

INDIAN INSTITUTE OF INFORMATION TECHNOLOGY
DESIGN AND MANUFACTURING (IIITDM) KANCHEEPURAM

INTRODUCTION OF NEW COURSE

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|--|---|------------------------|---|--|---|---|
| Course Title | Design for Artificial Organs | Course Code | BT5XXX | | | |
| Dept./ Specialization | Science and Humanities | Structure (LT/PC) | 3 | 1 | 0 | 4 |
| To be offered for | UG/PG Elective | Status | Core <input type="checkbox"/> | Elective <input checked="" type="checkbox"/> | | |
| Faculty Proposing the course | Dr. M. Monisha | Type | New <input checked="" type="checkbox"/> | Modification <input type="checkbox"/> | | |
| Recommendation from the DAC | | Date of DAC | 27/4/2022 | | | |
| External Expert(s) | 1) Dr. Abhijeet Joshi, Associate Professor, Department of Biosciences and Biomedical Engineering, IIT Indore 2) Dr. Subha Narayan Rath, Head and Associate Professor, Department of Biomedical Engineering, IIT Hyderabad | | | | | |
| Pre-requisite | CoT | Submitted for approval | | 47 th Senate | | |
| Learning Objectives | The objective of the course is to provide students with a comprehensive overview of the fundamentals of biomaterials used for manufacturing implants that has wide applications in the healthcare industry. This course will help students to understand the design considerations and materials used for manufacturing of various artificial organs. | | | | | |
| Learning Outcomes | On successful completion of the course, the student will be able to: <ul style="list-style-type: none"> • Explain biological, mechanical and physiochemical tests conducted on biomaterials before implantation in the human body. • Analyze the properties and applications of metallic, ceramic and polymeric biomaterials used for implantation • Demonstrate the structure and materials used in the fabrication of artificial organs. | | | | | |
| Contents of the course (With approximate break-up of hours for L/T/P) | Introduction to design considerations and evaluation of artificial organs, basic physiology of human organs, development of artificial heart, cardiac assist devices, mechanical heart valve, cardiac pacemaker and its implantation, artificial blood and artificial oxygen carriers, artificial heart-lung machine: lungs gaseous exchange/ transport and lung assisting devices (14L+4T) . Artificial kidney, kidney filtration, artificial waste removal methods, hemodialysis, regeneration of dialysate, membrane configuration, wearable artificial kidney machine (8L+2T) . Liver support system, artificial pancreas, artificial limbs, Audiometry: air conduction, bone conduction, masking ophthalmoscope, 3D bioprinting of artificial skin, cornea and collagen, Prosthetic and Orthotic devices, body immunological response to implants, (7L+3T) . Introduction to Biomaterials used in artificial organs and prostheses, biocompatibility, surface properties of biomaterials, surface characterization techniques, mechanical testing, physiochemical testing, biological testing <i>in vitro</i> testing and <i>in vivo</i> testing of biomaterials, Cellular reactions to biomaterials, inflammation, tissue engineering approaches for organ development (6L+2T) . Implant materials and their characteristics, Properties and biocompatibility of metallic, ceramic and polymeric biomaterials used in the fabrication of biodevices, Bio polymers: collagen and elastin, materials for ophthalmology: contact lens, Intraocular lens (7L+3T) . | | | | | |
| Text Book | 1. Ratner B.D and Hoffman A.S, “Biomaterials Science: An Introduction to Materials in Medicine”, Academic Press; 3 editions, November 8, 2012. 2. Myer Kutz, “Standard Handbook of Biomedical Engineering & Design” McGraw Hill, 2003. | | | | | |
| Reference Books | 1. The Biomedical Engineering Handbook, Joseph D Bronzino, Third Edition, 2006, CRC press, USA. 2. Biomaterials Science: An Introduction to Materials in Medicine, Buddy D. Ratner, Allan S. Hoffman, Frederick J. Schoen, Jack E. Lemons, Academic Press Inc; 3rd edition, 2012. | | | | | |