ME 686 Micro-manufacturing (3-0-0-6)

Introduction to micro-manufacturing:definition, need/importance, applications. Size effect. Classification of micro-manufacturing processes. Micro-machining processes: molecular dynamics at atomistic scale, diamond micro-machining and grinding, ultrasonic micro-machining, micro-EDM, laser beam micro-machining, micro-ECM, electron beam micro-machining, focused ion-beam techniques, abrasive micro-finishing techniques. Micro-forming techniques: laser micro-bending, micro-deep drawing and micro-extrusion. Micro-welding and joining techniques. Micro-fabrication using deposition techniques such as epitaxial, sputtering, chemical vapor deposition (CVD) techniques and Lithography (LIGA) based techniques. Sensors and actuators for micro-manufacturing. Metrology for micro-manufacturing. Introduction to nano-scale manufacturing.

Textbooks:

[1] V.K. Jain, Micromanufacturing Processes, Taylor and Francis, 2012.

[2] J. McGeough, Micromachining of Engineering Materials, Marcel Dekker,2002.

References:

[1] K. F. Ehmann, Micromanufacturing: International Assessment of Research and Development, Springer, 2007.

[2] P. Raichoudhury, Handbook of Microlithography, Micromachining and Microfabrication, 1997.

[3] V. K. Jain, Introduction to Micromachining, 2nd Ed., Narosa, 2010.

[4] R. W. Johnstone, Introduction to Surface micromachining, Kluwer Academic, 2004..

[5] M. Madou, Fundamentals of microfabrication, CRC Press, 1997.

[6] H. J. Levinson, Principles of lithography, 2nd ed., SPIE Press, 2005.