

## BME 777: Biodegradable Materials

**Instructor:** Dr. Anil Mahapatro, [anil.mahapatro@wichita.edu](mailto:anil.mahapatro@wichita.edu)  
**Day/Time:** Monday & Wednesday: 2:45pm – 4:00pm  
**Prerequisite:** BME 477 or ME 651 or instructor consent

**Course Description:** This course will provide students with a comprehensive overview of biodegradable materials as it relates to their applications in the biomedical and health care fields. The course will cover in details the different classes of biodegradable materials including biodegradable polymers, ceramics and metals. Synthesis, characterization and degradation of these materials in the biological environment will be covered. Biodegradation/biocorrosion mechanisms of these materials, the complexity of the response of the biological environment and the experimental methods for monitoring the degradation process will be discussed. Strategies for surface modification to control the degradation will be touched upon. Finally specific applications of these materials in drug delivery, cancer therapy, regenerative therapies, cardiovascular and orthopedic will be covered and the storage, sterilization and packing of these materials discussed.

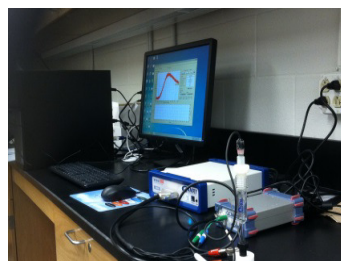
**Textbook:** No official text book has been assigned for the course. Materials will be drawn from various books and research journal papers

### Tentative Course Outline:

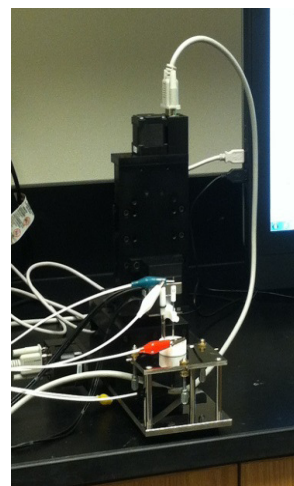
- Introduction to biodegradable materials
- Biodegradable metals
  - Iron based materials
  - Magnesium based materials
- Biodegradable polymers
  - synthetic and naturally available biodegradable polymers
- Biodegradable ceramics
  - Hydroxyapatite based materials
- Synthesis, characterization and degradation of these materials in the biological environment
- Biodegradation / bio-corrosion mechanisms
- The response of the biological environment in-vivo
- Experimental methods for monitoring biodegradation
- Strategies for surface modification to control the biodegradation
- Specific applications
  - drug delivery
  - cancer therapy
  - regenerative therapies
  - cardiovascular
  - orthopedic

### Representative Laboratory Exercises:

- Monitoring surface kinetics using a Quartz crystal microbalance
- Imaging of localized surface interactions



**Figure:** Gamry eQCM quartz crystal



**Figure:** Scanning Electrochemical Microscope