**Department of Electrical Engineering and Computer Science, The University of Tennessee**
**ECE 599 – Nanoelectronic System Design, Summer 2017**

An examination of a variety of emerging nanoelectronic technologies that each exhibit promise for future circuits and systems. Several different technologies will be explored in the context of nanoelectronic applications, including: carbon nanotubes, molecular electronics, DNA origami, spintronics, nanophotonics, and memristors. These various nanotechnologies will be explicitly explored for their potential applications in emerging computer memory, reconfigurable logic, neural networks, nonlinear computing, and potential uses for computer security. At the end of this course, the student is expected to have a broad understanding of nanotechnology and how nanoelectronic devices might be leveraged for emerging, real-world applications.

**Teaching Staff**
Professor: Garrett S. Rose: garose@utk.edu, 865-974-3132, **MK308**

**Schedule**
Lecture: Min H. Kao Building, Room TBD

**Office Hours**
Professor Rose: TBD

**Required Reading**
Academic papers and other relevant literature to be provided as needed

**Grading**

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| Homework: | 25% |
| Quizzes/Participation: | 20% |
| Project Presentation: | 20% |
| Project Report: | 35% |

**Assignment Policy**
Reading material will be distributed throughout the semester with corresponding homework assignments. All homework assignments are to be handed in at beginning of class on due date unless told otherwise. ***If there is a reasonable excuse, you will get one week after original due date to submit only if you notify the professor first***. One week after due date, no excuses will be accepted for late assignments. In *extreme* situations, you may be accommodated by other substitute assignments (extra credit, etc.).

**Academic Integrity**
All assignments to be turned in for credit must be each student's own work. Students can discuss problems and general ideas but any other deliverable must be written independently by each student.

Pop quizzes and in-class activities may be given from time to time during the class lecture period. Some in-class activities may allow for or even require collaboration with other students. Quizzes and in-class activities will be graded as part of "Quizzes/Participation." ***Quizzes will be closed-notes with no discussion allowed***. Any violations can result in a zero on the given quiz.

**Electronic Devices**
Laptops, smartphones, tablets and other electronic devices are allowed during lectures/discussions in as much as such devices are used with discretion and proper respect is given to the professor and other students. If the use of any electronic device is found to be a distraction then said device must be turned off and put away immediately.

**Project Expectations**
A major component of this course is a project where students will conduct a literature review on a particular nanoelectronic technology topic area. Toward the end of the course, students will leverage industry standard CAD tools to design and simulate an example nanoelectronic system based on their technology topic area. Project presentations will be delivered in-class by each student. Additionally, each student will also submit a technical report summarizing the technology topic area and detailing circuit design and simulation results for the example system.

**Disability Statement**
Any student requiring an accomodation based on the impact of a disability should contact the Office of Disability Services at 865-974-6087 to coordinate reasonable accomodations for documented disabilities.

**Topics Covered**
- Background: From Electronics to Nanoelectronics
- “Nanosizing” CMOS
- Physics of Constrained Dimensions
- 0D Nano-devices: Quantum Dots
- 1D Nano-devices: Nanowires & Nanotubes
- 2D Nano-devices: SOI & Graphene
- Introduction to Molecular Electronics
- Molecular Electronics: Systems of Self-Assembled Monolayers
- DNA Scaffolding and Origami
- Memristors and Memristive Systems
- Options for Nanoelectronic Memories
- Tiny Magnets: Spintronics and Magnetic RAM
- Approaches to Nanoscale Reconfigurable Logic Circuits
- Memristor-based Neuromorphic Systems
- Emerging Nanophotonic Applications
- Nano-Enabled Hardware Security