

Post Graduate Program on “Additive and Joining Technologies”

Mechanical & Industrial Engineering Department
Indian Institute of Technology Roorkee

Preamble

Additive and Joining Technologies is a newly restructured post graduate program of Mechanical and Industrial Engineering Department, Indian Institute of Technology Roorkee. The program has been conceptualized and designed considering growing demand for fast, cost effective manufacturing technologies in aerospace, automotive, petrochemical and even construction sector. This programme will impart in-depth knowledge and understanding on additive manufacturing and advanced fusion and solid state joining technologies. Additive Manufacturing allows developing engineering components of varying complexities fast and with reliability and the same is realized digitally using processes without any tool which opens a wide range of possibilities to deal with many manufacturing challenges.

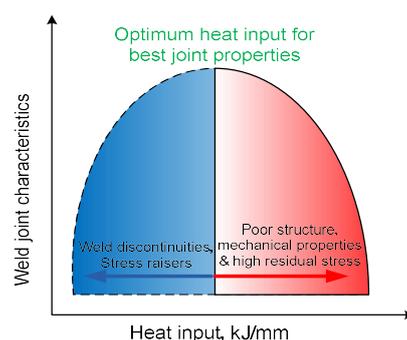
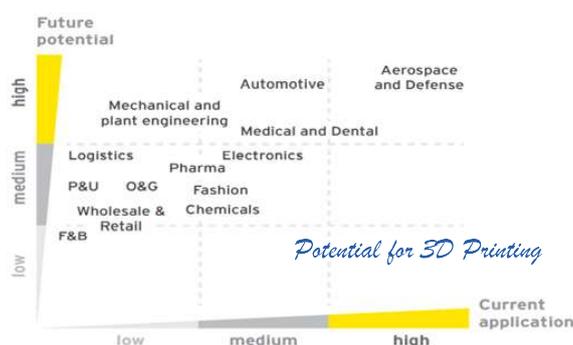
Content

The program encompasses additive manufacturing, solid state and fusion based joining technologies, material characterization and testing as program core courses and many industry oriented program elective courses. Further, many new courses designed in light futuristic requirement such as FEM for manufacturing processes, Dissimilar Metal Joining, Hybrid Joining Technologies, Reverse Engineering and Rapid Tool make the program attractive and futuristic. Therefore, program has great potential jobs and scope for undertaking doctoral research.

Strength

The Department laboratories are well established for imparting training and undertaking research in area of additive manufacturing (Rapid prototyping, 3D printing), solid & fusion joining (friction stir welding, diffusion bonding, spot welding, laser beam welding, plasma arc welding, gas metal arc welding, gas tungsten arc welding, submerged arc welding), material's inspection, testing and characterization (scanning electron microscope, micro-hardness, microscope, stereoscope, universal testing machine, creep testing machine, ultrasonic, magnetic particle, dye penetrant testing). Department is actively engaged in undertaking R & D project and supervising masters and doctoral research in this domain. The department has undertaken more than 10 sponsored project of worth more than 3 Crore and more 10 students have completed their doctoral work during the last five years in this domain. Team of researchers working in this area have published more than 50 articles in top notch journals like Welding Journal, Science and Technology of Welding, Brazing and Soldering, Materials Processing Technology and filed more than 10 patent applications on various technologies developed in area of joining and additive manufacturing. Prospective students of who have graduated in mechanical, production, manufacturing, welding engineering will find this program very useful for their career in terms of jobs and scope for higher studies. Faculty working in cutting edge world class technologies of the domain will be imparting training during the program and sharing knowledge.

(Note: Feel free to write to head@me.iitr.ac.in / dwivedi@me.iitr.ac.in for further information about the program)



About Additive Manufacturing

Additive Manufacturing (AM) is a process that models 3D structures by the addition of material in a layer-upon-layer pattern. It is also popular by the name of rapid prototyping, 3D printing, rapid tooling, direct digital manufacturing for the technology, which came to light in the late 1980s for making 3D models.

- AM is among the key technological developments in the fourth industrial revolution, which strongly affect the supply chain. Besides this, AM has been found to disrupt the traditional supply chain.
- This process has been transfigured from making prototypes and models to functional objects due to its fast and cost-effective ability.
- Today, AM has wide applications in aerospace, automotive, medical, healthcare, clothing, fashion, food industries, and many others.
- It is advantageous over traditional manufacturing due to its competence in making complex, almost near-net shape, and customized products.

About Joining Technologies

The joining of one of the prominent manufacturing techniques used to realize simple to complex and very large size structures. The development in field of materials and need of developing efficient and reliable engineering systems effectively has been pushing R & D in the field in joining. For example, joining of metal & non-metal combination in automotive sector and that of dissimilar metals in power sector to name a few are driving force for R & D in both fusion and solid state joining technologies. Residual stress and distortion is another challenging domain and high in demand from Indian / International Fabrication Industries. Highlights of the program with regard to joining technologies includes:

- Impart in depth knowledge by the world class faculty working in cutting edge solid state and fusion joining technologies
- Train engineers to fabricate technologically sound joint for critical applications like aerospace, nuclear through systematic understanding on metallurgical and design aspects of joining using FEM
- Provide hands on training on joining technologies (USW, FSW, DB, LBW, GMAW, GTAW, SAW, RSW) and inspection and testing methods (spectroscopy, scanning electron microscopy, micro-hardness/toughness/tensile/fatigue/creep testing, magnetic particle and ultrasound testing) to evaluate the soundness of joints.
- To impart knowledge through never before kind of futuristic courses (dissimilar metal joining, residual stress and distortion, hybrid joining technologies, FEM in manufacturing with reference to joining) as per need of fabrication industry.

Additional Info of Programs

- a) Structure of PG scheme: https://www.iitr.ac.in/academics/uploads/Structure_Additive%20and%20Joining%20Technologies.pdf
- b) Syllabus of different courses: https://www.iitr.ac.in/academics/uploads/Syllabi_Additive%20and%20Joining%20Technologies.pdf