Minnesota State University, Mankato

Curriculum Proposal

Please type or select the requested information. Print completed forms, add appropriate paper attachments, and route through MSU’s curricular process for recommendations and decisions.

College: [Science, Engineering and Technology] (Check all that apply): Undergraduate
Department: Electrical and Computer Engineering and Technology
Program: Electrical Engineering/Computer Engineering
Type of Change: COURSE PROPOSALS
Proposal: New Course

Title Current: Advanced Digital System Design
Title Proposed: (if applicable)
24-Char. Abbrev: EE 463

Effective Date of Change: 10/7
Academic Year: 05 (For Office Use Only)
Course Designator Number: EE 463
Number of Credits: 3

Include a course or program description for the Bulletin (30-40 words maximum for courses, 100 for programs):

Design of combinational and sequential systems and peripheral interfaces. Design techniques using MSI and LSI components in an algorithmic state machine; implementation will be stressed. Rigorous timing analysis, transmission-line effects and metastability of digital systems will be studied.

Rationale or Justification for change:

This course has outcomes that are very important for Computer Engineers and Electrical Engineers who may be involved in the design of digital systems.

***For General Education or Cultural Diversity Courses Only***

General Education Course:

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- For Writing Intensive Courses, attach a description of the kind and quantity of writing.
- For Upper Division Courses, include a description of the respects in which it is broad and general rather than narrow and specific, and so suitable as GE.

Attach paper copies of the following:

a. Syllabus or course outline.
b. Course’s student learning outcomes associated with each GE competency or CD designation.
c. List of strategies to be used to assess students’ achievement of each GE competency or CD designation.

***For New Courses***

Instructional Type: Lecture
Grading Format: Grade
Course will be offered: Fall Semester
Course is an elective.
Course is required for program
Pre- or Co-requisites: EE 244
Other courses are being changed or eliminated. (Explain.)

Course content or title is similar to courses in other departments. (Attach copy of letter of agreement with other program(s) contacted. Indicate the nature of the discussions and/or resolution of differences or potential conflicts.)

Attach paper copies of the following:

a. Syllabus or course outline.
b. Course’s student learning outcomes.
c. A list of resources required to offer and support this course.
d. A description of how teaching this course will affect department staffing.
e. If 400/500 level course, an explanation of added expectations of graduate students.

05-12

Academic Affairs
Minnesota State University, Mankato

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Revised September 2002
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EE 463 – Advanced Digital System Design

Course content is not similar to any other courses offered on campus

a. Syllabus – please see attached
b. Course student learning outcomes – please see attached
c. A list of resources required to support this course
   Current department labs are adequate to support this course – additional library resources will not be required to support this course
d. Department staffing – this course will be treated as an elective course and will be rotated as other department courses. The outcomes in this course are critical for many of our graduates – as such the department is committed to finding solutions to allow this course to be offered.
e. 400/500 N/A
Tentative Syllabus

Course Number: EE 463
Course Title: Advance Digital System Design
Semester: Fall 2006
Class Time: MWF
Class Location: TBD
Class Credits: 3
Instructor: TBD
Office:
Phone:
Email:
Office Hours:

Course Objectives

- Develop core competencies in digital design
- Be able to analyze and design combinatorial digital circuits
- Be able to analyze and design synchronous sequential digital circuits
- Be able to analyze and design asynchronous sequential digital circuits
- Apply digital design and analysis concepts in the design and analysis of microprocessor circuits and support systems
- Develop the necessary software skills to support the design and analysis of digital systems
- Study, analyze and implement key microprocessor architectural components using basic digital elements
- Explore alternate computing structures
- Complete rigorous timing analysis of digital systems
- Explore metastability and transmission line effects in digital systems

Recommended Texts: Digital Systems Hardware Organization and Design, Hill and Peterson
Fundamentals of Digital Logic and Microcomputer Design, Rafiquzzaman
Computer Architecture A Quantitative Approach, Hennessy and Patterson

Other References: Will be provided and identified during the semester

Grading:
1. Project/Activity Topics 120 points
2. Exams 425 points (3 – 100 point exams, 1- 125 point exam)
3. Final Skills/Activity Assessment 80 points
Grading Scale:
It is anticipated that the grading for this course will follow standard 10 percent break points. The instructor reserves the right to lower the scale to meet natural student distributions.

Cheating: Cheating will be dealt with in a manner that is consistent with the action. The severity of the penalty may be a simple reprimand or may result in failure of the course. The goal is for you to learn the material. If you are experiencing trouble in the course discuss it with the instructor – learning the material is easier and far more satisfying than cheating.

Documentation: It is expected that documentation and reports for this course will be prepared in a manner that would be acceptable in the work environment

Promptness: It is expected that assignments and obligations will be accomplished in a fashion that would be acceptable in the work environment. In the event you determine that you will be unable to complete an assigned task on time, let the instructor know in a timely fashion. Timely notification does not guarantee that a due date can be extended – some times things just have to be completed as scheduled. It should be expected that late assignments will be penalized at a rate of 15% per day.

ADA: It is the intent of the instructor of this course to provide a learning environment that is as conducive to learning and the expression of abilities as is possible. If any student in this course has any condition that requires special accommodation to allow them to master or demonstrate mastery of concepts they are asked to contact the instructor as soon as possible.

Participation: Conduct consistent with ethical and supportive business practices will be expected. In paraphrasing the Code of Conduct for many businesses – be on time for meetings – be prepared for meetings – do not interrupt – criticize ideas not people – respect each other – provide solutions not just problems.

Incompletes: Incompletes are given for circumstances beyond a student’s control. I don’t interpret this to cover poor planning.

Tentative Lecture Schedule

- Course Introduction – Expectations – Introduction to Digital – Introduction to Number Systems
- Base Conversion Methods, Complements of Numbers, BCD Codes, Error Codes and Floating Point formats
- Introductory Digital Design, Basic Gates and Operators
- Project/Activity Topic:
- Minterm and Maxterm Representations
- Design and Analysis of Common Circuits
- Project/Activity Topic:
  - Minimization with Theorems and necessary covers for timing
  - Karnaugh Maps, Including 5 and 6 Variables, Prime and Essential Implicants, and Don’t Cares – the need for redundant terms
  - Map Entered Variable K-Map Reductions and associated graph theory
- Project/Activity Topic:

- Exam 1
  - Useful Digital Circuits including ALU, Multiplexer, Demultiplexer and Comparators – and their design
  - Useful Circuits continued with A-O-I, wired logic and device parameters
- Project/Activity Topic:

- Different Logic Families and Properties
  - Programmable Logic – Design considerations
  - Programmable Logic
- Project/Activity Topic:

- Introduction interface circuits and standards
  - Fundamental Differences in Sequential Machines, Clocks and Oscillators
  - Types of Flip-flops, and design of Edged Triggered Circuits
- Project/Activity Topic:

- State Diagrams – determining hazards
  - State Machine Design
  - Counters and Shift Registers
- Project/Activity Topic:

- Exam 2
  - Multi-Input System Control
  - Timing and Frequency Issues Associated with Multi-Input System Control
- Project/Activity Topic:

- MSI Logic in System Control
  - Programmable Logic in System Control
  - Programmable System Controllers
- Project/Activity Topic:

- System Controllers Around a Shift Register
  - Programmable System Controller
  - Asynchronous State Machines
- Project/Activity Topic:
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Asynchronous State Machines
Exam 3
Computer Interfacing
Project/Activity Topic:

Computer Interfacing
Computer Interfacing

Parallel Processing
Parallel Processing
Alternate Computing Structures and Methodology
Project/Activity Topic:

High Speed Design Issues
High Speed Design Issues
High Speed Design Issues
Project/Activity Topic:

Final Exam:
Course Student Learning Outcomes – EE 463

- Develop core competencies in combinatorial digital design
- Develop core competencies in sequential digital design
- Learn digital design techniques using MSI and LSI components for the design of algorithmic state machines
- Develop core competencies in design of digital peripheral interfaces
- Be able to analyze and design combinatorial digital circuits
- Be able to analyze and design synchronous sequential digital circuits
- Be able to analyze and design asynchronous sequential digital circuits
- Apply digital design and analysis concepts in the design and analysis of microprocessor circuits and support systems
- Develop the necessary software skills to support the design and analysis of systems
- Study, analyze and implement key microprocessor architectural components and basic digital elements
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