

Tennessee Technological University
Department of Civil & Environmental Engineering
CEE 7450 – Advanced Topics in Concrete Durability

2017 Catalog Data:	CEE 7450 Lec. 2. Lab. 2. Cr. 3. Chemical and physical durability of Portland cement-based materials. Alkali-silica reaction, internal and external sulfate attack, permeability, shrinkage, freeze-thaw durability, and corrosion. Multi-scale (nano-, micro-, and macro-scale) investigations, including economical considerations, mitigation strategies, and advanced nano-/micro-structural characterization techniques.
Required Textbook:	None
Faculty Coordinator:	Dr. Ben Mohr
Prerequisites:	CEE 6300
Goal:	To present students with a comprehensive overview of the durability of portland cement-based materials through multi-scale (nano-, micro-, and macro-scale) investigations, including economic considerations, mitigation strategies, and microstructural characterization and chemical analysis techniques.

Course learning objectives:

1. To present students with a comprehensive overview of the durability of portland cement-based materials through multi-scale (nano-, micro-, and macro-scale) investigations, including economic considerations, mitigation strategies, and microstructural characterization and chemical analysis techniques.
2. To improve written technical communication skills.
3. To integrate research and learning.
4. To improve critical assessment.

Major Topics Covered:

1. Alkali-Silica Reaction (ASR)
2. Sulfate Attack and Thaumasite Formation
3. Delayed Ettringite Formation
4. Chemical Shrinkage and Self -Desiccation
5. Shrinkage Mitigation
6. Plastic Shrinkage
7. Drying Shrinkage and Creep
8. Freeze – Thaw Durability
9. Corrosion of Steel in Concrete

Measurable outcomes:

1. Understand the mechanisms of ASR and mitigation strategies
2. Understand the mechanisms of internal and external sulfate attack and mitigation strategies
3. Understand early age shrinkage mechanisms and mitigation strategies
4. Understand long term shrinkage and creep mechanisms and mitigation strategies
5. Understand freeze-thaw mechanisms and mitigation strategies
6. Understand corrosion mechanisms and mitigation strategies