Module Code | EEU44C02
---|---
Module Name | Microelectronic Circuits
ECTS Weighting | 5 ECTS
Semester taught | Semester 2
Module Coordinator/s | Dr Justin King

**Module Learning Outcomes with reference to the Graduate Attributes and how they are developed in discipline**

On successful completion of this module, students should be able to:

LO 1: Explain the electrical operation of the metal-oxide-semiconductor (MOS) field effect transistor.
LO 2: Analyse the fundamental static and dynamic performance of simple CMOS circuits noting design trade-offs.
LO 3: Implement various CMOS logic structures.
LO 4: Determine the limitations of current CMOS structures and alternatives.
LO 5: Extend knowledge of dynamic performance to more complex logic structures and systems.
LO 6: Demonstrate the fundamental principles of system design.

**Graduate Attributes: levels of attainment**

To act responsibly - Enhanced
To think independently - Enhanced
To develop continuously - Enhanced
To communicate effectively - Enhanced

1. An Introduction to Module Design from AISHE provides a great deal of information on designing and re-designing modules.
2. TEP Glossary
Module Content

Please provide a brief overview of the module of no more than 350 words written so that someone outside of your discipline will understand it.

- **The MOSFET:** Physical principles of device operation; current voltage relationships, device models; second order effects.
- **Static Circuit Analysis:** MOS inverters; the CMOS inverter transfer characteristic and its switching level; NAND and NOR gates; noise margin; transmission gate.
- **Dynamic Circuit Analysis:** Circuit lay-out, MOS transistor capacitances; inverter step response; gate delays; power dissipation.
- **Technology Scaling, 14 Nanometers and Beyond:** Limitations and emerging technologies. FinFETs.
- **CMOS Logic Functions:** Generalised CMOS combinational logic; XOR and transmission gate logic; sequential logic elements, SRAM, DRAM.
- **CMOS Subsystem Performance:** RC gate delay models.

Teaching and Learning Methods

- e.g., lectures, seminars, online learning via VLE, field trips, laboratories, practice-based etc...

This module is taught using a combination of lectures, tutorials and two supporting laboratories. During the tutorials, students will develop their problem solving skills by tackling problems based on the lecture material.

Assessment Details

<table>
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<th>Assessment Component</th>
<th>Assessment Description</th>
<th>LO Addressed</th>
<th>% of total</th>
<th>Week due</th>
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<td>End of Semester</td>
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<tr>
<td>Laboratory</td>
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<td>20</td>
<td>During Semester</td>
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Reassessment Requirements

Supplemental Written Exam

Contact Hours and Indicative Student Workload

- **Contact hours:** 36 hours

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3 TEP Guidelines on Workload and Assessment
<table>
<thead>
<tr>
<th>Section</th>
<th>Details</th>
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<tbody>
<tr>
<td>Independent Study (preparation for course</td>
<td>preparation for course and review of materials): 35</td>
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<td>and review of materials): 35</td>
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<td>Independent Study (preparation for</td>
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**Recommended Reading List**


**Module Pre-requisite**

EEU33C03 or equivalent

**Module Co-requisite**


**Module Website**

See Blackboard

**Are other Schools/Departments involved in the delivery of this module?**

No

**Module Approval Date**

- Approved by
- Academic Start Year: 2020
- Academic Year of Date: 2019/2020