments after packaging

Unit IV: After completion of the unit, Student are able to

1. Understand the know technologies of extending shelf life of fresh horticulture produce.

2. Understand Share information about recent trends in research and sharing of domain knowledge and protocols for storing fruits and vegetables.

MFPT 202 FOOD PLANT ORGANIZATION LAYOUT

Learning Objectives: Students should:-

1. Understand the food plant management.
2. Understand the structure and operations of food plant.
3. Understand the classification of dairy and food plants.
4. Understand the preparation of a plant layout .

UNIT I: Introduction of Plant Organization.

(15 lectures)

Operation Research, definition and scope, techniques in operation research. Food plant management factors bearing on location and layout of food plants, Regulatory requirements of food industries.

UNIT II: Structure and Operation of Food Plant.

(15 lectures)

Structure and operation of food plants, Executive design making in a food plant, Decision protocols, Evolution and role of management planning organizing and controlling, Decision processed for raising efficiency, productivity and quality in food plant operation, System analysis, its need and methodology.

UNIT III: Design of Food Plant

(15 lectures)

Classification of Dairy and Food Plants, farm level collection and chilling center, space requirement. Overall design of an enterprise : Plant design, sales planning for plant design , Strength of material – engineering materials, material science, use of various metals, including plastic, glass, etc. in food industry,

UNIT IV: Preparation of a Plant Layout

(15 lectures)

Plant Layout problem, importance, objectives, and classical types of layouts. Evaluation of Plant Layout. Advantages of good layout. Organizing for Plant Layout, Data forms, Common Problems in Plant Layout and Process scheduling, Sitting of Process sections, Equipment selection and capacity determination

Recommended Readings

- 1 Sivarethinamohan, R. Operations Research. Tata McGraw_Hill Pub. Co. Ltd.,2005
- 2 Managerial Economics- Analysis, Problems and cases.Metha, P.L. 2003., Sultan Chand and Sons, New Delhi.(Unit-I,II)
3. Milk Plant Layout H.S. Hall FAO Pub., Rome 1968 2
4. Plant Layout and Design James M.Moore Mac Millan, New York 1971
- 5.Textbook of Dairy Plant Layout and Design --- ICAR, New Delhi 2010
6. Applied guide to process and plant design Sean Moran Elsevier, 2015
7. Facility Planning And Layout Design ChandrashekarHiregoudar Technical Publications, 2017
8. Engineering for Dairy and Food Products A.W. FaralRebert E., Kriger Pub Co., New York 1980 3
9. Practical Plant Layout Richard Muther McGraw Hill, 1955

Course outcomes.

Unit I: After completion of the unit, Student are able to

1. Understand the plant organization.
2. Understand the techniques in operation research.

Unit II: After completion of the unit, Student are able to

1. Understand the executive design making in a food plan.
2. Understand the productivity and quality in food plant operation

Unit III: After completion of the unit, Student are able to

1. Understand the_classification of dairy and food plants.
2. Design food plant layout.

Unit IV: After completion of the unit, Student are able to

1. Solve plant layout problem.
2. Select Equipment and determine capacity

MFPT 203: Packaging Laws and Regulation

Learning Objectives: Students should:-

1. Understand the Indian regulatory system.
2. Understand the International laws CE Marking.
3. Understand the Sustainable development and processes.
4. Understand the labeling regulations

UNIT I: Indian Regulatory System

(15 lectures)

Indian Regulatory System Introduction, Laws and regulations- Need/Importance – Bureau of Indian Standards The Standards of weights and Measures Act (SWMA), Standard Units, Laws, Regulations and Ministries involved, Essential Commodities Act, Agricultural Produce (Grading and Marketing) Act, Prevention of Food Adulteration Act, Codex Standard Act, Export (Quality Control and Inspection) Act, Declarations on Packaged Commodities -Declarations for Interstate Trade and Commerce, Standard Packages, Maximum Permissible Error, Label Declarations, Standard Quantity specifications for various products, Symbols and Units used.

UNIT II: International Laws CE Marking

(15 lectures)

International Laws CE Marking, EU-REACH Regulations in packaging, RoHS (Restriction on Hazardous Substances), Uniform Weights and Measures Law, Details of Violations, offences, Penalties under various sections, ISO 14000 Environment Management System, IMDG (International Maritime for Dangerous Goods), EU Directives, Various storage requirements of Products, Specifications of Raw Materials used, IS Specifications with respect to packaging and Packaging Materials

UNIT III: Sustainable Development & Processes

(15 lectures)

Introduction to Sustainability, Sustainable Development & Processes, Need Today, Three Pillars of Sustainability & their effects on sustainable growth – Relation with environment waste management, Relevance of Sustainable Development in Packaging Sector – Traditional Packaging vs. Sustainable Packaging.

UNIT IV: Labeling regulations

(15 lecture)

Labeling regulations, Due diligence, Grouping information on the label, Nutritional labelling, Making a claim about vitamins and minerals, Date marking, Allergens declaration, Print size and clarity, Net quantity, Quantitative ingredient declaration/calculation (QUID), Use of symbols or icons, Specific labelling requirement

Recommended Readings

1. S.Ranganna, *Handbook of Analysis and Quality control for fruits and vegetable products* (McGraw Hill Education(India) PVT.LTD, Chennai, 2nd edition, 2008)
2. Richard coles, Derek Mc Dowelland Mork J Kirwan *Food Packaging Technology* (Blackwell publishing CRC Press, 2003)
3. Raija Ahvenainen, *Novel Food Packaging Techniques* (Woodhead Publishing Limited, 2003)
4. Determination of water absorptive of corrugated fiberboard (Cobb test)- FEFCOTESTING METHOD-April1986 amended in1985, 1994, March1997 *TAPPI Standards: Regulations and Guidelines*. Revision of T410om-08.
5. *TAPPI Standards: Regulations and Guidelines*. Revision of T4 111om-97.

Course outcomes:

Unit I: After completion of the unit, Student are able to

1. Understand the Indian regulatory system.
2. Understand the symbols and units used in packaging.

Unit II: After completion of the unit, Student are able to

1. Understand the International laws CE marking.
2. Understand the IS specifications with respect to packaging and packaging materials.

Unit III: After completion of the unit, Student are able to

1. Understand sustainable development and processes.
2. Understand the pillars of sustainability and their effects on sustainable growth.

Unit IV: After completion of the unit, Student are able to

1. Understand the labeling regulations.
2. Use symbols or icons, Specific labeling requirement.

MFPT 204 Instrumentation and Process Control

Learning Objectives: Students should:-

1. Understand the measurement of temperature , pressure, humidity.
2. Understand programmable logic controller.
3. Review laplace transforms.
4. Understand signal flow graph reduction technique.

UNIT 1 : Measurement of various parameters

Transducers: Measurement of temperature, flow, pressure, humidity, Gas concentration, Specific gravity, Concept of bio-sensors.
Introduction to Fuzzy logic& neural networks.

UNIT 2: Data and Monitoring system

Programmable logic controller, Data loggers, Data Acquisition Systems (DAS). Introduction to Direct Digital Control (DDC), Supervisory Control and Data Acquisition Systems (SCADA), Monitoring of plant parameters through Internet with SAP integration.

UNIT 3:Concept of Laplace Transform, Poles and zeros

Review of Laplace Transforms, concept of poles and zeroes, open and closed loop systems, transfer function, block diagram reduction technique.

UNIT 4: Signal flow , Stability concepts

Signal flow graph reduction technique, Stability general concepts, absolute and relative stability, Routh stability criterion, Bode Plots.

Recommended Readings

1. Doebelin EO, *Measurement System - Application and Design*. (McGraw Hill.Ernest O Doebelin.1995).
2. Nachtigal CL, *Experimental Methods for Engineers*. (McGraw Hill. 1990).
3. John Wiley & Sons, *Instrumentation and Control Fundamentals and Application*.
4. Thomas A.Hughes ,*Measurement and Control Basics* (ISA Press).
5. I.J Nagrath ,M.Gopal ,*Control systems Engineering* ,(New Age International).
6. BeckwithTG, *Mechanical Measurements*, (Addison-Wesley 1996).

Course outcomes.

Unit I: After completion of the unit, Student are able to

1. Measure temperature , pressure, humidity.
2. Measure Gas concentration, Specific gravity.

Unit II: After completion of the unit, Student are able to

1. Understand programmable logic controller.
2. Monitor of plant parameters through Internet with SAP integration.

Unit III: After completion of the unit, Student are able to

1. Review laplace transforms.
2. Understand block diagram reduction technique.

Unit IV: After completion of the unit, Student are able to

1. Understand the signal flow graph reduction technique.
2. Understand the Routh stability criterion, Bode Plots.

MFPP 205 TECHNOLOGY OF CEREALS, LEGUMES AND OIL SEEDS AND FOOD PLANT ORGANIZATION LAYOUT

Learning Objectives: Students should:

1. Understand determination of gluten content of wheat flour and conditioning of wheat.
2. Understand Malting, puffing and popping of grains.
3. Understand designing of layout of cold storage, pre-processing house, fruits and vegetable processing plants.
4. Evaluate different layout.

Practicals

1. Physical-tests of wheat and rice
2. Physicochemical and rheological properties.
3. Determination of gluten content in wheat flour.
4. Conditioning of wheat; Milling of wheat and rice by laboratory mill;
5. Parboiling of rice.
6. Quality tests of rice.
7. Amylose content determination in rice.
8. Malting, puffing and popping of grains.
9. Preparation of protein concentrates and isolates and their evaluation for protein content and solubility;
10. Extraction of oil using expeller and solvent extraction methods
11. Visit to related processing industries.
12. Layout of Food storage wares and go-downs
13. Layout and design of cold storage.
14. Layout of pre-processing house
15. Design and layout of low shelf life product plant
16. Design and layout of fruits processing plants
17. Design and layout of vegetable processing plants
18. Layout of multiproduct and composite food plants
19. Evaluation of given layout.
20. Designing of ETP layout

Recommended Readings

1. FSSAI manuals of analysis of foods, Oils and Fats, Food Safety and Standards Authority of India, Ministry of Health and Family Welfare, Government of India, New Delhi, 2016.
 2. Standards Methods for the analysis of Oils, fats and Derivatives, International Union of Pure and Applied Chemistry on Oils, fats and Derivatives, 7th edition.
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1. Chakrabarty, M.M. (2003). Chemistry and Technology of Oils and Fats. Prentice Hall.
 2. Dendy, D.A.V., & Dobraszczyk, B.J. (2001). Cereal and Cereal Products. Aspen.

3. Hamilton, R.J., &Bhati, A. (1980). Fats and Oils - Chemistry and Technology.App. Sci. Publ.
4. Hosoney, R.S. (1994). Principles of Cereal Science and Technology. 2nd Ed.AACC.
5. Kay, D.E. (1979). Food Legumes. Tropical Products Institute. 6. Kent, N.L. (1983). Technology of Cereals. 4th Ed. Pergamon Press
- 1 Sivarethinamohan, R. Operations Research. Tata McGraw_Hill Pub. Co. Ltd.,2005
- 2 Managerial Economics- Analysis, Problems and cases.Metha, P.L. 2003., Sultan Chand and Sons, New Delhi.(Unit-I,II)
3. Milk Plant Layout H.S. Hall FAO Pub., Rome 1968 2
4. Plant Layout and Design James M.Moore Mac Millan, New York 1971

Course outcomes.

After completion, Student are able to:

1. Determine gluten content of wheat flour and conditioning of wheat.
2. Perform malting, puffing and popping of grains.
3. Design of layout of cold storage, pre-processing house, fruits and vegetable processing plants.
4. Evaluate different layout.

MFPP 206 Packaging Laws and Regulation and Instrumentation and Process Control

Learning Objectives: Students should:

1. Understand determination of gas transmission rate, water vapor permeability of packaging material.
2. Identify plastic films.
3. Understand the measurement of temperature, liquid level, pressure, humidity, moisture and gas.
4. Understand the working and application of transducers.

Practicals

1. Determination of gas transmission rate of packaging films.
2. Identification of plastic Films
3. Determination of water vapor permeability of packaging material.
4. Determination of the static and dynamic tensile strength of paper

5. Measurement of resistance of a paper board and corrugated board to puncture.
6. Measurement of bursting strength of paper.
7. Prepackaging of fruits and vegetables.
8. Identification of different packaging instruments.
9. Measurement of temperature.
10. Measurement of liquid level
11. Measurement of Pressure
12. Measurement of Humidity
13. Measurement of Moisture
14. Measurement of Gas
15. Introduction to Transducers and its applications

1. S.Ranganna, *Handbook of Analysis and Quality control for fruits and vegetable products* (McGraw Hill Education India PVT.LTD, Chennai, 2nd edition, 2008)
2. Richard coles, Derek Mc Dowell and Mork J Kirwan *Food Packaging Technology* (Blackwell publishing CRC Press, 2003)
3. Raija Ahvenainen, *Novel Food Packaging Techniques* (Woodhead Publishing Limited, 2003)
4. Determination of water absorptive of corrugated fiberboard (Cobb test)- FEFCOTESTING METHOD-April 1986 amended in 1985, 1994, March 1997 *TAPPI Standards: Regulations and Guidelines*. Revision of T410om-08.
5. *TAPPI Standards: Regulations and Guidelines*. Revision of T411om-97.
6. Doebelin EO. 1966. *Measurement System - Application and Design*. McGraw Hill. Ernest O Doebelin. 1995.
7. *Measurement Systems - Application and Design*. McGraw Hill. Holman P 1996.
8. *Experimental Methods for Engineers*. McGraw Hill. Nachtigal CL. 1990.
9. *Instrumentation and Control. Fundamentals and Application*. John Wiley & Sons.
10. Thomas A. Hughes . *Measurement and Control Basics – ISA Press*

Course outcomes:

After completion, Student are able to:

1. Determine of gas transmission rate, water vapor permeability of packaging material.
2. Identify plastic films.
3. Measure temperature, liquid level, pressure, humidity, moisture and gas.
4. Handle transducers.

