

ELEMENTS OF PACKAGING TECHNOLOGY

Course Title:	Elements of Packaging Technology	Course Code	26PK-105
Semester	I	Course Group	Core
Teaching Scheme in Hrs. (L: T:P)	120:30:0	Credits	3
Methodology	Lecture + Assignments	Total Contact Hours:	150Pds
CIE	60 Marks	SEE	40 Marks

Course Content and Blue Print of Marks for SEE

Unit No	Unit name	Periods	Questions for SEE			Marks weightage	%Weightage
			R	U	A		
1.	Introduction to packaging and Classification of packaging materials	25	3	2	1	18	50
2	Packaging components and laws	25	3	2	1	18	50
3	Characteristics of the product and Export Packaging	25	3	2	1	18	50
4.	Hazards and Eco-friendly packaging	25	3	2	1	18	50
5.	Compatibility of the Package with the Product	25	6	4	2	36	50
6.	Total concept of Packaging	25	6	4	2	36	50
	Total	150					

Pre requisites

This course requires the basic knowledge of Basic Physics and Mathematics at Secondary school level

On completion of the course, the student will be able to:

Course Outcomes

CO1	Explain and classify packaging materials based on structure, properties, and applications.
CO2	Identify packaging components and interpret relevant packaging laws, standards, and regulations.
CO3	Analyze product characteristics to design appropriate export packaging solutions.
CO4	Assess packaging hazards and evaluate eco-friendly and sustainable packaging alternatives.
CO5	Evaluate compatibility between product and package to prevent contamination and quality loss.
CO6	Apply the total packaging concept by integrating design, protection, economics, and sustainability.

MID SEM –I EXAM					
S. No	Unit Name	R	U	A	Remarks
1	Unit-I	1, 2	5(a)	7(a)	
			5(b)	7(b)	
2	Unit-II	3, 4	6(a)	8(a)	
			6(b)	8(b)	
Total Questions		4	4	4	

MID SEM –II EXAM					
S. No	Unit Name	R	U	A	Remarks
1	Unit-III	1, 2	5(a) 5(b)	7(a) 7(b)	
2	Unit-IV	3, 4	6(a) 6(b)	8(a) 8(b)	
Total Questions		4	4	4	

SEMESTER END EXAMINATION									
Sl No	Unit No.	Questions to be set for SEE				Remarks			
		R		U	A				
1	I	4	1		9(a)	13(a)			
2	II								
3	III		2		10(a)	14(a)			
4	IV								
5	V		3	5, 6	9(b)	13(b)			
					11(a)	15(a)			
					11(b)	15(b)			
6	VI				7,8	10(b)		14(b)	
						12(a)		16(a)	
						12(b)		16(b)	
Total Questions		8		8		8			
	Remembering (R)	1 Mark							
	Understanding (U)	3 Marks							
Legend:	Application (A)	5 Marks							

Course Content

UNIT 1 - INTRODUCTION TO PACKAGING AND CLASSIFICATION OF PACKAGING MATERIALS

Duration: 25 HOURS

History of packaging, Earlier / Ancient Modern History of food packaging – packaging evolution – super market- its Chronological Developments-Introduction-Natural – synthetic, flexible – semi rigid – rigid packaging materials-Classification of packaging materialsbased onTraditional packaging materials, Strength and their function.

UNIT 2 -PACKAGING COMPONENTS AND LAWS

Duration: 25 HOURS

List at the various components of packaging –Separation-Clearance-Support Positioning- Positioning- Weight Distribution-Suspension-Closures –Cushioning- their functions and properties - Introduction to packaging laws-Existing Government laws – A survey-The gap in legislation-Packaging legislation in prospects -packaging legislation governed by the standard institutions. Export laws on packages - BIS/IS, ISO, ASTM, Legal Metrology, FSSAI. Explain which standards apply to which packaging types/components

UNIT 3 - CHARACTERISTICS OF THE PRODUCT AND EXPORT PACKAGING

Duration: 25 HOURS

Physical characteristics of a product-Physical state-weight-stability – rigidity – surface finish – fragility of the products- Centre of gravity-Symmetry. Physio-chemical characteristics of a product: - Effect to study of moisture, oxygen, mould-bacteria, fungi, temperature, heat, odor, light on the various products - Introduction - Concept and idea of export packaging - Packaging Symbols-Considerations for export packaging - Cargo transportation, Packaging containerized cargo - Shipping documents, Shipping marks - Inspection of export packaging and markings - Standards referenced for export compliance

UNIT 4 -HAZARDS AND ECO-FRIENDLY PACKAGING

Duration: 25 HOURS

Types of hazards- Mechanical Hazards, Climate Hazards, Other types of Hazards loading & unloading hazards, causes of mechanical damage – impact, vibration, crushing, and damage – impact, vibration, crushing. Shock, fragility, measurement of fragility – climatic hazards – temperature humidity – micro biological changes- Introduction, Importance of Eco-friendly package. Recycling of Packaging materials, 3R concept- Reduce, Reuse, Recyclable packages. Environmental aspects of packaging materials, Degradable materials for packages-Concept of solid waste. Disposal options-Green Packaging and its principles-Benefits of Eco-friendly packaging

UNIT 5 -COMPATIBILITY OF THE PACKAGE WITH THE PRODUCT

Duration: 25 HOURS

Product compatibility –Permeability, definition of migration and types of migrations, laws on diffusion, Ficks Law and Barriers law, mathematical derivation of permeability constant. Plasticizers, their types, functions and applications. Shelf life, its controlling factors, shelf-life testing procedures and shelf-life devices, simple problems based on ficks law.

UNIT 6 -TOTAL CONCEPT OF PACKAGING

Duration: 25 HOURS

Definition of packaging – integrate part of production, as a part of physical distribution as a tool for marketing –Functions of packaging-Advantages of packaging-Disadvantages of packaging-Packaging criteria-The concept of packaging-Historical events in the development of packages. Role of packaging technologist and his functions-3P – concept, Packaging – packaging utilities – status – development factors – criteria – marketing – levels of packaging– containerization. Types of materials used for different packaging components and various types of hazards occur during different modes of transportation.

Recommended Books

1. Packaging Technology and Engineering: Pharmaceutical, Medical and Food Applications — Dipak Kumar Sarkar
2. Textbook on Packaging Technology — P. Ganesan & K. Rathnakumar

3. Technology of Polymer Packaging — Arabinda Ghosh
4. Sustainable Packaging Materials: Winning Solutions — Muhammad Rabnawaz
5. Sustainable Materials for Food Packaging and Preservation — Tabli Ghosh, Ruchir Priyadarshi & Swarup Roy

SPECIFIC LEARNING OUTCOMES

1. C01 INTRODUCTION TO PACKAGING AND CLASSIFICATION OF PACKAGING MATERIALS

- 1.1.History of packaging
- 1.2.Chronological developments
- 1.3.Ancient packaging
- 1.4.Medieval packaging
- 1.5. Modern packaging
- 1.6.Evolution in packaging.
- 1.7.Introduction
- 1.8.Classification of packaging materials
- 1.9.Traditional packaging materials
- 1.10.Natural Packaging materials
- 1.11.Synthetic Packaging materials
- 1.12.Ancillary Packaging materials
- 1.13.Bulk Packaging materials

2. C02 PACKAGING COMPONENTS AND LAWS

- 2.1. Separation
- 2.2. Clearance
- 2.3. Support positioning
- 2.4. Positioning
- 2.5. Cushioning
- 2.6. Weight distribution
- 2.7. Suspension
- 2.8. Closures
- 2.9.Introduction to packaging laws
- 2.10. The existing laws – A survey
- 2.11. The gap in legislation
- 2.12. Packaging legislation in prospects
- 2.13. Packaging regulating bodies-FDA, FAO, WHO, ISI
- 2.14. Export laws on packages

2.15. BIS/IS, ISO, ASTM, Legal Metrology, FSSAI.

2.16. Explain which standards apply to which packaging types/components

3. CO3 CHARACTERISTICS OF THE PRODUCT AND EXPORT PACKAGING

3.1. Physical characteristics of a state

3.2. Physical State

3.3. Weight

3.4. Centre of gravity

3.5. Symmetry

3.6. Fragility

3.7. Rigidity

3.8. Surface finish

3.9. Susceptibility to water, water vapour, gases, odour, heat and light.

3.10. Introduction

3.11. Concept and idea of export packaging

3.12. Packaging Symbols

3.13. Considerations for export packaging

3.14. Cargo transportation

3.15. Packaging containerized cargo.

3.16. Shipping documents

3.17. Shipping marks.

3.18. Inspection of export packaging and markings.

3.19. Standards referenced for export compliance

4. CO4 HAZARDS AND ECO-FRIENDLY PACKAGING

4.1. Classification of Hazards

4.2. Mechanical Hazards

4.3. Impact Loads.

4.4. Shock and Vibration Loads

4.5. Crushing and fragility damages.

4.6. Climate Hazards

4.7. Temperature and humidity.

4.8. Micro biological Hazards.

- 4.9. Other types of Hazards
- 4.10. Definition of Eco-friendly packaging
- 4.11. '3R' concept
- 4.12. Concept of solid waste.
- 4.13. Disposal options
- 4.14. Recycling of Packaging materials
- 4.15. Degradable packaging materials
- 4.16. Green Packaging.
- 4.17. Green Packaging principles.
- 4.18. Benefits of Eco-friendly packaging

5. CO5 COMPATIBILITY OF THE PACKAGE WITH THE PRODUCT

- 5.1. Product compatibility
- 5.2. Permeability
- 5.3. Migration and types
- 5.4. Fick's Law
- 5.5. Barrier's law
- 5.6. Plasticizers.
- 5.7. Define shelf life
- 5.8. Storage test
- 5.9. State the factors controlling shelf life
- 5.10. Understand the shelf-life testing procedures
- 5.11. Understand the concept of shelf-life devices
- 5.12. Solve simple problems based on Fick's law

6. CO6 TOTAL CONCEPT OF PACKAGING

- 6.1. Definition of packaging
- 6.2. Functions of packaging
- 6.3. Advantages of packaging
- 6.4. Disadvantages of packaging
- 6.5. Packaging criteria
- 6.6. The concept of packaging
- 6.7. Historical events in the development of packages.

6.8. Role of packaging technologist-his functions

6.9. 3-P concept

6.10. Application of packaging materials

6.11. Assessment of hazards based on modes of transport.

Suggested Student Activities

1. Each student should visit library to refer to manual/Journals of Packaging related to packaging materials and components.
2. Each student should visit the Lab to know the materials used for packaging.
3. Each student will do the report on Types Different Packages available in the market
4. Prepare any one type of package carrying different food products in market.
5. Identify and prepare a list of materials used in the Different types of packaging applications.
6. Quiz and Group discussion
7. Surprise test

E-Learning links:

1. <http://nptel.ac.in>
2. www.packagingclinic.com
3. www.iip.in.com
4. <https://pcrri.org>

Internal Evaluation

Test	Units	Marks	Pattern
Mid Sem 1	1 and 2	20	-Part A 5 Short answer questions -Part B & C 2 Essay questions out of 3 Questions
Mid Sem 2	3 and 4	20	-Part A 5 Short answer questions -Part B & C 2 Essay questions out of 3 Questions
Slip Test 1	1 and 2	5	2 Essay Questions out of 3 Questions
Slip Test 2	3 and 4	5	2 Essay Questions out of 3 Questions

Assignment	1	5	Different group assignments of Higher order Questions that develop problem solving skills and critical thinking should be given
Seminars	1	5	
Total		60	

Semester End Examination marks distribution

	Short answer	Essay	Marks
Part A	8	0	8
Part B	0	4/4	12
Part C	0	4/4	20
Total	8	8/8	40

Mid-term Examination marks distribution

	Short answer	Essay	Marks
Part A	4	0	4
Part B	0	2/2	6
Part C	0	2/2	10
Total	4	4/4	20

CO-PO Mapping Matrix

Course Outcome		CL	Linked PO	Teaching periods
CO1	Define and explain the need of packaging, Identify the type of packaging materials for a given product	R/U/A	1,2,9	25
CO2	List and explain various Packaging components and laws.	R/U/A	1,2,9,10	25
CO3	List the characteristics of product, Identify the package markings and procedures for export	R/U/A	1,2,6,9	25
CO4	Identify the hazards occurred in different modes of Transportation, use green and eco-friendly packaging to save environment	R/U	1,2	25
CO5	Show the relationship between ficks and barriers law of diffusion	R/U/A	1,2,5	25
CO6	Write role of packaging technologist in society, Distinguish between packing and packaging	R/U/A	1,2,3,8,9,10	25
				150

Model Question papers

MODEL QUESTION PAPER
BOARD DIPLOMA MID EXAMINATIONS
D.PKGT – I - YEAR EXAMINATION

26PK-105-ELEMENTS OF PACKAGING TECHNOLOGY

TIME: 1 HOUR

MAXIMUM MARKS: 20

PART –A

MARKS: 1 X 4 =4

NOTE: Answer all questions. Each question carries ONE mark

1. Write briefly about natural packaging materials
2. Define the term packaging?
3. Distinguish between packing and packaging.
4. What are the applications of packaging?

PART –B

MARKS: 2X3 = 6

NOTE: Answer any two questions. Each question carries THREE marks.

5. a) What are the different types of packages?

OR

b) Packaging communicates? Explain

6. a) Write about shelf-life v/s self-life that is used in Packaging

OR

b) What are the various types of hazards to which the packaging is subjected? Explain typical situation to occur.

PART –C

MARKS: 2X5 = 10

NOTE: Answer any two questions. Each question carries FIVE marks.

7. a) Define label, how it helps packaging?

OR

b) Define tamperproof and pilfer proof?

- 8a) Packaging is a silent sales man”. justify the statement.

OR

b) What are the packaging components? Explain any four of them.

MODEL QUESTION PAPER
BOARD DIPLOMA END EXAMINATIONS
D.PKGT – I - YEAR EXAMINATION

26PK-105-ELEMENTS OF PACKAGING TECHNOLOGY

TIME: TWO HOURS

MAXIMUM MARKS: 40

PART –A

MARKS: 8 X 1 = 8

NOTE: Answer all questions. Each question carries two marks.

1. Write briefly about natural packaging materials
2. Define the term packaging?
3. Distinguish between packing and packaging.
4. What are the applications of packaging?
5. What are the different types of packages?
6. Define synthetic packaging materials
7. Write about a). Physical state b). Center of gravity
8. List the types of hazards.

PART –B

MARKS: 4X3 = 12

NOTE: Answer any four questions. Each question carries five marks.

9. a) Explain the importance of packaging?

OR

- b) Explain the various characteristics of a product.

10. a) What are the various types of hazards to which the packaging is subjected? Explain typical situation to occur.

OR

- b) Explain about functions of packaging

11. a) Explain briefly about history of packaging.

OR

Explain the effects on packages because of various hazards.

12. a) Write about shelf-life v/s self-life that is used in Packaging

OR

- b) What are the various types of hazards to which the packaging is subjected? Explain typical situation to occur.

PART –C

MARKS: 4X5 = 20

NOTE: Answer any four questions. Each question carries ten marks.

13. a) “Packaging is a marketing tool” Explain?

OR

b) Explain briefly the classification packaging materials with suitable examples.

14. a) What are the packaging components? Explain any four of them.

OR

b) What are the important factors contributing the overall cost of a package. Explain?

15. a) Explain the following (a) Closure (b) clearance (c) suspension (d) support

OR

b) What are the factors to be considered for design of a package? Explain them.

16. a) Packaging is a silent sales man”. justify the statement.

OR

b) What are the packaging components? Explain any four of them.

QUESTION BANK

26PK-105-ELEMENTS OF PACKAGING TECHNOLOGY

PART –A

1. List any six historical events in the development of packages
2. Define rigid packaging materials
3. Define packaging materials
4. Expand (a). PP (b). PS
5. List the various physical characteristics of a product
6. What is HACCP?
7. Define Vibration hazard?
8. What are the barrier properties of a package
9. What is tamper-evident packaging?
10. Write any four primary functions of packaging?
11. Write the sequence of packaging?
12. Define the term packaging?
13. Expand the term “PACKAGE”
14. What are the different types of packages?
15. Define natural packaging materials
16. Define flexible packaging materials
17. Define synthetic packaging materials
18. Expand (a). HDPE(b). PET
19. List the types of hazards.
20. Define compression hazard?
21. List out package components.
22. What are the packaging materials?
23. Define cushioning?
24. What are the early packaging materials?
25. Define packaging?
26. What are the primary functions of packaging?
27. Define semi-rigid packaging materials
28. Define primary packaging materials

29. Expand (a). PVC (b). LDPE
30. What are different type's hazards?
31. Define hazard?
32. What is the definition of tertiary packaging?
33. What are the disadvantages of packaging?

PART –B

- 10 Distinguish between packing and packaging?
- 11 What is the importance of packaging?
- 12 Classify the different levels of packages as per the usage. Give examples.
- 13 What are the packaging materials used for pharmaceuticals?
- 14 What is an FDA? Write any two products which are applicable.
- 15 What do you mean by ancillary packaging materials? Give examples for each.
- 16 What is the role of packaging link between production and marketing?
- 17 What is the need of package food?
- 18 Write about 3R concept that is used in packaging
- 19 Write briefly about history of packaging.
- 20 Distinguish between packing and packaging.
- 21 What are the advantages of packaging?
- 22 What are the applications of packaging?
- 23 Write about a). Physical state b). Center of gravity
- 24 What do you mean by secondary packaging materials? Give examples for each.
- 25 How a package communicates?
- 26 What is the need to increase the shelf life of a product
- 27 Write about role of packaging?
- 28 Packaging is a silent sales man". justify the statement.
- 29 What do you mean by primary packaging materials? Give examples for each.
- 30 What are the various physical and physio-chemical characteristics of a product?
- 31 Why is packaging so important?
- 32 Write about shelf-life v/s self-life that is used in Packaging
- 33 What are the uses of packaging?
- 34 Draw the flow chart of packaging?

- 35 Define tamperproof and pilfer proof?
- 36 Define label, how it helps packaging?

PART –C

1. Explain briefly about chronological developments of packaging.
2. What are the functions of packaging? Explain them.
3. Explain briefly the classification of various packaging materials by giving suitable examples.
4. Explain the various physical characteristics of a product.
5. Explain the typical situation to occur all those hazards.
6. List out the components of a package. explain any four of them.
7. What are the factors to be considered for design of a package? Explain them.
8. Explain the role of packaging in our day-to-day life
9. Explain about functions of packaging.
10. “Packaging is a marketing tool” Explain?
11. Explain briefly the classification of packaging materials with suitable examples.
12. Explain the various characteristics of a product.
13. What are the various types of hazards to which the packaging is subjected? Explain typical situation to occur.
14. Explain the following (a) Closure (b) Clearance (c) Suspension (d) Support
15. What are the important factors contributing the overall cost of a package. Explain?
16. Explain the importance of packaging?
17. Explain briefly about history of packaging.
18. Packaging communicates? Explain
19. What are the functions of packaging? Explain them briefly.
20. How the packaging materials are classified on the basis of function? Explain.
21. Explain the various physio-chemical characteristics of a product.
22. Explain the effects on packages because of various hazards.
23. What are the packaging components? Explain any four of them.
24. Explain the following
 - a) Cushioningb) clearance c) Positioningd) Weight distribution