



Prof. Ravi Hadimani

Dr. Hadimani has First Class Honors Degree in Mechanical Engineering from the Kuvempu University, India (2001), MS in Mechatronics from the University of Newcastle, UK (2003), and PhD in Electrical Engineering from the Cardiff University, UK (2010). He has served as a project scientist from 2010 to 2011 at the Institute of Materials Research and Innovation of the University of Bolton, UK. He has developed a hybrid piezoelectric and photovoltaic energy harvester, which was awarded the UK Energy Innovation Award in 2011, published in various news articles by BBC, New Scientist, and Scientific America. He has also developed and patented piezoelectric polymer fibre that can be used as an energy harvesting fabric. He is awarded the International Young Scientist Fellowship by National Natural Science Foundation of China

Dr. Somashekara M A



Dr. Somashekara M A has a Bachelor's degree in Mechanical Engineering from Reva University, India (2009), Master's (2011) and PhD (2016) from the Department of Mechanical and Aerospace Engineering, IIT Hyderabad. He has served as a Postdoctoral Research Fellow from 2016 to 2017 at SUTD, Singapore, and Postdoctoral Research Associate from 2017 to 2019 at the Ames Laboratory, USA. He has received several awards, including Research Excellence Award during PhD and Science and Engineering Research Board (SERB) Technology Translation Award. He is currently serving as an Associate Professor and Associate Dean R&D (External Relations) in the Dept of MMAE at IIT DHARWAD.

Course Content

This course provides a comprehensive introduction to the interdisciplinary field of functional materials and additive manufacturing (AM). It begins with the fundamentals of functional materials, including ferroelectric materials and nanostructured materials, followed by their synthesis and fabrication techniques. Participants will gain a solid foundation in additive manufacturing, exploring key processes and material considerations. Emphasis is placed on AM applications in medical implants and devices, as well as magnetic materials processed under external fields. The course also discusses the intersection of materials science and AM, highlighting the unique challenges and opportunities in this domain. Finally, current research directions, application areas, and technological gaps will be explored, preparing students for advanced study or research in functional materials and AM.

Topics Covered:

- Introduction to Functional Materials
- Ferroelectric and Magnetic Materials
- Nanostructured Functional Materials: Fabrication and Properties
- Fundamentals of Additive Manufacturing (AM)
- Key AM Processes and Material Compatibility
- AM of Medical Implants and Biomedical Devices
- AM of Magnetic Materials under External Fields
- Materials Science Aspects for AM
- Applications and Emerging Trends in Functional Materials and AM
- Research Challenges and Future Directions

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IIT DHARWAD

Department of Mechanical, Materials
and Aerospace Engineering



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**Functional Materials
Manufacturing for
Energy and Biomedical
Applications**

22nd-31th, Dec 2025

Last for registration : 30 Nov 2025

Overview

Advanced manufacturing of functional materials plays a pivotal role in revolutionizing both energy and biomedical fields. In the realm of energy applications, innovative manufacturing techniques enable the production of highly efficient magnetic and piezoelectric materials for energy conversion applications such as permanent magnets in wind turbines, magnetocaloric regenerators in magnetic refrigerators, soft magnetic materials in motors, generators, and transformers.

This not only enhances energy conversion and storage capabilities but also contributes to the development of sustainable and clean energy solutions. In the biomedical sector, advanced manufacturing facilitates the creation of tailored materials for several medical devices and implants, such as transcranial magnetic stimulation coils, deep brain stimulation leads, and bone implants. Precise material design and fabrication ensures compatibility with the human body, improving therapeutic outcomes and patient well-being.

Additive manufacturing enables personalized implant and device fabrication with ease and low lead time. Overall, a course in advanced manufacturing of functional materials will train the students and researchers to achieve breakthroughs in energy efficiency and healthcare innovation.

Objectives



Provide foundational knowledge of functional materials and their diverse applications in fields such as energy, electronics, and biomedical engineering.



Introduce fabrication techniques, with a focus on both traditional methods and additive manufacturing (AM) approaches for functional materials.



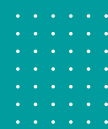
Enable students to understand material design principles, fabrication processes, and application-specific usage of functional materials.



Offer hands-on experience in 3D printing and design, facilitating practical understanding of AM technologies.



Present case studies related to the energy and medical sectors, demonstrating real-world applications and challenges in implementing functional materials using AM.



From 22nd to 31th Dec,
2025 (10 days)

✓ Lectures: 25 hrs. ✓ Tutorials: 20 hrs.

An examination will be conducted upon completion of the course



Who can attend

- Executives, engineers and researchers from Academic, University, Manufacturing, service and government organizations including R&D laboratories.
- Student at all levels (BTech/MSc/MTech/PhD) or Faculty from reputed academic institutions and technical institutions.



Fees

The participation fees for taking the course is as follows:

- **Industry/ Research Organizations: INR 4,400 /- (Incl GST)**
- **Faculty : INR 2,400/- (Incl GST)**
- **Students : INR 1,200/- (Incl GST)**
- **Others : INR 1,500/- (Incl GST)**

The above fee includes lunch, coffee, tea, registration kit, instructional materials, computer use for tutorials and assignments, laboratory equipment usage charges, 24 hr free internet facility. The participants will be provided with accommodation on payment basis.