**Course number and name: MTSE 4050:** **Polymer Science & Engineering**

**Credits and contact hours:** 3 Credits. Walk in or by appointment

**Instructor’s or course coordinator’s name**: Dr. Witold Brostow

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

Ulf W. Gedde, Polymer Physics, Kluver, *lectures in the Power Point format and handouts*.

1. *Other supplemental materials*

None

**Specific Course Information**

1. *Brief description of the content of the course (catalog description)*

Chemical structures, polymerization, molar masses, chain conformations. Rubber elasticity, polymer solutions, glass state and aging. Mechanical properties, fracture mechanics and viscoelasticity. Dielectric properties. Polymer liquid crystals. Semi-crystalline polymers, polymer melts, rheology and processing. Thermal analysis, microscopy, diffractometry and spectroscopy of polymers. Computer simulations of polymer-based materials.

1. *Prerequisites or co-requisites*

MTSE 3000, 3001

1. *Indicate whether a required, elective, or selected elective course in the program*

Elective

**Specific goals for the course**

1. *Specific outcomes of instruction*

|  |
| --- |
|  |
| **Specific Course Learning Outcome** |
| 1. Understand the difference between thermoplastics and thermosets in terms of chemical structures, properties and recycling options |
| 1. understand the difference between homopolymers and copolymers |
| 1. understand the mechanism by which the mulitviscosity motor oil maintains its viscosity in spite of temperature changes |
| 1. understand the difference between melting temperatures and glass transition temperatures including effects of the cooling rate on determination results |

1. *Explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.*

This course addresses ABET Student Outcome 4

**List of topics to be covered**

1. Introduction
2. Chemical structures
3. Polymerization
4. Molar masses
5. Chain conformations
6. Rubber elasticity
7. Polymer solutions
8. Glassy state. Brittleness. Aging
9. Mechanical properties and viscoelasticity
10. Fracture mechanics
11. Polymer liquid crystals
12. Molten state & processing
13. Semi-crystalline polymers
14. Surface properties and tribology
15. Dielectric & thermal properties
16. Microscopy
17. Diffractometry and spectroscopy
18. Computer simulations
19. PBMs for protection of the environment