## SEMESTER: S7

# PLASTICS PACKAGING TECHNOLOGY

| Course Code | PEPOT748 | CIE Marks | 40 |
|---|---|---|---|
| Teaching Hours/Week (L: T:P: R) | 3:0:0:0 | ESE Marks | 60 |
| Credits | 3 | Exam Hours | 2 Hrs. 30 Min. |
| Prerequisites (if any) | Plastic materials, Processing | Course Type | Theory |

**Course Objectives:**

1. Study of fundamentals of plastic materials, its properties, processing techniques and applications for packaging applications.
2. Understand the methodology for selection of packaging equipments, packaging equipment checklist, wrapping, sealing methods

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## SYLLABUS

| Module No. | Syllabus Description | Contact Hours |
|---|---|---|
| 1 | Introduction to plastics packaging, functions of packaging, advantages of plastic packaging, distribution hazards, special requirements of food and medical packaging, packaging legislation and regulation, packaging as a system, elements, approach, package, design, relation criteria for packaging materials, packaging equipment checklist, case histories. | 9 |
| 2 | Major packaging plastics, introduction, PE, PP, PS, PVC, polyesters, PVDC, vinylacetate, PVA, EVA, PV Alcohol, PA, PC ionomers & fluoro polymers. Conversion process, compression & transfer moulding, injection moulding. | 9 |

| | | |
|---|---|---|
| **3** | Blow moulding, extrusion, rotary thermoforming, lamination, metallizing, decoration process, shrink wrapping, pallet & stretch wrapping, sealing methods, plasma barrier coatings, energy requirement for conversion, extrusion, film and flexible packaging, extrusion, cast film & sheet, blown film, multi-layer film & sheet coatings, laminations & co extrusions, stretch and shrink wrap, pouching, sealing, evaluation of seals in flexible packages, advantages of flexible packaging, flexible packaging products, specialized packaging for food products. | **9** |
| **4** | Thermoformed, moulded and rigid packages, thermoforming packages, position & thermoforming & wrap forming, solid phase pressure forming,skin packaging, thermoforming moulds, advantages & disadvantages of moulding foams, other cushioning materials & distribution packaging, polystyrene & other foams systems cushioning, design of moulded cushioning systems, plastic pallets, drums & other shipping containers, testing plastic packages, barrier, printing, labelling& pigmenting, sterilization systems and health care products, packaging hazards and their controls, environmental considerations. | **9** |

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**Course Assessment Method**
**(CIE: 40 marks, ESE: 60 marks)**

**Continuous Internal Evaluation Marks (CIE):**

| Attendance | Assignment/ Microproject | Internal Examination-1 (Written) | Internal Examination- 2 (Written) | Total |
|---|---|---|---|---|
| **5** | **15** | **10** | **10** | **40** |

**End Semester Examination Marks (ESE)**

*In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions*

| Part A | Part B | Total |
|---|---|---|
| • 2 Questions from each module.<br>• Total of 8 Questions, each carrying 3 marks<br>**(8x3 =24marks)** | • Each question carries 9 marks.<br>• Two questions will be given from each module, out of which 1 question should be answered.<br>• Each question can have a maximum of 3 sub divisions.<br>**(4x9 = 36 marks)** | **60** |

**Course Outcomes (COs)**

At the end of the course students should be able to:

| | Course Outcome | Bloom's Knowledge Level (KL) |
|---|---|---|
| **CO1** | Outline significance of plastic packaging. | **K2** |
| **CO2** | Summarize major packaging plastics. | **K2** |
| **CO3** | Apply methodology of conversion process | **K3** |
| **CO4** | Discover the relationship between film and flexible packaging. | **K4** |
| **CO5** | Compare different thermoforming and testing methods for plastic packages. | **K4** |

Note*: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create*

**CO-PO Mapping Table:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | **3** | | | | | | | | | | | |
| **CO2** | **3** | | | | | | | | | | | |
| **CO3** | **3** | | | | | | | | | | | |
| **CO4** | **3** | | | | | | | | | | | |
| **CO5** | **3** | | | | | | | | | | | |

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| Text Book | | | | |
|---|---|---|---|---|
| **Sl. No** | **Title of the Book** | **Name of the Author/s** | **Name of the Publisher** | **Edition and Year** |
| **1** | Understanding plastics packaging technology. | Selke, S. E. | Hanser Verlag. | 1997 |

| Reference Books | | | | |
|---|---|---|---|---|
| **Sl. No** | **Title of the Book** | **Name of the Author/s** | **Name of the Publisher** | **Edition and Year** |
| **1** | Food packaging technology | Coles, R., McDowell, D., &Kirwan, M. J. (Eds.). | CRC Press | 2003 |
| **2** | Permeability properties of plastics and elastomers: a guide to packaging. | Massey, L. K. | William Andrew. | 2003 |
| **3** | Plastic packaging materials for food: barrier function, mass transport, quality assurance, and legislation. | Piringer, O. G., & Baner, A. L. (Eds.). | John Wiley & Sons. | 2008 |

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| Video Links (NPTEL, SWAYAM…) | |
|---|---|
| **Module No.** | **Link ID** |
| **1** | https://youtu.be/piGjS-7VRMs?si=ZXj7kXDYCMp4cSXl |
| **2** | https://youtu.be/RCnyrD5FPVs?si=8JYtKL1yRrs-Wd8W |
| **3** | https://youtu.be/EF1nYb3kTxI?si=q7J4YUB6jxlyNr2U |
| **4** | Biodegradable polymers, definition, classification, example and applications (youtube.com) |