Course Outcomes for Embedded Test Questions Assessment Tool

MY 3100- Materials Processing I

i. An understanding of the three laws of Thermodynamics, as they pertain to Materials Engineering

ii. An ability to perform mass and energy balances for chemical processes relevant to Materials Engineering

iii. An ability to perform calculations of chemical equilibrium using the basics of the theory of Solution Thermodynamics

iv. An ability to relate phase diagrams to Solution Thermodynamics and the criteria for chemical equilibrium

MY 3110- Materials Processing II

i. The ability to predict the dynamics for materials processes controlled by fluid flow.

ii. The ability to predict the diffusion controlled kinetics of materials processes using the atomistic and phenomenological theories and models for diffusion in materials.

iii. The ability to predict the effect of the rate of heat transport on the heat treatment and solidification of materials

iv. The ability to use the theories and models for the kinetics of thermally activated chemical processes to predict the microstructural development of materials during processing.

MY 3200- Materials Characterization I

i. An understanding of the general principles and nomenclature of crystallography as applied to Materials Engineering

ii. An understanding of the principles of optics as they pertain to microscopy

iii. A basic understanding of and the ability to use X-ray diffraction for the structural characterization of materials

iv. An understanding of the basic principles of and the ability to obtain mechanical properties data through the mechanical testing of materials
MY3210- Materials Characterization II

i. An understanding of the interaction of electromagnetic radiation with matter, and of the use of such interactions for the structural and chemical analysis of materials

ii. An understanding of additional characterization techniques useful for Materials Engineering, such as thermal analysis, calorimetry, and particle size analysis

iii. An understanding of and the ability to carry out the analysis and presentation of experimental data, including error analysis, graphing and data formatting

iv. An ability to write technical reports, following conventions for technical report formats and writing style

MY3300- Design of Microstructure

i. An understanding of and the ability to use the basic theory and equations describing phase transformations in materials

ii. An ability to relate phase transformation theory to common Materials processing techniques and their effects upon the microstructure of materials

iii. An ability to use phase diagrams to predict qualitatively processing techniques that could be employed to achieve a desired microstructure in an engineering material.

MY3400- Mechanical Properties of Materials

i. describe and predict elastic deformation in isotropic and anisotropic (including composite) engineering materials

ii. describe and predict yielding of engineering materials under uniaxial and multiaxial states of stress

iii. describe the major microstructural-based mechanisms of strengthening in (crystalline) materials, and apply these principles to alloy and process design

iv. identify the microstructural based dependencies of mechanical failure in engineering materials, including yielding, fracture, fatigue, and creep; and apply these principles to design and process failure-resistant materials

MY3700- Electronic Properties of Materials

i. An understanding of how electrons, photons and phonons interact in materials

ii. A basic understanding of the band theory of solids, and how it relates to the electronic, optical, thermal and magnetic properties of materials

iii. A basic understanding of the operation of elementary solid-state electronic devices