

**A GIAN course on
Emerging Frontiers in Research and
Innovation in Poro-Biomechanics and
Medical Devices**



Mar 11-15, 2019

REGISTRATION FORM

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2. Gender Male Female

3. Category: Academic/Industry/Student [For registration as students, please enclose a bonafied certificate from parent institution]

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Course on

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

Mar. 11-15, 2019

Foreign Faculty

Dr. GAFFAR GAILANI

*Department of Mechanical Engineering and Industrial Design Technology
New-York City College of Technology USA*

Course Coordinator

Dr. A. M. KUTHE

Professor

Mechanical Engineering Department

GIAN Coordinator (VNIT)

Dr. K. M. BHURCHANDI

Professor & Head

Electronics & Communication Department

PATRON

Dr. P. M. PADOLE

Director

Visvesvaraya National Institute of Technology Nagpur

CAD-CAM CENTRE

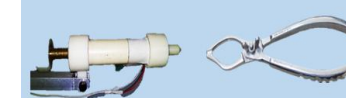
Mechanical Engineering Department

Visvesvaraya National Institute of Technology (VNIT)

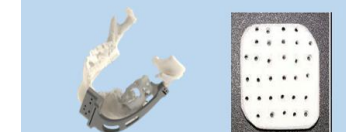
Nagpur-440010 India



CAD-CAM Centre is centre for innovation in Department of Mechanical Engineering, VNIT Nagpur. CAD-CAM centre provides a great platform for young engineers and researchers to work under completely equipped research laboratory. CAD-CAM centre equipped with latest machines including WEDM, ECM, CNC-VMC, Rapid Prototyping machine (FDM and uPrint), Agitation Tank, CNC-CMM, Induction furnace to name a few for Engineers, Doctors and Scientists to work under one roof. Two externally funded projects titled BETIC & SMART FOUNDRY runs under this centre.



Glaucoma screener Nasal surgery forceps



Maxillofacial surgery jig Bone Scaffold

Medical Devices Developed at CAD-CAM Centre

CAD-CAM centre facilitate rapid translation of innovative ideas from surgeons into high-quality low-cost medical devices suitable for local population. Facilities at CAD-CAM centre include state-of-art labs required for medical device innovation viz rapid prototyping, pilot manufacturing, testing, characterization, packaging, and tissue engineering.



VNIT, Nagpur is one of the thirty National Institutes of Technology in the country. The Govt. of India by the act of Parliament (National Institutes of Technology Act, 2007) declared VNIT Nagpur as an Institute of National Importance along with other NITs. The VNIT located at Nagpur, which is known as 'Orange City', is connected to almost all part of the country by trains and flights. You can reach the institute from both railway station as well as the airport by taxi or auto-rickshaw in minimum time.



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 for 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 (B.Tech/MSc/MTech/PhD).
- Faculty members from reputed academic institutions and technical institutions.

COURSE OUTLINE & DETAILS

Day 1	Day 2	Day 3	Day 4	Day 5
Introduction	Poroelasticity	Applications	Modeling (FEA)	Additive manufacturing for medical and prosthetic devices

ABOUT THE SPEAKERS



Dr. Gaffar is an associate professor in the department of Mechanical Engineering and Industrial Design Technology in New York City College of Technology (City Tech). He received his bachelor degree (honor degree) in mechanical engineering from Khartoum University in 1995 and his Master and PhD degrees in mechanical engineering from City College of New York. Prior to receiving his PhD he worked full time for General Electric Research and Development and Department of Design and Construction in New York City for many years. In his PhD thesis he was mentored by worldwide Distinguished Professor of Biomedical and Mechanical Engineering Dr. Stephen Cowin. Together, with professor Luis Cardoso they wrote a book in bone fluid flow in 2009. They were the first to extract and test a single osteon (micromechanical testing). Their 2013 paper in the journal of Biomechanics was selected among five highly cited papers for 2014 – 2015. Dr. Gailani's paper in 2009 was selected by Zwick Corporation (Germany) among the seven best papers in innovative materials testing. Dr. Gailani is currently building the Center of Medical Additive and Manufacturing (funded by NASA and NSF) in collaboration with NASA LaRC, Hospital for Special Surgery, North Carolina State University, and Department of Restorative Dentistry at City Tech. Dr. Gailani has taught in many universities including New Jersey Institute of Technology and Polytechnic University (currently New York University). He was invited speaker to the NSF EFRJ, Hershey Orthopedics at Penn State University, and many others. Dr. Gailani was an external examiner for PhD thesis in USA and India.



Dr. A.M.Kuthe is currently Professor in Mechanical Eng. department and Prof-in-charge of CAD-CAM centre at Visvesvaraya National Institute of Technology (VNIT) Nagpur which is an institute of national importance by the act of parliament. Prof. A.M.Kuthe 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 Roorkee and joined Birla consultancy Services (BICS) as senior software engineer. He left BICS and joined as regular faculty in VNIT in 1993 His research work mainly focused in the area of Rapid Prototyping (RP). The capabilities of RP equipment were extensively exploited by him to make custom build 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 demonstrate his deep study as well as authority on the subject. Creation of a well equipped CAD-CAM centre at VNIT 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.Kuthe in the area of RP expands the conventional boundaries of research

REGISTRATION FEES

Participants From Abroad	US \$ 400
Industry/Research Organizations	Rs.10,000/-
Students	Rs.3,200/-
Students (SC/ST)	Rs.1,600/-
Non Students	Rs.6,400/-

The above fees include all instructional materials, computer use for tutorials, free internet facility, tea, snacks and lunch. It is inclusive of 18% GST as per institute norm. The participants may avail single bedded shared accommodation and food (breakfast and dinner) if requested on additional payment basis.

Last date for Registration: 28/02/2019

HOW TO APPLY

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

For Electronic Payment (NEFT)
Name of the Beneficiary: Director VNIT
A/c No. 10259420288
Name of Bank: State Bank of India
Branch Name: VRCE Branch, Nagpur
MICR Code: 440002005
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 amkme2002@yahoo.com

CONTACT

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