# ECE 6150 Syllabus

ECE 6150: Computational Aspects of Cyber-Physical Systems

**Instructor**: Prof. Marilyn Wolf, [wolf@ece.gatech.edu](mailto:wolf@ece.gatech.edu)  
**Office hours**: TBA or by appointment.  
**Administrative assistant**: Pam Halverson, Klaus 2358.  
  
**Classroom and times**: TBA.  
  
**Text**: Marilyn Wolf, High Performance Embedded Computing, second edition.  
Course overheads: <http://www.marilynwolf.us/HPEC2e/overheads.html>  
  
**Grading**: four in-class quizzes 20% each, final exam 20%. Extra credit assignments will also be available.

Quiz dates TBA.

Rules for in-class quizzes and final exams: open book, open notes (both paper and electronic); closed Internet.

## Summary

This course introduces key concepts in the design of cyber-physical systems and Internet-of-Things (IoT), including physical scales ranging from single-node systems to large-scale networked cyber-physical systems. The course will develop models for key design parameters, including delay and energy; design of both single-node and networked embedded systems; models and design methodologies for real-time sensing and control systems; safety and security in cyber-physical and IoT systems; and performance and power management in real-time computing systems.

## Topical Coverage and Outline

1. Challenges in cyber-physical systems and IoT systems.
2. Performance and power analysis of processor architectures.
3. Performance and power analysis of programs.
4. Performance and power optimization of programs.
5. Real-time scheduling on uniprocessors.
6. Models for single-node CPS: closed-loop delay and stability, sources of delay.
7. Distributed control problems.
8. Architectures for distributed control systems.
9. Models for network delay.
10. Advanced real-time scheduling for multicore and networked systems.
11. Real-time control.
12. Safe and secure cyber-physical and IoT systems.
13. Design methodologies and models.

Course Educational Objectives:

* Apply basic knowledge of computer system organization and software design to real-time, energy-aware computing for cyber-physical and Internet-of-Things systems.
* Learn foundational techniques for the design of cyber-physical and IoT computing systems.

Course Educational Outcomes:

* Demonstrate competence in the analysis and design of real-time and energy-aware design of computational systems for use in cyber-physical and IoT systems.

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