16BM207 BIOMATERIALS AND ARTIFICIAL ORGANS

Hours Per Week :

L	T	P	C
3	-	-	3

Total Hours :

L	T	P
45	15	-

WA/RA	SSH/HSH	CS	SA	S	BS
20	46	6	12	3	2

Course Description and Objectives:

This course aims at imparting the knowledge of material science, chemistry and characteristics and classification of Biomaterials. The objective of the course is to learn about different metals and ceramics used as biomaterials, polymeric materials and combinations for mechanism of tissue replacement implants and artificial organ development.

Course Outcomes:

The student will be able to:

- analyze different types of Biomaterials and its classification.
- perform combinations of materials that could be used as a tissue replacement implant.

SKILLS:

- ✓ *Understand the importance of importance of biomaterials and implants in the health care.*
- ✓ *Study various materials for biocompatibility.*
- ✓ *Determine and selection of right materials for its bio applications.*
- ✓ *Apply specific design and quality control.*

UNIT - 1 **L-9**

STRUCTURE OF BIO-MATERIALS AND BIO-COMPATIBILITY: Definition and classification of bio-materials, Mechanical properties, Visco elasticity, Wound healing process, Body response to implants, Blood compatibility.

UNIT - 2 **L-9**

IMPLANT MATERIALS :**IMPLANT MATERIALS**: Metallic implant materials, Stainless steels, Co-based alloys, Ti-based alloys, Ceramic implant materials, Aluminum oxides, Hydroxyapatite, Glass ceramics, Carbons, Medical applications.

UNIT - 3 **L-9**

POLYMERIC IMPLANT MATERIALS :Polymerization, Polyamides, Acryrilic polymers, rubbers, High strength Thermoplastics, Medical applications, Bio polymers- Collagen and Elastin; Medical Textiles-Silica, Chitosan, PLA composites, Sutures, Wound dressings; Materials for ophthalmology-Contact lens, Intraocular lens, Membranes for plasma separation and Blood oxygenation.

UNIT - 4 **L-9**

TISSUE REPLACEMENT IMPLANTS: Small intestinal submucosa and other decellarized matrix biomaterials for tissue repair; Softtissue replacements, Sutures, surgical tapes, adhesive, Percutaneous and skin implants, Maxillofacial augmentation, Vascular grafts, hard tissue replacement Implants, Joint replacements, Pancreas replacement.

UNIT - 5 **L-9**

ARTIFICIAL ORGANS: Artificial blood, Artificial skin, Artificial Heart, Prosthetic Cardiac Valves, Artificial lung (oxygenator), Artificial Kidney (Dialyser membrane), Dental Implants.

TEXT BOOK:

1. Sujata V. Bhatt, "Biomaterials", 2nd edition, Narosa Publishing House, 2005.

REFERENCE BOOKS:

1. Park J.B., "Biomaterials Science and Engineering", 1st edition,Plenum Press, 1984.
2. Myer Kutz, "Standard Handbook of Biomedical Engineering and Design" Mc Graw Hill, 2003.
3. John Enderle, Joseph D. Bronzino, Susan M.Blanchard, "Introduction to Biomedical Engineering", 2nd edition,Elsevier, 2005.
4. A.C Anand, J F Kennedy, M.Miraftab, S.Rajendran,"Woodhead Medical Textiles and Biomaterials for Healthcare", 2nd edition, Publishing Limited 2006.
5. D F Williams, "Materials Science and Technology: Volume 14, Medical and Dental Materials: A comprehensive Treatment Volume", VCH Publishers, 1992.
6. B D Ratner, AS Hoffmann,FJ Schoen and JE Lemmons, "An introduction to Materials in Medicine", Academic Press 1996.

ACTIVITIES:

- *Classify biomaterials.*
- *Characterize the polymers based on strength, yielding and other mechanical properties specific to application.*
- *Identify biomaterials used for medical grafts,*
- *Determine and select the right materials for surgeries, or implants or whole organs replacement with artificial organs.*