

ICGEE Curriculum available for 2011/2012 Academic Year

Radio Frequency Integrated Circuit Design (RFIC)

Module Title:	Radio Frequency Integrated Circuit Design
Module Status:	Available in the 2011/2012 academic year.

Generic Module Information:

Name of module owner/lecturer?	Dr. Kevin McCarthy
Delivery mode: e.g. on-site, on-line, mixed-mode. For on-site specify contact hours per week	<p>For Cork located students: on-site lectures 2hrs per week at UCC</p> <ol style="list-style-type: none"> Semester 1: 19/09/2011 to 9/12/2011 <ul style="list-style-type: none"> Thursday, 16.00–17.00, L1, Electrical Engineering Building Friday, 12.00–13.00, Kane-B10A, Kane Building Semester 2: 3/01/2012 to 23/03/2012 <ul style="list-style-type: none"> Wednesday, 9.00 – 10.00, Kane-B10A, Kane Building Friday, 11.00–12.00, L2, Electrical Engineering Building <p>For students from other locations: Web-based video lectures plus online meetings with the lecturer (planned in advance after the first meeting). Written exam at the end of the year at UCC/Cork.</p>
Duration of the module:	2 semesters: 36 hours of lectures. CAD-based assignment.
Assessment methods and weightings where relevant:	End of year 3-hour exam accounting for 80% of marks. Design or analysis assignment accounting for 20% of marks.
Pass standard:	40%
Penalties for late submission of continuous assessment work:	Where work is submitted up to and including 7 days late, 10% of the total marks available shall be deducted from the mark achieved. Where work is submitted up to and including 14 days late, 20% of the total marks available shall be deducted from the mark achieved. Work submitted 15 days late or more shall be assigned a mark of zero.
Number of ECTS or institutional credits assigned to the module:	5 ECTS
Course Content or Syllabus (Optional):	<ul style="list-style-type: none"> Building blocks of Radio Frequency (RF) transceivers for mobile telephone and wireless networks; Review of RF Transistors; Two-port Parameters for RF Devices; Common RF terminology including Intermodulation and Noise; LNA Design using the Smith Chart; RF Oscillators and Frequency Synthesizers; RF Mixers and Modulators
Learning Outcomes	<p>At the end of this module the student will be able to:</p> <ul style="list-style-type: none"> Determine the 2-port parameters for RF transistors using small-signal equivalent circuit analysis and vice-versa. Use the Smith Chart to illustrate important RF characteristics such as matching, gain and noise performance. Design RF Low Noise Amplifiers using Smith Chart techniques for optimum gain and noise performance. Partition an RF system into functional sub-blocks and describe the trade-offs between the different options for this partitioning. Determine the characteristics of an RF system such as noise

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	<p>figure, gain compression and inter-modulation.</p> <ul style="list-style-type: none"> ● Analyse and Design Basic RF Oscillators. ● Analyse and Design Basic RF Mixers. ● Analyse and Design Basic RF Phase Locked Loops and Frequency Synthesizers. ● Design, simulate (using a standard simulator as recommended in class), and compose a written performance report pertaining to an RF element chosen from the following list: RF Amplifier, RF Oscillator, RF Mixer, RF Filter, RF Frequency Synthesizer or RF System-on-Chip.
Recommended Text	<p>“RF Microelectronics”, Behzad Razavi, Prentice Hall, 1997</p>
Supplementary Texts	<ul style="list-style-type: none"> ● “Design of Analog CMOS Integrated Circuits”, Behzad Razavi, McGraw Hill, 2000. ● “The Design of CMOS Radio-Frequency Integrated Circuits”, Thomas. H. Lee, Cambridge University Press, 2nd Edition, 2003 ● “VLSI for Wireless Communication”, Bosco Leung, Prentice Hall, 2002 ● “RF Circuit design”, Christopher Bowick with John Blyler and Cheryl Ajluni, Newnes/Elsevier, 2008 ● “Radio-Frequency Integrated Circuits and Technologies”, Frank Ellinger, Springer, 2007
Other relevant information	<p>Ph.D. students at Irish universities may take the module for credit at UCC by registering as a visiting student. The registration mechanism for other students is to be determined.</p>