



# FUNDAMENTALS OF MATERIAL PROCESSING - PART 2

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**PRE-REQUISITES :** Under graduate level mathematics, thermodynamics

**INTENDED AUDIENCE :** Undergraduate Students and first year graduate students of following discipline:  
Materials Engineering, Mechanical Engineering, Metallurgical Engineering,  
Industrial Engineering, Electrical Engineering

**INDUSTRIES APPLICABLE TO :** Manufacturing Companies, Iron and Steel companies, Automobile companies, Equipment manufacturers.

### **COURSE OUTLINE :**

The aim of the course is to acquaint students with the fundamentals involved in the processing of materials. Various materials processes are used in variety of industries to create and form materials for wide range of applications. There are some commonalities behind all these processes and the aim of this course is to go through these fundamental physics and materials science behind these processes so as to be able to understand, design and predict the outcome of these methods. At the end of this course, students should be able to answer the following questions: (a) What are the various fundamental material processing techniques and the science behind it; (b) What processing method to use for a given material and a given application. This course is offered in two parts of 20 hours each. First part of the course deals with Solidification and Powder Metallurgy, while the second part deals with Metal processing and Thin film deposition.

### **ABOUT INSTRUCTOR :**

Prof. Shashank Shekhar is an assistant professor at IIT Kanpur. He joined IITK in 2010 and has since taught manufacturing related courses to 2nd year, 3rd year as well as 4th year UG students. His research interest lies in thermo mechanical processing, particularly severe plastic deformation using techniques like machining and constrained groove pressing.

Prof. Anshu Gaur is an assistant professor at IIT Kanpur in the department of Materials Science and Engineering. He joined IITK in 2012 and has since taught Thin Film and Device fabrication related courses as departmental elective to 4th year UG students, MTech and PhD students of MSE and other departments. His research interest lies in area of thin films and electronic materials and devices.

### **COURSE PLAN :**

#### **Module-1 (Metal Working)**

**Week 1:** Stress and Strain Analysis and Yield Criteria

**Week 2:** Plastic Instability and Superplasticity

**Week 3:** Mechanics of metal working

**Week 4:** Friction and Formability and Case Studies

#### **Module-2 (Thin film deposition)**

**Week 5:** Introduction to Vacuum Technology; PVD

**Week 6:** Introduction to Plasma, PVD- Sputtering

**Week 7:** Chemical Vapor Deposition

**Week 8:** Special techniques and applications