

“Certificate Program in Integrated Electronic Design”
Professor Robert Bowman – Electrical Engineering – August 2013

Certificate Program for Integrated Electronic Design:

Description

The Certificate Program for Integrated Electronic Design offers a comprehensive curriculum on the design of state-of-the-art electronic circuits. The program builds on an introductory understanding of semiconductor device physics and basic circuit theory. The design of analog and mixed-signal circuits are addressed in courses focusing on issues and trade-offs involved in widely used circuits. In addition, the program offers an advanced course to instill an in-depth understanding of all processes involved in designing a modern integrated circuit.

Regular RIT courses with the same course numbers (EE 381, EE 482, and EE 726) may be substituted for the on-line courses to satisfy certificate program requirements. The on-line courses with similarly listed regular course numbers also satisfy bachelor’s degree requirements in electrical engineering. EE 285 is a course specific to the Certificate Program and must be taken online. The EE 726 online graduate course may be used as a professional elective or graduate course in RIT BSEE or graduate degree programs. Students register for these online courses in the same manner as they would for regular courses at RIT.

Lecture content is delivered via the internet as mpeg4 video streams accessed through the RIT course management system, myCourses. Quizzes are taken online through myCourses. A course Discussion Board is provided for students to pose questions to each other or the course instructor. Interactive online office hours are offered at regularly scheduled times.

Electronic lab work is conducted in the student’s home environment by the student using specialized instrumentation and software and an electronic parts kit. This instrumentation¹ (referred to as the Personal Test Lab) is purchased by the student for a very reasonable price and is used throughout the Certificate program.

Four courses are required to complete the Certificate Program in Integrated Electronic Design as indicated in the table below. Course are taken in the sequence as indicated.

**Course Requirements for the
Certificate Program in Integrated Electronic Design**

4 Required Courses		
Course Title	Online Course	Faculty Author
Intro to Circuit Theory	EE 285	Dr. Moon
Electronic Design I	EE 381	Dr. Bowman
Electronic Design II	EE 482	Dr. Bowman
Mixed Signal IC Design	EE 726	Dr. Bowman

¹ See <http://www.digilentinc.com/Products/Detail.cfm?NavPath=2,842,1018&Prod=ANALOG-DISCOVERY> for the Analog Discovery portable circuit design module and the Analog Parts Kit

Certificate Program Learning Objectives Will Provide:

- an introduction to engineering mathematics required for understanding and analyzing electronic circuits.
- an understanding of general purpose circuit analysis methods such as Kirchhoff's laws, small-signal approximation, Thevenin equivalent circuits, 2-port networks, circuit transfer functions, frequency response, Laplace transforms, and Bode plots.
- an understanding of the conduction properties of diodes and transistors.
- an understanding of the analysis and design of commonly used one and two transistor circuits including amplifiers, current mirrors, and dc bias networks.
- an understanding of how to design key analog integrated circuit cells including operational amplifiers, data converters, and voltage reference cells.
- an understanding of modern integrated circuit design techniques including ratiometric design, process insensitive design, corners analysis, and analysis of matching properties.
- a perspective that couples in-depth analysis with design intuition.
- an understanding for both CMOS and BJT semiconductor process technologies.

Who Should Take This Program?

- Experienced electronic technicians, device engineers, and application engineers interested in re-focusing their careers toward circuit design but cannot devote the time required for a bachelor's degree.
- Circuit design practitioners interested in enhancing their skills in areas of integrated analog and digital design
- Device, application and system engineers
- Researchers in the natural sciences, interested in understanding the fundamentals and limitations encountered in designing electronic systems

How Do You Earn the Certificate?

- Begin your certificate any academic semester that an applicable course is offered, subject to prerequisites
- Take courses for credit and a grade
- Maintain a B average (GPA of 3.0) or better

What Prerequisite Knowledge is Required?

- Phenomenological (working) knowledge of circuit elements including resistors, capacitors, diodes, and transistors
- Familiarity with and interest in electronic circuits and electronic systems
- Some college level Math and Physics is preferred.

Tuition

12 semester credits (four 3 credit courses) are required to complete the certificate program. It is estimated that the total tuition cost for the certificate program for the academic years 2013 and 2014 will be less than \$15,000.

Time to Complete Certificate

1-2 years average

3 years maximum to complete

Faculty Sponsor

Robert Bowman, Professor of Electrical Engineering, RIT