

IC 818 INTRODUCTION TO BIOMATERIALS

Introduction to basic concepts of Materials Science; Salient properties of important material classes; Property requirement of biomaterials; Concept of biocompatibility; Structure and properties of biological cells & tissues; cell-material interactions and foreign body response; Assessment of biocompatibility of biomaterials, in vitro biochemical assays (cellular adhesion, cellular viability using MTT, osteogenic differentiation using ALP assay; Biomuneralisation using Osteocalcin assay);

In vivo testing and histocompatibility assessment; genotoxicity assessment (Physical damage to DNA by biomaterial eluates); important biometallic alloys: Ti-based, stainless steels, Co-Cr-Mo alloys; Bioinert, Bioactive and bioresorbable ceramics; Processing and properties of different bioceramic materials with emphasize on hydroxyapatite; synthesis of biocompatible coatings on structural implant materials; plasma spraying of carbon nanotube reinforced hydroxyapatite on Ti-6Al-4V substrate; Microstructure and properties of glass-ceramics; biodegradable polymers; Design concept of developing new materials for bio-implant applications.

REFERENCES

1. Biomaterials Science: An introduction to Materials in Medicine, Edited by Ratner, Hoffman, Schoet and Lemons, Second Edition: Elsevier Academic Press, 2004.
2. Comprehensive structural integrity, Vol.9: Bioengineering Editors: Mithe, Ritchie and Karihalo, Elsevier Academic Press, 2003,

ADDITIONAL READINGS

1. Biomaterials Science and Biocompatibility, Fredrick H. Silver and David L. Christiansen, Piscataway, Springer, New Jersey.
2. Biological Performance of Materials: Fundamentals of Biocompatibility, Janathan Black, Marcel Dekker, Inc., New York and Basel, 1981.
3. Basic Cell Culture: A Practical Approach, Edited by J.M. Davis, IRL Press, Oxford University Press, New York, 1994.