Subject Description Form

Subject Code	EIE2211
Subject Title	Logic Design
Credit Value	3
Level	2
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	To provide students with a broad view in both hardware and software aspects of digital systems in general and microprocessor systems in particular, and enable them to gain understanding and skills that will be used in later computer related courses. Emphasis will be placed on topics including: 1. Common binary logic components found in a microcomputer system 2. Use and applications of programmable logic devices 3. Structure and organization of microprocessors
Intended Subject Learning Outcomes	**Upon completion of the subject, students will be able to:** Category A: Professional/academic knowledge and skills 1. Understand the fundamentals of digital systems and associated technologies. 2. Analyse and design simple systems related to digital logic. 3. Apply logic design techniques to construct digital systems with programmable logic devices and microprocessors, and appreciate the use of them. 4. Appreciate the importance of creativity and critical thinking on finding "good" solutions or making "good" designs. Category B: Attributes for all-roundedness 5. Think critically.
Contribution of the Subject to the Attainment of the Programme Outcomes	**Programme Outcomes:** Category A: Professional/academic knowledge and skills • Programme Outcome 1: This subject contributes to the programme outcome through the teaching of the foundation concepts of logic design. • Programme Outcome 2: This subject contributes to the programme outcome by providing students with a number of experiments and exercises to analyze and interpret data. • Programme Outcomes 3 and 4: This subject contributes to these two programme outcomes through requiring students to conduct experiments. • Programme Outcome 5: This subject contributes to these programme outcomes through the teaching of the concepts and skills for designing digital systems, and by providing students with the opportunity to apply the techniques and tools to solve practical engineering problems.
Subject Synopsis/ Indicative Syllabus	**Syllabus:** 1. Logic Circuit and ICs 1.1 Decoders and encoders 1.2 Multiplexers and demultiplexers 1.3 Binary adders, binary adder-subtractors 1.4 Binary multipliers 1.5 Sequential circuit analysis and design 1.6 Registers and counters 1.7 HDL representation.

2. Memory and Programmable Logic Devices
   - 2.1 RAM: Write and read operations, timing waveforms, RAM integrated circuits, three-state buffers, DRAM ICs
   - 2.2 Programmable logic technologies
   - 2.3 ROM, PLA and PAL
   - 2.4 VLSI programmable logic devices: Xilinx FPGA.

3. Microprocessor
   - 3.1 Register transfer operations
   - 3.2 Microoperations
   - 3.3 Bus-based transfer
   - 3.4 ALU
   - 3.5 Shifter
   - 3.6 Datapath representation
   - 3.7 Control word
   - 3.8 Control unit
   - 3.9 Hardwired control
   - 3.10 Basic Assembly Language Programming.

Laboratory Experiment:

1. Basic logic gates and their applications
2. Hardware description language and programmable logic devices

Teaching/ Learning Methodology

Teaching and Learning Method	Intended Subject Learning Outcome	Remarks
Lectures	1, 2, 3, 4	Fundamental principles and key concepts of the subject are delivered to students.
Tutorials	1, 2, 3, 4, 5	Supplementary to lectures and are conducted with smaller class size. Students will be able to clarify concepts and to have a deeper understanding of the lecture materials. Problems and application examples are given and discussed.
Laboratory sessions	1, 2, 3, 4, 5	students will make use of the software and hardware tools to develop simple digital systems, perform simulations

Assessment Methods in Alignment with Intended Subject Learning Outcomes

Specific Assessment Methods/Tasks	% Weighting	Intended Subject Learning Outcomes to be Assessed (Please tick as appropriate)				
		1	2	3	4	5
1. Continuous Assessment	50%					
• Test	20%	✓	✓	✓	✓	
• Quizzes	10%	✓	✓	✓		
• Laboratory activities	20%	✓	✓	✓	✓	✓
2. Examination	50%	✓	✓	✓	✓	
Total	100%					

<table>
<tr><td></td><td>The continuous assessment will consist of several quizzes, 1 lab demonstration, 1 lab report, and 1 test.

Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

<table>
<tr><th>Specific Assessment Methods/Tasks</th><th>Remark</th></tr>
<tr><td>Quizzes, tests and examination</td><td>End-of chapter type problems used to evaluate students' ability in applying concepts and skills learned in the lessons.
Students need to think critically and creatively in order to come up with solutions for existing problems.</td></tr>
<tr><td>Laboratory sessions</td><td>Each student is required to do a demonstration and submit a lab report.</td></tr>
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<tr><td>Student Study Effort Expected</td><td>
<table>
<tr><td>Class contact (time-tabled):</td><td></td></tr>
<tr><td>• Lecture</td><td>24 Hours</td></tr>
<tr><td>• Tutorial/Laboratory/Practice Classes</td><td>15 hours</td></tr>
<tr><td>Other student study effort:</td><td></td></tr>
<tr><td>• Lecture: preview/review of notes; homework/assignment; preparation for test/quizzes/examination</td><td>36 Hours</td></tr>
<tr><td>• Tutorial/Laboratory/Practice Classes: preview of materials, revision and/or reports writing</td><td>30 Hours</td></tr>
<tr><td>Total student study effort:</td><td>105 Hours</td></tr>
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</td></tr>
<tr><td>Reading List and References</td><td>Textbooks:

1. M.M. Mano and C.R. Kime, Logic and Computer Design Fundamentals, 4th ed., Upper Saddle River, NJ: Prentice-Hall, 2008.

Reference Books:

1. M.M. Mano and M.D. Ciletti, Digital Design. Upper Saddle River, NJ: Prentice-Hall, 2007.
2. S. Yalamanchili, VHDL – A Starter's Guide, 2nd ed. Prentice-Hall, 2005.
3. E.O. Hwang, Digital Logic and Microprocessor Design With VHDL, 1st ed., CL-Engineering, 2006.</td></tr>
<tr><td>Last Updated</td><td>December 2023</td></tr>
<tr><td>Prepared by</td><td>Dr. Y. H. Chan</td></tr>
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