Bhaskaracharya College of Applied Science

B.Sc. (Honours) Polymer Science

Category I

DISCIPLINE SPECIFIC CORE COURSE – 7:

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 (if any)
		Lecture	Tutorial	Practical/ Practice		
RUBBER ADDITIVES (DSC-7-RA)	4	3	0	1	Passed Class XII with Physics, Chemistry, Maths	NIL

LEARNING OBJECTIVES

The Learning Objectives of this course are as follows:

- To enable the students to know about need for additives in compounding of rubber
- To understand the different types of ingredients in compounding.
- To know about property modification by vulcanization
- To enrich knowledge on testing of compounded rubber

LEARNING OUTCOMES

The Learning Outcomes of this course are as follows:

After completing the course, the students

- Will understand concept of rubber compounding.
- Will modify the properties of rubber by incorporation of additives.
- Will develop rubber compound for required end use application.
- Will modify the strength by varying vulcanizing agents.
- Will do testing of rubber and asses quality of rubber compound.

SYLLABUS OF DSC-7

THEORY COMPONENT-

UNIT – I **(09 Hours)**

FILLERS AND PROCESSING AIDS

Fillers: Carbon black, Non carbon black, Colors and Pigments,Plasticizers, Process aids, Softeners and Extenders.

UNIT – II (9 Hours)

OTHER ADDITIVES FOR RUBBERS

Vulcanizing agents (sulphur, peroxide and metal oxide, phenolic curatives, benzoquinone derivatives, bismaleimides), accelerators (benzothiazoles, benzothiazolesulfenamide, dithiocarbamates, amines), lubricants, retarders (pre-vulcanized inhibitor), activators,

UNIT – III (06 Hours)

ANTIDEGRADATION AND MISCELLEOUS ADDITIVES

Uv stabilizers, Heat stablizers, Antioxidants, Antiozonants- Mechanism of degradation – Mechanism of ozone attack. Special purpose additives: Chemical blowing agents – Flame retardants – Antistatic agent – Abrasives -Integral bonding additives – stiffening agents. antioxidants, thermal), softners, tackifying agents, blowing agents, surface property modifiers etc.

UNIT – IV (06 Hours)

INDIVIDUAL RUBBER FORMULATIONS

Formulating for natural and synthetic rubbers and typical recipes for a few rubber products, Implications of FDA Regulations - Toxicity and environmental issues.

UNIT – V (12 Hours)

FORMULATION FOR PERFORMANCE REQUIREMENTS

Compounding to meet different Hardness requirements – Iow compression set – For damping application – Compounding to meet bonding requirements with metals and textiles– Compounding to meet processing – Economics of compounding – Cost estimation.

PRACTICAL COMPONENT- 60 Hours

- Mastication of NR on two roll mill
- Mixing of rubber compounds
- Compression moulding of rubber compounds
- Preparation of dry rubber products – play ball
- Preparation of dry rubber products – Hawaii sheet
- Preparation of dry rubber products – M.C Sheet
- Preparation of dispersions for compounding of latex
- Preparation of latex products: i. Hand Gloves ii. Balloon iii. Rubber band iv. Thread
- Compression moulding of fabric/rubber composite
- Preparation of rubber blends

ESSENTIAL/RECOMMENDED READINGS

- John S Dick, Rubber Technology- Compounding and Testing for Performance Hanser Publishers, 2001.
- C. Hepburn, Rubber Technology and Manufacturing, Butterworth-Heinemann, 2009
- Brendon Rodgers, Rubber Compounding- Chemistry and Applications, Taylor and Francies, 2016.