EEL5737  Reconfigurable Computing

1. **Catalog Description** (3 credit hours) – Fundamental concepts at advanced undergraduate level and introductory graduate level in reconfigurable computing based upon advanced technologies in field-programmable logic devices. Topics include general concepts, device architectures, design tools, metrics and kernels, system architectures, and application case studies.

2. **Pre-requisites** - EEL4712C or EEL5764 or consent of instructor.

3. **Course Objectives** - Students will gain fundamental knowledge and understanding of principles and practice in reconfigurable architecture and computing through class lectures and discussions, reading assignments, homework and lab experiments, and a major research project.

4. **Instructor** – Dr. Greg Stitt
   a. **Office location** – 323 Benton Hall
   b. **E-mail address** – gstitt@ece.ufl.edu
   c. **Web site** – www.gstitt.ece.ufl.edu
   d. **Office hours** - Monday+Tuesday, Period 3 (9:35-10:25). Also, by appointment.

5. **Teaching Assistant** - Lu Hao
   a. **Office location** - TBA
   b. **Telephone**
   c. **E-mail address**
   d. **Office hours**

6. **Meeting Times** – M W F 4th period

7. **Class/laboratory schedule** – 3 50-minute sessions per week

8. **Meeting Location** – NEB 201

9. **Material and Supply Fees** – N/A

10. **Textbooks and Software Required** - None

11. **Recommended Reading**
Boards will be made available for use outside of class.

12. Course Outline
   - General overview (< 1 week)
     o Goals and motivations
     o History, state of the art, future trends
     o Basic concepts and related fields of study
     o Performance, power, and other metrics
     o Algorithm analysis and speedup projections
     o VHDL tutorial
   - RC Architectures (~1 week)
     o Device characteristics
     o Fine-grained architectures
     o Coarse-grained architectures
   - FPGA Physical Design Tools (~1 week)
     o Technology mapping
     o Placement & routing
   - Register Transfer (RT)/Logic Synthesis (1-2 weeks)
     o Controller/Datapath synthesis
     o Logic minimization
   - RC Application Design (1-2 weeks)
     o Parallelism
     o Systolic arrays
     o Pipelining
     o Optimizations
     o Bottlenecks
   - High-level Design (~3 weeks)
Lab Experiments: A series of laboratory experiments will be assigned in synchronization with the topics covered in class lecture. These experiments will be undertaken by small teams of students in an open-lab environment in the first half of the semester. Students enrolled in the graduate section of this course may be assigned extra tasks for each lab. Special arrangements will be made for EDGE students.

Project: Students will form small teams and undertake a major project (on a topic subject to instructor approval) exploring fundamental issues in reconfigurable computer architectures, systems, and applications. Special arrangements will be made for EDGE students. This project will span the second half of the semester and provide students the opportunity to more deeply explore fundamental issues in RC. Students enrolled in the graduate section of this course will undertake a significantly broader and deeper topic or role than those in the undergraduate section. The culmination of each project for a graduate student will be a clear and concise technical report suitable for publication discussing project concepts, development, experiments, results, and analyses. The most important outcome of each project and report will be the research results that are achieved, analyses rendered, and conclusions drawn with demonstrable insight.
Equipment: The state-of-the-art Reconfigurable Computing equipment available for this course is made possible by a generous grant from the Rockwell Collins Growth Relationship Grant Program and an equipment/software donation from Nallatech.

13. Attendance and Expectations – Attendance is not required, but highly recommended.

14. Grading –
   - Midterm1 (Wednesday, October 13\textsuperscript{th}*, 50 minutes): 25%
   - Midterm2 (Wednesday, December 8\textsuperscript{th}*, 50 minutes): 25%
   - Labs/Homework: 25%
   - Project: 25% (this may vary based on difficulty of chosen final project)

*All EDGE students will have a 3-day window for each test that starts one day before the scheduled time. For example, midterm 1 can be taken from October 11\textsuperscript{th} until October 13\textsuperscript{th}, and midterm 2 can be taken from December 5\textsuperscript{th} until December 7\textsuperscript{th}.

15. Grading Scale –
   - A: 90-100
   - A-: 87-89
   - B+: 84-86
   - B: 80-83
   - B-: 76-79
   - C+: 72-75
   - C: 68-71
   - C-: 64-67
   - D+: 60-63
   - D: 56-59
   - D-: 54-57
   - E: 53 and below

Undergraduate students, in order to graduate, must have an overall GPA and an upper-division GPA of 2.0 or better (C or better). Note: a C- average is equivalent to a GPA of 1.67, and therefore, it does not satisfy this graduation requirement. Graduate students, in order to graduate, must have an overall GPA of 3.0 or better (B or better). Note: a B- average is equivalent to a GPA of 2.67, and therefore, it does not satisfy this graduation requirement. For more information on grades and grading policies, please visit: https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx.

16. Make-up Exam Policy - Missed exams cannot be made up, except in case of documented emergency. EDGE students will have a 3-day window to take the test.

17. Honesty Policy – All students admitted to the University of Florida have signed a statement of academic honesty committing themselves to be honest in all academic work and understanding that failure to comply with this commitment will result in disciplinary action. This statement is a reminder to uphold your obligation as a UF
student and to be honest in all work submitted and exams taken in this course and all others.

18. **Accommodation for Students with Disabilities** – Students Requesting classroom accommodation must first register with the Dean of Students Office. That office will provide the student with documentation that he/she must provide to the course instructor when requesting accommodation.

19. **UF Counseling Services** – Resources are available on-campus for students having personal problems or lacking clear career and academic goals. The resources include:
   - UF Counseling & Wellness Center, 3190 Radio Rd, 392-1575, psychological and psychiatric services.
   - Career Resource Center, Reitz Union, 392-1601, career and job search services.

20. **Software Use** – All faculty, staff and student of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.