- Ulrich, T. K. T. and Eppinger, D.S. (2004), Product design and development, Tata McGraw-Hill, 3rd edition.
- Mahajan, M. (2008) Industrial Engineering and Production Management, Dhanpat Rai Publication.
- Mollay, A.R. (1994) Plastic Part Design for Injection Moulding, Hanser Publishers, Munich Vienna, New York.

SUGGESTIVE READINGS

- Hollins, B. Pugh, S. (1990) Successful product design, Butterworth & Co.

Note: Examination scheme and mode shall be as prescribed by the Examination Branch, University of Delhi, from time to time.

DISCIPLINE SPECIFIC ELECTIVE COURSES (DSE-5)

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 BIOMEDICAL APPLICATIONS	4	2	0	2	Class 12th with Physics, Chemistry	---

Learning objectives

The Learning Objectives of this course are as follows:

- To acquire knowledge of biocompatibility and biodegradation
- To learn about applications and testing of bio-compatible polymer in tissue engineering

Learning outcomes

After studying this paper, students will be able to

- Explain the basic concepts and requirement of biomedical applications and biocompatibility
- Apply the knowledge of various polymers in biomedical application

SYLLABUS OF DSE-5

THEORY COMPONENT-

UNIT 1 (8 Hours)

BASICS OF BIOMATERIALS

Important features for Biomedical Application: responsiveness, estimations of biodegradation and biocompatibility.

Types of Polymers in Biomedical applications and their Importance, hydrogel, fibres, bio-ceramics, bio-elastomers and membrane

UNIT 2 (10 Hours)

POLYMERS IN BIOMEDICAL APPLICATION

Permanent implants for function-orthopaedics (Internal and External artificial organ), cardio vascular, respiratory patches and tubes, digestive system, genitourinary system, nervous system, orbital (corneal and lens prosthesis)–permanent implant for cosmoses, other applications of engineered material in clinical practices, silicone implants. polymer membranes, polymer skin, polymeric blood

UNIT 3 (12 Hours)

MISCELLANEOUS APPLICATIONS (DENTAL, LENSES, DRUG DELIVERY AND TISSUE ENGINEERING)

Contact Lenses, Hard Lenses, Gas Permeable Lenses, Flexible Lenses, Soft Lenses, Hydrogels, Equilibrium Swelling, Absorption And Desorption, Oxygen Permeability, Types of Soft Lenses, Manufacture, Cleaning And Disinfection.

Dental applications, denture bases, crown and bridge resins, plastic teeth, mouth protectors, maxillofacial prosthetic materials, restorative material, polyelectrolyte based restoratives, sealants, adhesives, dental impression and duplicating materials, agar, algmater elastomers.

Introduction to drug delivery, polymers in controlled drug delivery, dressing strips, polymer drug vessels, core shell and nanogels, tissue engineering, uses of cellulose, chitosan and alginate

PRACTICAL COMPONENT (60 Hours)

- Evaluate the biocompatibility of polymeric samples.
- Determination of the degradation behavior of polymers such as thermal, hydrolytic etc.
- Preparation of membranes and measurement of their absorption behavior.
- Preparation and characterization of dental cement.
- Prepare a hydrogel and characterization.

- Prepare jaw by powdered silicone rubber
- To find out biocompatibility of polymer products by enigmatic test
- Determination of mechanical strength of polymers.
- To find out hydro degradation of artificial bone.
- To prepare porous membranes.

ESSENTIAL/RECOMMENDED READINGS

- Park, J. B. (2003) Bio-materials, An Introduction, CRC Press.
- Tiwari A., Tiwari A., (2013) Nanomaterials in drug delivery, Imaging and Tissue Engineering, Wiley.
- Pilla S., (2011) Handbook of Bioplastics and Biocomposites Engineering Applications, Wiley.

SUGGESTIVE READINGS

- Ratner B.D., Hoffman A.S., (1996) An Introduction to Materials in Medicine, Academic Press.
- Saltzman W.M., (2001) Drug delivery: Engineering principles for drug therapy, Oxford University Press.
- Kalia S., Averous L., (2011) Biopolymers: Biomedical and Environmental Applications, John Wiley & Sons.

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