

Indian Institute of Technology Guwahati
Proposal for a New Course / Revision of a Course

Course Number & Title: BT636 & Tissue Engineering & Regenerative medicine	
L-T-P-C: 3-0-0-6	
Type of Letter Grading (Regular Letter Grades / PP or NP Letter Grades): Regular Letter Grades	
Kind of Proposal (New Course / Revision of Existing Course): Revision of Existing Course	
Offered as (Compulsory / Elective):Electives	
Offered to: B Tech/M Tech/PhD	
Offered in (Odd/ Even / Any):Any	
Offered by (Name of Department/ Center):BSBE	
Pre-Requisite: Nil	
Preamble / Objectives (Optional): Human tissue and/or organ failure, as a result of disease or trauma, is a major health concern world over. Treatment options include donor based transplantation, surgical repair, artificial prostheses etc. Ultimately, however, major damage may never be repaired in a truly satisfactory way. For such cases tissue engineering/regenerative medicine has emerged as a potential alternative, whereby tissue and organ failure is addressed by implanting lab grown tissue grafts and organ mimics that are fully functional and compatible. A variety of approaches are used to engineer these tissues in combination with stem cells/biomaterial/growth factors etc. Stem cells because of their remarkable regenerative potential are a preferred choice. Notable engineered tissues include bone, cartilage, blood vessels, liver, skin, muscle, nerve conduits etc.	
Course Content/ Syllabus Introduction to tissue engineering & regenerative medicine: principles underlying tissue engineering/regenerative medicine strategies, key concepts of tissue engineering/regenerative medicine, its need and current available technologies. Structure and organization of tissues: various cell and tissue types, its organization, structure-function relationship. Stem cells: stem cell types, their characteristics, potency Cell isolation, culture and differentiation: primary cell isolation techniques, cell culture needs, differentiation abilities of stem cells towards specific lineages. Biomaterials in tissue engineering & regenerative medicine: knowhow on current biomaterials, natural vs. synthetic, role of a biomaterial in tissue engineering, its properties, biodegradable polymers and 3D scaffold processing techniques; Cell-cell and cell-matrix interactions: knowhow and importance of such interactions, extracellular matrices; tissue repair and angiogenesis Biocompatibility and immune rejection: biomaterial/graft compatibility, host acceptance and rejection Drug, growth factor and gene delivery: knowhow and importance of sustained and controlled delivery, implications and applications Bioreactors in tissue engineering & regenerative medicine: knowhow on bioreactors, tissue growth and maturation, implications and applications. Applications in tissue engineering & regenerative medicine: tissue regeneration case studies on bone, cartilage, blood vessel, skin, cornea etc.	
Books (In case UG compulsory courses, please give it as "Text books" and "Reference books". Otherwise give it as "References".	
Texts and References: (Format: Authors, <i>Book Title in Italics font</i> , Volume/Series, Edition Number, Publisher, Year.)	
1.	The Principles of Tissue Engineering (4th edition), by Robert Lanza, Robert Langer, and Joseph P. Vacanti.Academic Press (AP). 2013.
2.	Essentials of Stem Cell Biology (3 rd edition), by Robert Lanza and Anthony Atala. Academic Press (AP). 2013
3.	Biomaterials Science: An Introduction to Materials and Medicine (3rd edition), by

	Buddy D. Ratner, Allan S. Hoffman, Frederick J. Schoen and Jack E. Lemons. Academic Press (AP). 2012
4.	Culture of Animal Cells: A Manual of Basic Technique and Specialized Applications (6th edition), by R. Ian Freshney. Wiley-Blackwell. 2010
5.	Biomaterials: Principles and Applications, by B. Park and J.D. Bronzino. CRC Press. 2002
6.	An Introduction to Tissue-Biomaterial Interactions by K.C. Dee, D.A. Puleo and R. Bizios. Wiley 2002.