## SEMESTER S3

# LATEX TECHNOLOGY

| Course Code | PCPOT303 | CIE Marks | 40 |
|---|---|---|---|
| Teaching Hours/Week (L: T:P: R) | 3:1:0:0 | ESE Marks | 60 |
| Credits | 4 | Exam Hours | 2 Hrs. 30 Min. |
| Prerequisites (if any) | Basic knowledge in Polymer materials and Polymer science. | Course Type | Theory |

**Course Objectives:**

1. To impart knowledge on processing and product development of polymer latices
2. To familiarize various compounding ingredients

## SYLLABUS

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| Module No. | Syllabus Description | Contact Hours |
|---|---|---|
| 1 | **Natural rubber latex:** - General composition, preservation, fundamental latex characteristics, particle size and distribution, stability and destabilisation, coacervation, viscosity-concentration relationship, surface free energy and wetting behaviour, zeta potential, electrical properties of colloidal system, thermal movement of molecules, Brownian motion, synthetic lattices and their blends, latex concentration methods, concentrated latex, significance of specification limits. | 11 |
| 2 | **Test methods:-** total solids, dry rubber content, total alkalinity, coagulum content, sludge content, pH, KOH number, mechanical, chemical and thermal stability, VFA number, zinc oxide stability principles of latex compounding, de-ammoniation of latex, vulcanising agents, accelerators, antioxidants, fillers, dispersing and emulsifying agents, stabilisers, thickening agents, and other miscellaneous additives, special ingredients, preparation of dispersions and emulsions, latex compounding, pre-vulcanised latex. | 11 |

| | | |
|---|---|---|
| **3** | **Dipping methods-** straight dipping, coagulant dipping, different types of formers, dipping process, after treatments, defects in dipped goods, Manufacture of dipped goods like rubber band, medical gloves, household gloves, industrial gloves, dipped fabric gloves, balloon, nipples, prophylactics, impregnation, spreading, fabric proofing and coating. Rubber-textile composite products, latex bonded fibrous structures, coir foam, latex treated rugs and carpet backing. | **11** |
| **4** | **Latex foam processing methods: -** compounding, mechanical frothing by beating, vulcanisation, washing and drying, gelling, gelling systems, merits and demerits of gelling systems, continuous foam production, typical latex compounds for foam production. Latex castings and mouldings- principles and production of hollow articles, solid articles, use of porous moulds in casting, manufacture of latex thread, latex cement and adhesives, latex paints, protective coatings, chewing gum, use of latex in road rubberisation | **11** |

**Course Assessment Method**

**(CIE: 40 marks, ESE: 60 marks)**

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**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><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** | Explain the principles, instrumentation and applications of latex concentration. | **K5** |
| **CO2** | List the significance and methods of latex specification tests and various grades of NR latex. | **K1** |
| **CO3** | Identify the different latex product manufacture techniques and formulate compounds for the same. | **K3** |
| **CO4** | Compare and contrast between various latex product manufacture methods and the significant steps involved in each. | **K4** |
| **CO5** | Discuss the significance safety aspects in latex processing. Also, how production and processing of NR latex affects the economy of Kerala | **K6** |

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

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## CO-PO Mapping Table (Mapping of Course Outcomes to Program Outcomes)

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | 2 | | 1 | | | | 2 | | | |
| **CO2** | 3 | 3 | 2 | | 1 | | | | | | | |
| **CO3** | 3 | 3 | 2 | 2 | | | | | 2 | | | |
| **CO4** | 3 | 3 | 1 | 1 | | | | | | | | |
| **CO5** | 2 | 2 | 1 | 2 | | 1 | | | | | | |

Note: *1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), -: No Correlation*

| Text Books | | | | |
|---|---|---|---|---|
| **Sl. No** | **Title of the Book** | **Name of the Author/s** | **Name of the Publisher** | **Edition and Year** |
| 1 | Polymer Latices: Science and Technology, Vol 1, 2 and 3 | D.C. Blackley, | Springer Science | 1997 |
| 2 | Natural Rubber Latex Technology, | N.R.Peethambaran, | | 2016 |
| 3 | Practical Guide to Latex Technology, | Rani Joseph | Smithers Rapra | 2013 |
| 4 | Vanderbilt Latex Handbook | Mausser | R.T.Vanderbilt Co. Inc., U.S.A | 3rd edition, |

| Reference Books | | | | |
|---|---|---|---|---|
| **Sl. No** | **Title of the Book** | **Name of the Author/s** | **Name of the Publisher** | **Edition and Year** |
| 1 | Latex Foam Rubber | E. W. Madge | Elsevier | 1982 |
| 2 | The Vanderbilt Latex Handbook, | R. F.Mausser | R.T. Vanderbilt Company | 1987 |
| 3 | Journal of Rubber Developments, Dipped Goods, Vol. 25 | | | 1972 |
| 4 | High Polymer Lattices, Vol 1 and 2 | D.C. Blackley, | Maclaren | 1966 |

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| Video Links (NPTEL, SWAYAM…) | |
|---|---|
| **Module No.** | **Link ID** |
| **1** | https://youtu.be/p5pk4Um6lsk |
| **2** | https://youtu.be/TMOqFXBMdVM?si=PfsDe6JBvq9riYJe |
| **3** | https://youtu.be/eo3K56MqELQ?si=V3pm3Jk9I7qOcRBh |
| **4** | https://youtu.be/f1V4POGaAsc?si=-ZUes7vpzrK2Efa0 |