1. **Course number and name:** 055:032 - Introduction to Digital Design

2. **Credits and contact hours:** 3

3. **Instructor:** James Maxted

   a. **references:** Xilinx references on course website

5. **Specific course information**
   a. **Brief description.** Modern design and analysis of digital switching circuits; combinational logic; sequential circuits and system controllers; interfacing and busing techniques; design methodologies using medium- and large-scale integrated circuits; lab arranged.
   b. **Prerequisite:** sophomore standing.
   c. **Required** for all majors.

6. **Specific goals for the course, mapped to outcomes**

<table>
<thead>
<tr>
<th>Course Goal</th>
<th>Basis For Goal Assessment</th>
<th>Supports ABET Outcomes</th>
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</thead>
<tbody>
<tr>
<td>1. Understanding of digital information representation and arithmetic.</td>
<td>Homework, exam questions</td>
<td>a(●), c(●), k(●)</td>
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<tr>
<td>2. Understanding of the structure and design of combinational logic circuits</td>
<td>Homework, exam questions, lab reports</td>
<td>a(●), c(●), c(●), k(●)</td>
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<tr>
<td>3. Understanding of sequential logic circuits</td>
<td>Homework, exam questions, lab reports</td>
<td>a(●), c(●), c(●), k(●)</td>
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<tr>
<td>4. Understanding of Hardware Description Language and associated tools</td>
<td>Lab reports</td>
<td>a(●), c(●), c(●), j(●), k(●)</td>
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<td>5. Understanding of modern programmable logic devices</td>
<td>Homework, exam questions, lab reports</td>
<td>a(●), c(●), c(●), j(●), k(●)</td>
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<tr>
<td>6. Understanding of Register Transfer Level Operations</td>
<td>Homework, exam questions, lab reports</td>
<td>a(●), c(●), c(●), k(●)</td>
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<td>7. Understanding of basic computer system architecture.</td>
<td>Homework, exam questions, lab reports</td>
<td>a(●), c(●), k(●)</td>
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<td>8. Have opportunities to further his/her professional development through working on teams in laboratory projects; practicing written, oral and graphical communication skills; and using modern computer tools.</td>
<td>Lab reports</td>
<td>b(○), d(○), g(○), k(○)</td>
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7. **Brief list of topics to be covered**

   a. Introduction to digital systems
   b. Information representation
   c. Logic operations and combinational circuits
   d. Combinational logic synthesis
7. Brief list of topics to be covered, continued

e. Hardware Description Language
f. Sequential circuits
g. Registers, memory, programmable logic devices
h. Register Transfer Level (RTL) specification and design
i. Sequencing and control
j. Basic computer architecture
k. In class exams
l. Laboratory Projects: Introduction to lab equipment--build and test a simple
digital circuit using TTL ICs, Combinational circuit design using switches, TTL
gates, LEDs; Combinational circuit design using VHDL and programmable gate
array (FPGA); 4-bit ALU design using VHDL and FPGA; Integrating counter
design using sequential VHDL and FPGA; 4-wheel robot control unit using
sequential VHDL and FPGA