



Indian Institute of Science  
Centre for BioSystems Science and Engineering



## SEMINAR

at 11:30 pm on 22<sup>nd</sup> March 2018 (Thursday)

MRDG Seminar Hall

### Functionalized Biomaterials for Tissue Engineering and Regenerative Medicine: Innovations and Interventions

**Ashok Kumar**

**Department of Biological Sciences and Bioengineering, Indian Institute of Technology Kanpur,  
Kanpur-208016, UP, INDIA**

Development of next generation biomaterials and scaffolds considers different aspects of mimicking the architecture, physiology as well as the physiochemical properties of the tissue to be repaired and regenerated. Over the last decade, we have developed and fabricated different scaffolds as well as biomaterials that have shown potential applications for regeneration of tissues such as bone, cartilage, liver, neural and cardiovascular system. We design and develop cryogels, which are supermacroporous polymeric hydrogels synthesised under frozen conditions for development of Bio Artificial Liver (BAL) devices as a treatment strategy for liver failure. Besides this we have used these cryogel matrices for *in vitro* as well as *in vivo* drug screening. For musculoskeletal regeneration, cryogels are being employed for repair of surgically created critical size bone defects. For load bearing bone repair and regeneration, we developed nano-hydroxyapatite based bone cement and bone void filler along with calcium sulphate hemihydrate and evaluated their regenerative capabilities. Recently we have developed next generation biomaterials for neural and cardiac regeneration. For neural regeneration, we developed and evaluated an advanced nerve guidance channels (aNGCs) by mimicking the architecture of the peripheral nerve by combing advanced technologies of cryogelation, electrospinning and 3D bioprinting. For cardiovascular regeneration, we are developing antioxidant elastomeric polymeric scaffolds which can attenuate oxidative stress, release oxygen and can also find applications in chronic and diabetic wound healing. Overall our research focus is to develop indigenous, clinically relevant devices, biomaterials and scaffolds for repair and regeneration of critically damaged tissues. In this talk, I will provide a glimpse of various tissue engineering strategies which our research group is developing for regeneration of these damaged tissues.

Dr. Ashoke Kumar is currently a Professor a Department of Biological Sciences and Bioengineering at IIT Kanpur . He pursued his doctoral studies from IIT Roorkee His current research interests are Biomaterials, Tissue Engineering, Regenerative Medicine ,Stem cell research, Bioprocess engineering and environmental biotechnology.

