## Additive Manufacturing Technologies (ME 628: 2-0-2-6)

Rapid Prototyping (RP): Principle of RP, Various RP technologies (3D Printing, Stereolithography Apparatus (SLA), Selective Laser Sintering (SLS), Fused Deposition Modeling (FDM), Laminated Object Manufacturing (LOM), Laminated Manufacturing (LM), etc.), Product accuracy and surface quality, Speed, Various materials (strength, homogeneity and isotropy), Economic analysis, Advancement in RP. Rapid Prototyping with Allied Technologies: Introduction to Rapid Manufacturing (RM), RM of polymeric objects, Direct and indirect routes for RM of metallic & ceramic objects, Advancement in RM (Synergistic integration of hybrid processes and multiple technologies). Computational Aspects of Additive Manufacturing (AM): Introduction to STL format, Pre & Post-processing of STL files, Various slicing methods, Various area-filling methods, Overview of the algorithms for slicing and areafilling, Emerging trends. An Overview of Mathematical Modelling of AM Processes: Thermal cycle, Residual stress, Single bead and multi bead formation in cladding based AM processes. Reverse Engineering (RE): Introduction to RE, Digitizing methods, 3D reconstruction. Laboratory session: Making models on FDM machines, Measurement of surface quality and mechanical properties, Existing CAM packages for AM, Development of entry level AM software, Design for AM (Build orientation, Topology optimization, Conformal cooling channels).

## Texts/References:

- [1] Ian Gibson, David Rosen, and Brent Stucker, "Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing" Springer, New York, NY, 2015.
- [2] Frank W. Liou, Rapid Prototyping and Engineering Applications: A Toolbox for Prototype Development, CRC Press, Taylor and Francis Group, 2007.
- [3] Duc Pham, S.S. Dimov, "Rapid Manufacturing: The Technologies and Applications of Rapid Prototyping and Rapid Tooling", Springer-Verlag London, 2001.