Module Code: EEU33C02
Module Name: DIGITAL CIRCUITS
ECTS Weighting: 5 ECTS
Semester taught: Semester 2
Module Coordinator/s: Declan O’Loughlin

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:

1. Explain the operation of the common electronic switching and implementations of logic gates with them.
2. Analyse simple transistor switching circuits to determine their performance criteria and limitations.
3. Analyse simple transistor switching circuits to determine static and dynamic performance parameters and related operating figures of merit.
4. Explain the operation and evaluate the performance of logic gates.
5. Design simple transistor circuits for practical discrete applications from a performance specification.
6. Carry out circuit analysis experiments using CAD tools such as MultiSim in a systematic and informed manner.

Graduate Attributes: levels of attainment
To act responsibly - Enhanced
To think independently - Attained
To develop continuously - Enhanced
To communicate effectively - Attained

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.

Digital Circuits is a one semester module taken by Junior Sophister C, CD and D Stream students. It provides a thorough foundation in digital circuits as applied to modern logic device families. The module aims to provide students with knowledge of the operational principles and practical limitations of digital circuits at device and circuit level, as well as instructing them in the analysis and design of these circuits. All of the principles and techniques learned are applicable to the design of digital circuits on a wider scale. During the module, students will develop the analytical and synthesis skills needed to design digital...
circuits for electronic equipment intended for any modern application area. In particular C Stream Electronic Engineering students will use these skills later in further circuit and system design modules, while CD Stream Electronic & Computer Engineering and D Stream Computer Engineering students gain the insight needed to appreciate how the design of digital circuits influences and ultimately limits the performance of computers at gate, architectural and system level. The issues encountered ultimately influence factors such as critical paths, throughput rates, instruction cycle times, signal integrity, and data loss which are most important issues in modern computers.

Syllabus:
Semiconductor Electronics: brief revision of fundamental semiconductor laws; current flow mechanisms.
Bipolar Junction Diode: the p-n junction; barrier potential; the ideal diode equation.
Bipolar Junction Transistor: physical principles of operation; device characteristics and parameters.
Bipolar Transistor Inverter: operation of the BJT transistor as a switch; simple inverter circuit; static and dynamic performance characteristics; effects of loading.
BJT Inverter Applications: the design of simple bipolar transistor circuits to act as buffers, drivers and interfaces in a range of applications.
TTL Logic Family: logic characteristics and performance; operating principles of standard 7400 series gates; circuit analysis and power consumption evaluation, Advanced TTL families.
MOS Field Effect Transistor: physical principles of operation; device characteristics and parameters.
MOS and CMOS Inverter: simple resistively loaded MOS transistor inverter, standard p-type /n-type CMOS inverter.
CMOS Logic Family: basic combinational circuits; the CD 4000 series gates.

Teaching and Learning Methods

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

The module is taught using a combination of lectures, tutorials and a supporting simulation-based laboratory. During the tutorials students will develop their problem solving skills by tackling problems based on the lecture material.
Assessment Details

Please include the following:
- Assessment Component
- Assessment description
- Learning Outcome(s) addressed
- % of total
- Assessment due date

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<tr>
<th>Assessment</th>
<th>Examination</th>
<th>Nos. 1 - 5</th>
<th>70%</th>
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<td></td>
<td>2 hour written examination</td>
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<td>Weeks 4-10</td>
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<td>Continuous Assessment</td>
<td>Written Reports</td>
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Reassessment Requirements

Written exam only

Contact Hours and Indicative Student Workload

Contact hours:
- 50 hours

Independent Study (preparation for course and review of materials):
- 25 hours

Independent Study (preparation for assessment, incl. completion of assessment):
- 50 hours

Recommended Reading List


Module Pre-requisite

Successful Completion SF year of BAI programme

Module Co-requisite

Module Website

Blackboard
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<td>Module Approval Date</td>
<td>19/08/2019</td>
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<tr>
<td>Approved by</td>
<td>M. J Burke</td>
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<tr>
<td>Academic Start Year</td>
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<td>Academic Year of Date</td>
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