

# **Composite Materials and Structures: Processing & Fabrication, Analysis and Design**

## **Overview**

An extensive research and development have been made on composite materials and structures and found polymer composites offer superior specific mechanical properties, resistance to corrosion and fatigue, tailorability of material and flexibility of manufacturing. Transfer of this knowledge to young students, teaching faculty and practicing engineers is highly desired to prepare future advanced workforce, retain current workforce to adapt to new and ever changing industries. This course contributes to the creation of an atmosphere of life-long learning and continuous training. Wealth of a nation depends on how well its work force is prepared and trained. Success of the IT industry in India is an example of the contribution by private and state engineering colleges and training centers for preparing and continuous training of workforce. Keeping this philosophy in mind this course is designed and delivered to the students, practicing engineers and executives on composite materials and structures. Composite materials have been in use since BCs and over the years it has advanced and incorporated science, mathematics and engineering to make it simple enough to teach and train students and interested participants.

The proposed two-week short course will cover the insights into processing and fabrication of polymer composites from particle to fiber reinforcement, prediction of material physical and mechanical properties by analysis and test validation, analysis and design of structural elements, and joints and structures with damage. The daily course consists of two 1-hour lectures followed by two-hour lab/tutorials on hands-on experience and problem solving. The lab includes a short quiz to assess the understanding of the day's material by the participants. The course feedback will be obtained at the end of each module; the first feedback will be used to make changes, if necessary, to the second module and the last feedback will be used for a future courses. A complete syllabus and the lecture notes will be provided to the participants on the first day of the class.

## **Objectives of the Course are to introduce and teach:**

- Composite materials
- Micromechanics analyses
- Laminate analyses
- Failure theories and failure analysis of structures
- Design of laminates and joints

- Damage tolerance analysis and design
- Emerging technologies

<b>Modules</b>	<p><b>Module A: Processing, Fabrication and Analysis of Composite Materials</b></p> <p><b>Module B: Design of Composite Laminated Structures</b></p> <p><b>Dates: 31/12/2018 to 11/1/2019</b></p> <p><b>Number of participants for the course will be limited to Sixty.</b></p> <p><b>Selection will be based on first come first serve</b></p>	<p><b>Course Co-ordinator</b></p> <p><b>Dr. Siddaramaiah</b>  <b>Professor &amp; Head</b>  <b>Department of Polymer Science &amp; Technology,</b>  <b>Sri Jayachamarajendra College of Engineering,</b>  <b>JSS S&amp;TU, Mysuru 570 006, Karnataka, India</b>  <b>Tel: +91 821 2548285 (O)</b>  <b>Cell No.: 9972095262</b></p>
<b>You Should Attend If...</b>	<p><input type="checkbox"/> Students at all levels- (B.Tech/M.Sc./M.Tech./ Ph.D.) or Faculty from reputed academic institutions and technical institutions</p> <p><input type="checkbox"/> Executives, engineers and researchers, serving in academic and government organizations including R&amp;D laboratories</p>	
<b>Fees</b>	<p>The participation fees for taking the course is as follows:</p> <p><input type="checkbox"/> Participants from Host Institute: Rs. 1000/-</p> <p><input type="checkbox"/> Indian Participants (from Academic Institutes): Rs. 2000/-</p> <p><input type="checkbox"/> Industry/ Research Organizations (Indian): Rs. 4000/-</p> <p><input type="checkbox"/> Participants from abroad: US \$200</p> <p>The above fee includes all instructional materials computer use for tutorials and assignments, laboratory equipment usage charges and working lunch</p>	

## **International Teaching Faculty**

**Dr. Kunigal N. Shivakumar, Professor, North Carolina A&T State University, Greensboro, USA**



Dr. Shivakumar is the Director of Center for Composite Materials Research and NASA Funded Center for Aviation Safety at North Carolina Agricultural and Technical State University. He received B.E. and M.E. in Civil Engineering from Bangalore University and Indian Institute of Science, respectively, and Ph.D., in Aeronautical Engineering from Indian Institute of Science, India. His research and technical activities includes polymer based composite materials and structures; fracture mechanics, and novel concepts and models to address challenging problems in Structures and Materials. Before joining North Carolina A&T State University (A&T) in 1991 Dr. Shivakumar worked NASA Langley Research Center, Old Dominion University and Analytical Services and Materials Inc, for about 12 years. Dr. Shivakumar's research at A&T has been funded by NASA, ONR, ARMY, AFRL, NSF, and FAA and industries like Lockheed Martin, Boeing, Atlantic Research Corporation, GE-Aircraft Engines, and 3TEX Inc. He received more than \$20 m as a Principal/Co-P Investigator. Dr. Shivakumar has successfully collaborated and collaborating with a number of universities including University of MD (College Park), University of Mississippi, University of Tennessee, University of Utah, UC-Berkley and Harvard. Dr. Shivakumar has served in government, industry, and universities. He advised/Co-advised 22 Ph.Ds and 41 M.S., students at NC A&T and other universities. Dr. Shivakumar has published more than 250 peer reviewed articles in journals and conferences and made equal number of presentations.

Dr. Shivakumar is an Associate Fellow of AIAA, member of ASME and ASC. He is has conducted a number of national and international conferences and workshops. He worked in number of technical committees and societies, specifically in advancing materials and structures. Dr. Shivakumar was an Associate Editor of AIAA journal and Member of Board of Editors of Computer Modeling and Engineering Sciences. He is a reviewer for a number of journals in structures and materials and reviewed Ph.D. dissertations for a number of international universities/institutions. Dr. Shivakumar has received many awards from NASA, AIAA, AS & M Inc., North Carolina A&T State University, and Indian Institute of Science. Dr. Shivakumar has two patents and a several copyrighted software codes and test fixtures. Currently, Dr.

Shivakumar's research is supported/collaborated by a number of faculty from College of Engineering and College of Arts & Science, Research associates, technical staff and many M.S. and Ph.D., students.

## Host Faculty

Prof. Siddaramaiah obtained Ph.D., (1993) degree from University of Mysore, Mysore, India. He worked as a Post Doctoral Research Fellow under Brain Korea (BK-21) Fellowship for a period of



one year (2007-08), Chonbuk National University, South Korea. He visited University of Federal, Rio de Janeiro, Brasil, two times (2005 and 2009 for a period of 3 months each under UNESCO-TWAS visiting Fellowship. He had undergone training on Haake rheocord at M/s. Thermo Fisher Scientific, Karlruhe, Germany and at M/s. Bosch-Rexroth new Drive & Control Academy,

Würzburg, Germany, during 16 - 26 March 2009. He is working as Professor & Head, Department of Polymer Science & Technology, Sri Jayachamarajendra College of Engineering, Mysore, which is affiliated to Visveswaraya Technological University, Belgaum. He is the recipient of SERC Visiting Fellowship from DST, New Delhi (2000) and Visiting Scientist fellowship from IIT, Kharagpur (2000).

He has authored more than 300 research articles in reputed referred journals, more than 270 conference papers, 12 book chapters, 4 review articles, one book, three monographs and is a co-inventor of 3 Indian patents. 25 students have successfully completed their Ph.D., degree under his supervision and he has supervised 6 M.Sc., (Engg) by research, and one M.Phil.

He is a recipient of "Young Scientist Award-1997", in 'Chemical Science' awarded by KAAS, Bangalore, India and "Sir C.V. Raman Young Scientist Award – 1999" in 'Chemical Technology' by KSCST, Government of Karnataka, Bangalore (2002). His name listed in Marquis (USA) Who's Who in the World (biography) in 16, 17, 18 & 20th Edition – 1998, 1999, 2000 & 2002. He is the recipient of 'PROJECT OF THE YEAR' award two times and "Certificate of Commendation", award from KSCST, Bangalore. He and his research team received "Best Paper Award" more than nine times. Recently he received, "Silver Trophy Plasticon Award-2012 in the category of Best Research, Plastindia Foundation, New Delhi. He is the recipient of Runner-Up of 6th National Award for Technology Innovation 2015-16 in Innovation in Polymeric Products, "Design and development of highly flexible and visibly transparent UVA radiation sensing polymer nanocomposite hybrids", by Ministry of Chemicals and Fertilizers, Dept. of Chemicals & Petrochemicals, Govt. of India, New Delhi, 20th Jan 2016.