## DISCIPLINE SPECIFIC ELECTIVE (DSE-17)

**Credit distribution, Eligibility and Pre-requisites of the Course**

| Course title & Code | Credits | Credit distribution of the course | | | Eligibility criteria | Pre-requisite of the course |
|---|---|---|---|---|---|---|
| | | Lecture | Tutorial | Practical/ Practice | | |
| **POLYMERS IN SPORTS AND FOOTWEAR TECHNOLOGY** | **4** | **2** | **0** | **2** | **12$^{Th}$ with PCM/PCB** | **---** |

### COURSE OBJECTIVES:

The Learning Objectives of this course are as follows:

1. To impart knowledge of the basic concepts of raw material and its use in manufacturing of sports and footwear.
2. To learn design and design criteria of sports and footwear

### LEARNING OUTCOMES

The Learning Outcomes of this course are as follows:

After studying this paper, students will be able to

1. Apply the knowledge of various type of polymers used in footwear manufacturing
2. Analyse the soling and its material requirements

### SYLLABUS OF DSE 17

**THEORY: (30Hours)**

**UNIT 1: SHOE SOLES (10Hours)**

Soling requirements, soling materials, compounding and processing. Individual soling compounding-PVC, thermoplastic rubber, polyurethane, ethylene vinyl acetate, etc.

**UNIT 2: ADHESIVES FOR SHOE (10 Hours)**

Soling adhesives and types of adhesives, adhesion principle, adhesive selections, Heel covering; sole attaching, neoprene, PU, hot melt and liquid curing adhesives, adhesion problems. Coated fabrics: PVC, PU coated fabric.

**UNIT 3: SOLES MATERIALS (5 Hours)**

Molded and pre fabricated units, individual solings – rubbers, vulcanized rubbers, nylons, polyesters, PVC, thermoplastic rubbers, PU, EVA.

**UNIT 4: PROCESSING (5 Hours)**

Injection moulding, sponge moulding, direct molded shoes, thermoplastic moulding, polyurethane injection moulding, insert moulding, HF flow moulding.

## PRACTICALS: (60Hours)

- Selection and identification of materials for sports equipment (tennis/badminton racket, football, tennis ball, cricket ball etc.)
- Determination of bonding strength of sole.
- Preparation and testing of shoe sole by compression molding.
- Testing of shoe components for different properties such as compressive strength, tensile strength, compression set, shore A etc.
- Estimate tear strength and abrasion resistance of a sole.
- Prepare different compounded sheets of EVA.
- Determine low temperature flexibility of shoe materials.
- Prepare the sponge sole and calculate its specific gravity.
- Prepare PU adhesive for sole bonding and determine the peel strength.
- Estimate out cold flexibility of sport goods
- Demonstration of design aspects of different footwear.
- Industrial visit for exposure to instruments and working.

## ESSENTIAL/RECOMMENDED READINGS


1. Martin J.M., Smith W.K., (2007) HandBook of Rubber Technology, CBS Publisher.
2. Harvey A.J., (1982) Footwear Materials and Process Technology, A LASRA publication.
3. Cohn, W.E., (1969) Modern Footwear Materials & Process, Fairchild Publications.
4. Luximon, A. (Ed.). (2021). Handbook of footwere design and manufacture. Woodhead Publishing.


## SUGGESTIVE READINGS


1. Venkatappaiah, B. (1997). Introduction to Modern Footwear Technology. B. Sita.
2. S SMuthu, (2020) Leather and Footwear sustainability, Springer.


## ASSESSMENT METHODS:

All the examiniations and assement methods shall be in the line with the University of Delhi gidelinceissused from time to time

## KEYWORDS:

Compounding, Shoe adhesives, Polyurethane, fabrication of sole.