

Course Syllabi: UTA002: Manufacturing Processes (L : T : P :: 2 : 0 : 3)

1. **Course number and name:** UTA002 Manufacturing Processes

2. **Credits and contact hours:** 3.5 and 5

3. **Text book, title, author, and year**

Text Books / Reference Books

- Chandra, S., Jayadeva, Mehra, A., *Numerical Optimization and Applications*, Narosa Publishing House, (2013).
- Taha H.A., *Operations Research-An Introduction*, PHI (2007).
- Pant J. C., *Introduction to optimization: Operations Research*, Jain Brothers (2004)
- BazaarraMokhtar S., Jarvis John J. and ShiraliHanif D., *Linear Programming and Network flows*, John Wiley and Sons (1990)
- Swarup, K., Gupta, P. K., Mammohan, *Operations Research*, Sultan Chand & Sons, (2010).

a. Other supplemental materials

- Nil

4. **Specific course information**

a. Brief description of the content of the course (catalog description)

Machining Processes: Principles of metal cutting, Cutting tools, Cutting tool materials and applications, Geometry of single point cutting tool, Introduction to multi-point machining processes – milling, drilling and grinding, Tool Life, Introduction to computerized numerical control (CNC) machines, G and M code programming for simple turning and milling operations, introduction of canned cycles.

Metal Casting: Principles of metal casting, Introduction to sand casting, Requisites of a sound casting, Permanent mold casting processes.

Metal Forming: Forging, Rolling, Drawing, Extrusion, Sheet Metal operations.

Joining Processes: Electric arc, Resistance welding, Soldering, Brazing.

Laboratory Work:

Relevant shop floor exercises involving practices in Sand casting, Machining, Welding, Sheet metal fabrication techniques, CNC turning and milling exercises, Experiments on basic engineering metrology and measurements to include measurements for circularity, ovality, linear dimensions, profiles, radius, angular measurements, measurement of threads, surface roughness.

Basic knowledge and derivations related to above measurements, uncertainties, statistical approaches to estimate uncertainties, Line fitting, static and dynamic characteristics of instruments will be discussed in laboratory classes.

5. **Specific goals for the course**

After the completion of this module, students will be able to:

- Develop simple CNC code, and use it to produce components while working in groups.
- Analyse various machining processes and calculate relevant quantities such as velocities, forces.
- Recognise cutting tool wear and identify possible causes and solutions.
- Understand the basic principle of bulk and sheet metal forming operations for analysis of forces.
- Analyse various shearing operations for tooling design.
- Apply the knowledge of metal casting for different requirements.
- Analyse and understand the requirements to achieve sound welded joint while welding different similar and dissimilar engineering materials.

6. Brief list of topics to be covered

- Machining process
- Metal casting
- Metal forming