SUBJECT DESCRIPTION FORM

Subject title: CMOS Analog Integrated Circuits Design & Analysis

Subject code: EIE578

Credit value: 3

Responsible staff and department: Dr Vincent S.L. Cheung, EIE

Pre-requisite: Nil

Recommended background knowledge:

Knowledge of electronic circuit design and microelectronics at a level equivalent to the final year of an honours degree in electronic engineering. Experience in designing integrated circuits using CMOS technologies is preferred.

Mutual exclusions: Nil

Learning approach:

Mainly lecture based. Supplement with practical CAD tools exercises on integrated circuits design and simulation.

<table>
<thead>
<tr>
<th>Lecture</th>
<th>33 hours</th>
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<tbody>
<tr>
<td>Practical/Seminar</td>
<td>9 hours</td>
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Assessment:

<table>
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<tr>
<th>Continuous Assessment</th>
<th>45%</th>
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<tbody>
<tr>
<td>Examination</td>
<td>55%</td>
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<tr>
<td>Total</td>
<td>100%</td>
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Objectives:

To provide knowledge of analog integrated circuits design, simulation and layout techniques and concepts. In particular, to look at how different design methodologies and styles are utilized to achieve high-performance, cost-effective integrated circuits. The subject focuses on widely-used CMOS technologies as the design platform.
Knowledge and understanding:

Having successfully completed this module, the student will be able to demonstrate knowledge and understanding of:

- The practical design methodologies and styles for CMOS analog integrated circuits.
- The design knowledge on circuit frequency responses, stability and compensation methods as well as an exposure to both traditional and advanced operational-amplifier designs and techniques.
- The use of EDA tools for design, simulations and layout verifications.

Intellectual skills

Having successfully completed the module, the student will be able to:

- Apply top-down, systematic design approach for some analog CMOS integrated circuits.
- Employ the simulation techniques to other kinds of circuits.

Keyword syllabus:

1. Overview
   1.1 CMOS devices model and characteristics.
   1.2 Analog circuit analysis methods and short-cuts.
   1.3 Practical circuit design flow from topology choice to design, simulation and layout.

2. Semiconductor Technologies
   2.1 Focusing on advanced CMOS technologies.
   2.2 Basic CMOS circuit design.
   2.3 Advance CMOS operational-amplifiers design.

3. Major Design Issues
   3.1 Quick analysis methodologies.
   3.2 Frequency response, circuit stability and basic compensation techniques.
   3.3 Operational amplifiers design, advance topologies overview.
   3.4 Analog layout techniques focusing on practical matching skills and parasitics effects.
   3.5 Offset problems, process corners and variation issues.

4. CMOS Subsystem Design
   Current sources, one-stage amplifier to multi-stage amplifier designs, cascade and cascade topologies.

5. Design Verifications
   5.1 Device models and process corners simulation.
   5.2 Temperature effects and offset problems due to process variations.
   5.3 Design & simulation techniques to ease debug or performance enhancements.
   5.4 Layout for improved reliability and matching.

Indicative reading list and references:


