



MEDICAL BIOMATERIALS

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PRE-REQUISITES : Basics of physics, chemistry and mathematics.

INTENDED AUDIENCE : UG/PG Biotech programmes (core or elective) and research scientists in biotechnology, material science and metallurgy, surgeons, clinicians, dentists.

INDUSTRIES APPLICABLE TO : Implants, devices, biomaterials industries.

COURSE OUTLINE :

Biomaterial is any natural or synthetic material used to replace or augment a part of the body so that it improves the human health by restoring the function of the natural living tissue or organ. It should be biocompatible and should not cause any adverse systemic reaction to the host. It could be a polymer, metal, ceramic or combination of these. It may have to be in contact or remain in the body for few hours or for rest of the life of the person.

ABOUT INSTRUCTOR :

Prof. Mukesh Doble is a faculty at the Department of Biotechnology at IIT Madras. He has previously worked in Imperial chemical Industries (ICI) and General Electric (GE) for 20 years. His areas of research are Biomaterials, Biopolymers, and Drug design. He has published 270 papers and 10 books and filed 10 patents (including two US). He has delivered online video courses in Downstream processes and Biostatistics.

COURSE PLAN :

Week 1: Introduction to Biomaterials

- Background history
- History
- Properties (Mechanical and Physico-chemical)
- Properties (Mechanical and Physico-chemical)

Week 2: Mechanical properties

- Mechanical properties
- Resorbability, biodegradation
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- Biofilm

Week 3: Biofilm

- Biofilm
- Biofilm
- Material characterization - Analytical instruments
- Analytical instruments

Week 4: Analytical instruments

- Analytical instruments
- Biological responses, compatibility, cytotoxicity
- Proteins, Tissue and blood Response
- Cell-biomaterial interaction
- Ceramics

Week 5: Animal trials (in vivo)

- Animal trials
- Metals-types, classifications, applications
- Metals - properties
- Metals - properties

Week 6: Metals - properties

- Metals
- Polymers-types, classifications, applications
- Polymers
- Polymers

Week 7: Blends/composites

- Biopolymers
- Hydrogels
- Preparation of different morphologies (with experiments)
- Surface modifications (with experiments)

Week 8: Ceramics

- Drug delivery systems/encapsulation
- Biomaterials for cardiovascular/pulmonary/ophthalmological applications
- Biomaterials for urinary/dental/skin applications
- Sterilization of implants, device failures, unique issues, conclusion