



Theme Diary

Interdisciplinary MTech in Additive Manufacturing

Prof Suryakumar S
Department of Mechanical & Aerospace Engineering

KID: 20220102

Additive Manufacturing (AM) or more popularly known as 3D Printing, is a rapidly evolving manufacturing approach with advantages over traditional fabrication including increased design complexity, enhanced part customization and lower setup times. In particular, there is a significant interest in AM for biomedical, defence, and aerospace applications requiring high-temperature strength, higher strength-to-weight ratio, and corrosion resistance along with unparalleled design freedom.

The growing demand for AM also needs a steady influx of professionals who specialize in this area. Hence, in 2020, IITH started an interdisciplinary M.Tech in Additive Manufacturing to address the gap between AM applications and the lack of trained engineers in this field. The course is designed to equip students to understand and advance AM by combining a fundamental understanding of the underlying science along with a specialized study of different processes and technologies. The course will also focus on capturing the interdisciplinary nature of the AM by providing hands-on experience with designing, adapting, and building parts using current AM technology. It leverages the strong ecosystem of AM research at IITH, thus providing the students an opportunity to carry on research in a variety of AM Applications.

The course structure is designed to give the student a broad exposure of various AM processes and a deeper study in a chosen field. First semester courses are aimed at providing an overview of various aspects of AM to the students. In the second semester, the student can take specialized courses of his/her choice from the following course baskets:

- (1) Systems Integration for AM
- (2) Computational Tools for AM
- (3) Applications- Bio-AM
- (4) Applications- Metal-AM.

The second year will be a Thesis.

The course is open for both MoE and Self-sponsored students and candidates sponsored by government labs like DRDO.

Elective Courses in Semester I (the list is not exhaustive)

Basket	Course Title	Credits
Systems Integration for Additive Manufacturing	Life Cycle Analysis	1
	Elasticity & Plasticity	1.5
	Computational Tools for Geometric Modelling	1.5
Computational Techniques for Additive Manufacturing	Finite Element Methods	3
	Mathematical Methods for Engineers	3
	Augmented Reality & Virtual Reality	1
Bio Additive Manufacturing	Biomaterials: Materials in Medicine	2
	Lab on Chip	1
	Advanced Fabrication	2
	Microfluidic Platform for Cell Culture & Diagnostics	1
Metal Additive Manufacturing	Metal Additive Manufacturing	3
	Advanced Physical Metallurgy	3
	Powder Metallurgy Manufacturing	3
	Materials Synthesis and Characterization	3

Elective Courses in Semester II (the list is not exhaustive)

Basket	Course Title	Credits
Systems Integration for Additive Manufacturing	Computational Fluid Dynamics	1.5
	Fluid Mechanics and Heat Transfer	1.5
	Industry 4.0	1.5
	Design for Additive Manufacturing	1
	Finite Element Analysis	3
Computational Techniques for Additive Manufacturing	Introduction to Computational Methods in Materials Science	3
	Advanced Topics in Mathematical Tools	3
	Machine Learning and Its Applications	3
	Topology Optimization with Additive Manufacturing	1
Bio Additive Manufacturing	Tissue Engineering	2
	Bio microfluidics	2
	3D Printing in Medicine	2
	Biomaterials - Materials in Medicine	3
	Introduction to Microfluidics and Microreactors	2
Metal Additive Manufacturing	Metallurgy of Welding and Additive Manufacturing	3
	Structure and Characterization of Metallic Materials	3
	Advanced Mechanical Behavior of Materials	3
	Microstructure Engineering for Advanced Manufacturing	3
	Advanced Thermodynamics of Materials	3
	Thermo-Mechanical Processing of Materials	3
	Advanced Material Joining Processes	1.5

Course Title	Credits
Semester I	
Fundamentals of Additive Manufacturing	3
Product Design and Prototyping	2
Biofabrication	2
Materials for Additive Manufacturing	2
English for Communication	1
Elective course(s) (from any one or more of the four elective baskets)*	3
Sub-total	15
Semester II	
Biofabrication Technology Lab	1
Additive Manufacturing Processes Lab	1
Industrial Lectures	1
Elective courses (from any one or more of the four elective baskets)**	12
Sub-total	15
Semester III and IV	
Thesis	24
Total Credits	52