

## **MF5202 THEORY OF METAL FORMING**

### DETAILED SYLLABUS

#### **OBJECTIVES:**

- To study the basic concepts of metal forming techniques and to develop force calculation in metal forming process.
- To study the thermo mechanical regimes and its requirements of metal forming

#### **UNIT I THEORY OF PLASTICITY**

Theory of plastic deformation – Yield criteria – Tresca and Von-mises – Distortion energy – Stress strain relation – Mohr's circle representation of a state of stress – cylindrical and spherical co-ordinate system – upper and lower bound solution methods – Overview of FEM applications in Metal Forming analysis.

#### **UNIT II THEORY AND PRACTICE OF BULK FORMING PROCESSES**

Analysis of plastic deformation in Forging, Rolling, Extrusion, rod/wire drawing and tube drawing – Effect of friction – calculation of forces, work done – Process parameters, equipment used – Defects – applications – Recent advances in Forging, Rolling, Extrusion and Drawing processes – Design consideration in forming.

#### **UNIT III SHEET METAL FORMING**

Formability studies – Conventional processes – H E R F techniques – Superplastic forming techniques – Hydro forming – Stretch forming – Water hammer forming – Principles and process parameters – Advantage, Limitations and application

#### **UNIT IV POWDER METALLURGY AND SPECIAL FORMING PROCESSES**

Overview of P/M technique – Advantages – applications – Powder preform forging – powder rolling – Tooling, process parameters and applications. - Orbital forging – Isothermal forging – Hot and cold isostatic pressing – High speed extrusion – Rubber pad forming – Fine blanking – LASER beam forming

#### **UNIT V SURFACE TREATMENT AND METAL FORMING APPLICATIONS**

Experiment techniques of evaluation of friction in metal forming selection – influence of temperature and gliding velocity – Friction heat generation – Friction between metallic layers

## SSLC, HSE, DIPLOMA, B.E/B.TECH, M.E/M.TECH, MBA, MCA

*Notes*

*Syllabus*

*Question Papers*

*Results and Many more...*

Available @

[www.AllAbtEngg.com](http://www.AllAbtEngg.com)

– Lubrication carrier layer – Surface treatment for drawing, sheet metal forming, Extrusion, hot and cold forging. Processing of thin Al tapes – Cladding of Al alloys – Duplex and triplex steel rolling – Thermo mechanical regimes of Ti and Al alloys during deformation – Formability of welded blank sheet – Laser structured steel sheet - Formability of laminated sheet.

### **OUTCOMES:**

At the end of this course the students are expected to upgrade their knowledge on plasticity, surface treatment for forming of various types of metal forming process.

### **REFERENCES:**

1. Altan T., Metal forming – Fundamentals and applications – American Society of Metals, Metals park, 2003
2. ALTAN.T, SOO-IK-oh, GEGEL, HL – Metal forming, fundamentals and Applications, American Society of Metals, Metals Park, Ohio, 1995.
3. ASM Hand book, Forming and Forging, Ninth edition, Vol – 14, 2003
4. Dieter G.E., Mechanical Metallurgy (Revised Edition II) McGraw Hill Co., 1988
5. Helmi A Youssef, Hassan A. El-Hofy, Manufacturing Technology: Materials, Processes and Equipment, CRC publication press, 2012.
6. Marciniak,Z., Duncan J.L., Hu S.J., ‘Mechanics of Sheet Metal Forming’, Butterworth-Heinemann An Imprint of Elsevier, 2006
7. Nagpal G.R., Metal Forming Processes- Khanna publishers, 2005.
8. Proc. Of National Seminar on “Advances in Metal Forming” MIT, March 2000
9. SAE Transactions, Journal of Materials and Manufacturing Section 5, 1993-2007
10. SHIRO KOBAYASHI, SOO-IK-oh-ALTAN, T,Metal forming and Finite Element Method, Oxford University Press, 2001.
11. Surender kumar, Technology of Metal Forming Processes, Prentice Hall India Publishers,2010