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| **Course** | ECE 27000 - Introduction to Digital System Design |
| **Type of Course** | Required for CmpE and EE Programs |
| **Catalog Description** | An introduction to digital system design and hardware engineering, with an emphasis on practical design techniques and circuit implementation. |
| **Credits** | 4 |
| **Contact Hours** | Class: 3, Lab: 3 |
| **Corequisite Course** | ENGR 12800 or equivalent course of computer programming |
| **Prerequisites by Topics** | Basic understanding of circuits (voltage, current, Ohm's Law) and electrical components (resistors, capacitors, switches*).* |
| **Textbook** | W. Kleitz, *Digital Electronics - A Practical Approach*, Prentice Hall, Current Edition. |
| **Course Objectives** | This course will provide a comprehensive understanding of the principles and practices of digital logic circuits. Students should be able to analyze, design and implement combinational and sequential circuits.  The laboratory sessions form an integral part to provide practical experiences in hardware and software analysis and design. |
| **Course Outcomes** | On successful completion of this course, students should be able to:   1. Understand the basic characteristics of integrated-circuit logic devices (1). 2. Analyze and simplify combinational logic circuits (1). 3. Design combinational logic circuits with building blocks such as adders, encoders, decoders, multiplexers and demultiplexers (2). 4. Understand the operations of flip-flops and use timing waveforms to analyze sequential logic circuits (1). 5. Design sequential logic circuits(2). 6. Realize, test, and debug practical digital circuits (6). 7. Use programmable logic devices and computer aided design (CAD) tools to design digital circuits (7). 8. Present lab results effectively in form of lab reports (3). |
| **Lecture Topics** | 1. Number systems and codes 2. Digital electronic signals and switches 3. Basic logic gates 4. Programmable logic devices 5. Boolean algebra and reduction techniques 6. Timing hazards 7. Exclusive-OR and Exclusive-NOR gates 8. Arithmetic operations and circuits 9. Code converters, multiplexers, and demultiplexers 10. Logic families and their characteristics 11. Flip-flops and registers 12. Practical considerations for digital design 13. Counter circuits 14. Shift registers 15. Synchronous sequential state machines |
| **Computer Usage** | High |
| **Laboratory Experience** | High |
| **Design Experience** | High |
| **Coordinator** | Chao Chen, Ph.D. |
| **Date** | October 2021 |