***Spring 2018***

**IE 527 – Additive Manufacturing**

**Instructor:**

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**Course Description:**

Comprehensive study of fundamentals, process characteristics and practical applications of various Additive Manufacturing processes.

**Learning Objectives:**

* Learn the basic process steps of the Digital Work Flow from Design to Manufactured AM parts
* Understand the various software tools, processes and techniques that enable advanced/additive manufacturing
* Learn the fundamentals of various additive manufacturing (AM) processes using polymers, metals, and other material and understand the operating principles, capabilities, and limitations of AM processes
* Gain hands-on experience with AM machines and understand the complete process steps through design, fabrication, and measurement of example parts.
* Study the range of applications of AM across the spectrum of industries (e.g. aerospace/automotive, medical devices, and consumer products) while developing the understanding of the requirements, constraints, and business case for the applications.
* Be able to evaluate and select appropriate AM technologies for specific applications
* AM role in the future of manufacturing and digital transformation of manufacturing

**Text Book:**

*Additive Manufacturing Technologies-3D Printing, Rapid Prototyping and Direct Digital Manufacturing*

*Authors: Ian Gibson, David W. Rosen, Brent Stucker*

*Springer, 2015*

**Course Outline**

Introduction to Additive Manufacturing Processes

Digital Workflow for Additive Manufacturing

Common Process Steps

Role of 3-D CAD

Other Sources of 3-D data (Point Cloud, CT scan, MRI) and conversion to data for AM

Data files and Data Standards

Algorithms for processing CAD Data - Slicing, Orientation, Support Generation

Process Planning for AM

Implications of Additive Manufacturing on Design

Shape Optimization

Design for Additive Manufacturing

Reverse Engineering

3-D Geometric Data Acquisition

Technology for 3-D Scanning

Working with 3-D Point Cloud Data

Fitting polygons and surfaces

Reconstruction of Solid and Surface Models

Material for AM and Material Properties

Polymers and Photopolymers

Metal Powders

Material Properties and Impact of AM

Additive Manufacturing Processes, Process Characteristics and Capability, Process Models

Vat Polymerization

Material Extrusion

Material Jetting

Binder Jetting

Sheet Lamination

Powder Bed Fusion

Directed Energy Deposition

Post Processing of AM Parts

* Processes to improve material characteristics (HIP, Annealing, etc.)
* Improving Surface Finish

Business Case for AM

Applications and Case Studies of AM in Aerospace, Bio Medical and other domains

Process Cost Models

Impact on Supply Chain