Course on

Emerging Frontiers in Research and Innovation in Poro-Biomechanics and Medical Devices

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Emerging Frontiers in Research and Innovation in Poro-Biomechanics and Medical Devices

**SCOPE**

The theory of Poroelasticity (PE) was introduced few decades ago. PE is focused on the study of deformation of porous materials saturated with fluid. PE lies in the intersection of elasticity, solid mechanics, fluid mechanics, and continuum mechanics. The theory was extended to deal with deformation of biological tissues, bone mechanotransduction, bone implants, osteoporosis, arthritis, and microgravity. In this course the constitutive relations of continuum mechanics will be explained and extended to discuss modeling of selected biological systems. The problem of unconfined compression of porous disk saturated with fluid will be explored and extended to establish the model of Russian Doll to analyze fluid flow in cortical bone. The work will be extended to discuss theoretical modeling of articular cartilage and biologically inspired materials.

Additive manufacturing (AM) has shown great value in medical devices industry, because it addresses the challenges of this industry. AM can make parts with complex geometries with less cost than conventional manufacturing and can produce customized devices. Because of the rapid growth in AM and AM materials, the medical device industry is considering AM in many applications including orthopedic implants. Other applications of AM that will be introduced are in entertainment, architecture, automotive, and aerospace. We will present the principles and processes of additive manufacturing (AM) and extend them to different material models including lattice and cellular structures. Estimating cost of AM remains one of the challenges that still not fully resolved, however we will discuss the MIT cost analysis model that was recently released. In depth evaluation of AM in orthopedic implants and biomaterials will be discussed also. A scheme of collaboration between academic institutions and students in India and USA will be outlined to design and fabricate medical and prosthetic devices for patients in India.

**COURSE OBJECTIVES**

- Introducing participants to the theory of poroelasticity and its application in modeling biological tissues such as modeling materials with hierarchical pore size structure.
- Present a detailed case study of unconfined compression of porous disk saturated with fluid and applying the case to many biological tissues.
- Help participants get in depth understanding for design and fabrication of medical and prosthetic devices using advanced medical imaging, CAD, and CAM; and introduce additive manufacturing principles, applications, and cost analysis.
- Build a network between participants and their counterparts in the USA to design and fabricate medical devices at low cost.

**WHO CAN ATTEND**

✓ Executives, engineers and researchers from manufacturing, service and government organizations including R&D laboratories.
✓ Student at all levels (BTech/MTech/MSc/PhD).
✓ Faculty members from reputed academic institutions and technical institutions.

**CONTACT**

Dr. A.M. Kuthie is currently Professor in Mechanical Eng. department and Prof-in-charge of CAD-CAM centre at VVMS Deemed University (VNTV), Nagpur which is an institute of national importance by act of parliament. Prof. A M Kuthie began his career in 1986 after B.E. (Mechanical) from Govt. College of engineering Amravati by joining Hindustan Aeronautics Limited, Nashik. He obtained his M.Tech from IIT Powai and joined Birla Consultancy Services (BICS) as senior software engineer. He left BICS and joined at regular faculty in VNTV in 1993. His research work focused primarily in the area of Rapid Prototyping (RP). The capabilities of RP equipment were extensively exploited by him to make custom human body parts that were implanted in human bodies as well as to develop zero defect pattern making and casting. He has earned patent for the niche work undertaken by him. His contribution to international and national journals, presentation of papers at international conferences and authoring of a book demonstrates his deep study as well as authority on the subject. Creation of well equipped CAD-CAM centre at VNTV speaks volumes of his passion for raising the bar of academic standards. His self-motivation for introduction of industry oriented courses, as well as untiring efforts in creating awareness and building capacity for large scale adoption of Rapid Prototyping using CAD is a testimony of his passion. The all encompassing contribution of Prof. A.M.Kuthie in the area of RP expands the conventional boundaries of research.

**REGISTRATION FEES**

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<thead>
<tr>
<th>Category</th>
<th>Fee (INR)</th>
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<tbody>
<tr>
<td>Participants From Abroad</td>
<td>Rs 400</td>
</tr>
<tr>
<td>Industry/Research Organizations</td>
<td>Rs 10,000/</td>
</tr>
<tr>
<td>Students</td>
<td>Rs 3,200/</td>
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<tr>
<td>Students (SGST)</td>
<td>Rs 1,600/</td>
</tr>
<tr>
<td>Non Students</td>
<td>Rs 6,400/</td>
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The above fees include all instructional materials, computer use for tutorials, internet facilities, tea, snacks and lunch. It is inclusive of 18% GST as per institute norm. The participants may avail single booked shared accommodation and food (breakfast and dinner) if requested on additional payment basis.

**Last date for Registration: 28/02/2019**

Interested persons may apply in the format shown here along with the registration fee paid through demand draft in favour of Director, VNTV, Nagpur and payable at Nagpur through NEFT transfer. The number of seats is limited and thus candidates are advised to register early.

**HOW TO APPLY**

For Electronic Payment (NEFT)

Name of the Beneficiary: Director VNTV
A/c No. 10259420288
Name of Bank: State Bank of India
Branch Name: WRCE, Nagpur
MICR Code: 44002005
IFSC Code: SBIN0006702

**Note:** For NEFT transfers all the transaction details are to be sent.

For confirmation of registration, the proof of payment (a scanned copy of the Demand Draft/NEFT transaction details along with the registration form and copy of PDF generated at GIAN portal if registered through GIAN portal, are to be mailed to amk1amk2002@yahoo.com

**CONTACT**

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