Course name	**ECE 53801 Discrete Event Dynamic Systems**
Credit and contact hours	(3 cr.) Class 3
Course coordinator's name	Lingxi Li
Textbook	C. G. Cassandras and S. Lafortune, *Introduction to Discrete Event Systems*. 2nd Edition. Springer, 2008. ISBN-13: 9780387333328
Course information	ECE 53801 Discrete Event Dynamic Systems (3 cr.) P: Graduate standing or consent of instructor. Class 3. This course introduces discrete event dynamic systems with their applications in system modeling, analysis, and control. Models such as automata, Petri nets, Markov chain, and queueing systems are introduced, along with an analysis of their dynamics. Discrete event simulation methods are included. Examples from various engineering applications are given. **Prerequisites/ Co-Requisite** Undergraduate: ECE30200, or Graduate standing **Required, Elective, or Selected Elective:** EE Elective, CE Elective
Goals for the course	Upon successful completion of the course, students should be able to 1. Develop and use discrete event system models for engineering systems. [1, 2, 6] 2. Design supervisory control laws for automata and Petri net models. [1] 3. Analyze system performance using extended (timed and hybrid) discrete event system models. [1, 2, 6] 4. Build a Markov model/queueing system for practical systems (e.g., the birth-death process) and analyze its dynamic properties. [1, 2, 6] 5. Investigate the performance of discrete event systems using computer-aided tools. [1, 2, 6]
List of topics to be covered	1. Introduction: concepts and physical examples (1 class) 2. Review of linear algebra and probability theory (1 class) 3. Languages and automata (1 class) 4. Modeling and analysis of automata models (2 classes) 5. Supervisory control (3 classes) 6. Petri nets: modeling and concepts (1 class) 7. State estimation and fault diagnosis using Petri nets (3 classes) 8. Control of Petri nets (1 class) 9. Timed automata and timed Petri nets (2 classes) 10. Hybrid automata and hybrid Petri nets (2 classes)

	11. Markov chain: concepts and properties (3 classes) 12. Transient and steady-state analysis of Markov chain (2 classes) 13. Queueing systems: concepts and dynamics (2 classes) 14. Performance evaluation of queueing systems (2 classes) 15. Discrete event simulation (2 classes) 16. Exams (2 classes and final exam period)
Syllabi approved by	Lingxi Li
Date of approval	10/23/2021