



UNIVERSITY OF
BIRMINGHAM

Module Name:	Net Shape Manufacturing
Module Code:	04 17688
Presenter(s):	Professor Moataz Attallah
Credit Rating:	10
Venue:	School of Metallurgy & Materials, University of Birmingham

Description:

Net shape or near net shape manufacturing technologies aim at producing a part to its final or near-to-final shape in a single process. This category of manufacturing technologies includes: casting and injection moulding of ceramic and metallic materials, powder metallurgy, advanced metal forming and joining technologies, and rapid manufacturing. Rapid manufacturing is designated for manufacturing components from their CAD files directly without using a mould or a die. It includes: direct laser fabrication, selective laser sintering, rapid prototyping, 3D printing, laminate manufacturing and net shape HIPping.

This course will introduce the state-of-art of various net shape manufacturing techniques, with a special emphasis on rapid manufacture, including the mechanism of individual techniques, their pros and cons, their applications and limitations.

During the course, students will be asked to design their own components and create CAD files of those components and manufacture them using DTM laser Sintersation in the IRC.

Learning Outcomes:

By the end of the module the student should be able to:

- Understand the mechanism of various rapid manufacturing techniques
- Create CAD files of simple components
- Manufacture those components from their CAD files using laser and selected powder

Syllabus:

- S. Kalpakjian and Steven Schmid, *Manufacturing Engineering and Technology*, 6th edition. California: Addison Wesley Longman, Inc., 1997.
- *Welding and Joining of Aerospace Materials*. MC Chaturvedi, Ed. Woodhead Publishing Ltd., Cambridge, United Kingdom, 2012.
- *Materials Processing Handbook*, edited by J. R. Groza, J. F. Shackelford, E. J. Lavernia, M. T. Powers (Taylor & Francis CRC Press, 2007).
- Gibson, I, Rosen, D.W., Stucker, B., *Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing*, Springer, 2009.

Assessment:

Write a structured paper (70%), 3,000 words max and prepare a brief presentation (30%, 10 slides max) both for submission after the course presentation.

Timetable

A total of 6 lectures, covering (1) NS forming, (2) powder metallurgy, (3,4) additive manufacturing, (5) plastics and composites NS manufacturing, and (6) netshape joining.

1 day lab involving the design of a CAD model, and running a number of samples using the 3D printer.