08-37

Minnesota State University, Mankato HOLD and CLEAR buttons only compatible with Acrobat V. 4 and 5

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
Department: Electrical and Computer Engineering and T
Program: Computer Engineering
Type of Change Proposed: N/A Program Redesign
Title Current: N/A
Title Proposed:
24-Char. Abbrev:

(Check all that apply):
☑ Undergraduate
☐ Graduate
CIP # _____

Proposal # 80
Effective Date of Change:
Academic Year 07-08
(For Office Use Only)

Course Designator and Number	Number of Credits

(if applicable)

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

Rationale or Justification for change:

Change in bulletin copy due to Physics course format change.
Physics 221 General Physics I (5) -- credit change to (4)
Physics 222 General Physics II (5) -- credit change to (3)
Physics 223 General Physics III (3) -- new course

For General Education or Cultural Diversity Courses Only

General Education Course:

GE Category #	GE Category Name (Maximum of 3 Categories)
N/A	
N/A	
N/A	

? 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.

Cultural Diversity Course:

(Please check one.)

☐ **Core** (At least 75% devoted to topics of race, gender, sexual orientation, age, class, and disabilities as they occur in United States Society.)

☐ **Related** (At least 25% devoted to the above topics or to a global perspective on topics related to African American, Asian, Hispanic, and Native American inhabitants of the United States.)

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

(Check all that apply:)
☐ Course is an elective.
☐ Course is required for program
☐ Pre- or Co-requisites:
☐ Other courses are being changed or eliminated. (Explain.)

Instructional Type: Lecture
Grading Format: ☐ Grade ☐ P/N

Course will be offered:
☐ Fall Semester
☐ Spring Semester
☐ Summer Session

☐ 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.

Minnesota State University, Mankato

Curriculum Proposal

Signature Page

Department
_X_Recommended (Category/ies_____)
__Not Recommended (Category/ies_____)
W. B. Hudson — Department Chair — Oct 17, 07 — Date
Comments:

College Curriculum Committee
_X_Recommended (Category/ies_____)
__Not Recommended (Category/ies_____)
Committee Chair — 10/30/07 — Date
Comments:

College Dean
_X_Recommended (Category/ies_____)
__Not Recommended (Category/ies_____)
Dean — 11/2/07 — Date
Comments:

General Education Subcommittee
__Recommended (Category/ies_____)
__Not Recommended (Category/ies_____)
General Education Subcommittee Chair — Date
Comments:

Undergraduate Curriculum and Academic Policy Committee
_X_Recommended (Category/ies_____)
__Not Recommended (Category/ies_____)
UCAP Faculty Chair — 12/10/07 — Date
Comments:

Faculty Association Graduate Committee
__Recommended
__Not Recommended
Faculty Association Graduate Chair — Date
Comments:

Graduate Dean
__Recommended
__Not Recommended
Graduate Dean — Date
Comments:

Academic Affairs Council
_X_Recommended (Category/ies_____)
__Not Recommended (Category/ies_____)
Assistant Vice President — 12/20/07 — Date
Comments:

Senior Vice President and Vice President for Academic Affairs
_X_Approved (Category/ies_____)
__Not Approved (Category/ies_____)
Sr. Vice President / Vice Pres. Academic Affairs — 12/20/07 — Date
Comments:

COMPUTER ENGINEERING

The educational objectives for our Bachelor of Science in Computer Engineering degree are to prepare our graduates to:

1. Function as responsible members of society with an awareness of the social, ethical, and economic ramifications of their work.
2. Become successful practitioners in engineering and other diverse careers.
3. Succeed in full time graduate and professional studies.
4. Pursue continuing and life-long learning opportunities.
5. Pursue professional registration.
6. Provide foundational education that allows for personal growth and flexibility through their career.

Our metrics for determining success in meeting these objectives will include:

1. Assessment of societal, economic awareness, and ethical performance of our graduates by the graduate and employer.
2. Monitoring of the success of our graduates in the work force.
3. Monitoring of the success of our graduates in graduate and professional programs.
4. Assessment of continuing and life-long learning by the graduate (and their employer as applicable.).
5. Reviewing the number and success of our students completing professional registration to advance their careers.

In support of these objectives, the program provides a curriculum including the following components that will prepare students for excellent careers in Computer Engineering:

1. A strong background in the physical sciences; mathematics, including discrete math; and engineering sciences, including extensive hands-on laboratory instruction.
2. An integrated design component including instruction in basic practices and procedures, creativity, control, economics, and synthesis. The process begins with basic instruction during the freshman year and concludes with a capstone design project.
3. A choice of sub-disciplines in the senior level electives.
4. Opportunities for students to develop sensitivity to the social and humanistic implications of technology and motivate them to make worthwhile contributions to the profession and society, while upholding the highest standards of professional ethics.
5. A course in engineering economics to promote awareness of the economic aspects of engineering.
6. Preparation for continuing study and professional development.

During the senior year, as allowed by the state, students will be required to take the Fundamentals of Engineering (FE) examination or its equivalent.

The curriculum offers students the opportunity to emphasize a number of specialized areas including advanced digital systems, communications, digital signal processing, networking and system design.

The recommended high school preparation is two years of algebra, one year of geometry, one-half year of trigonometry, one-half year of college algebra, and a year each of physics and chemistry plus a programming language. Without this background it may take students longer than four years to earn a degree. During the first two years students take science and mathematics courses common to all branches of engineering (pre-engineering), as well as supporting work in English, humanities, and social sciences. Second-year computer engineering students complete physics, mathematics and 200-level engineering and computer science courses.

Admission to Major. Admission to the college is necessary before enrolling in non-engineering 300- and 400-level courses. Minimum college requirements are:

- a minimum of 32 earned semester credit hours.
- a minimum cumulative GPA of 2.00 ("C").

Please contact the department for application procedures.

During spring semester of the sophomore year, students should submit an application form for admission to the Computer Engineering program. Admission to the program is selective and, following applications to the department, subject to approval from the faculty. The department makes a special effort to accommodate transfer students. Only students admitted to the program are permitted to enroll in upper-division engineering courses. No transfer credits are allowed for upper-division engineering courses except by faculty review followed by written permission.

Before being accepted into the program and admitted to 300-level engineering courses (typically in the fall semester), a student must complete a minimum of 56 semester credits including the following:

- General Physics (calculus-based) (10 credits)
- Calculus, Differential Equations, Probability & Statistics (20 credits)
- Electrical Engineering Circuit Analysis I and II (including lab.) (7 credits)
- Chemistry (5 credits)
- English Composition (4 credits)
- Computer Sciences (Java and C++) (4 credits)
- Introduction to Electrical and Computer Engineering (6 credits)

A cumulative GPA of 2.5 for all science and math courses must have been achieved for program admittance. Grades must be "C" or better for courses to be accepted.

GPA Policy. Students graduating with a degree in Computer Engineering must have:

1. completed a minimum of 20 semester credit hours of upper division EE and CS courses at Minnesota State Mankato.
2. have a cumulative GPA of 2.25 on all upper division EE and CS courses, and
3. have completed their senior design sequence at Minnesota State Mankato.
4. have taken the Fundamentals of Engineering (FE) exam or its equivalent and achieved the desired competency level.

Petition to evaluate transfer credits must occur no later than the first semester the student is enrolled in or declared a major housed in the Department of Electrical and Computer Engineering Technology.

Accreditation

Computer Engineering is not an accredited program by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology.

P/N Grading Policy. A student who majors in CE must elect the grade option for all required courses including courses offered by another department.

COMPUTER ENGINEERING BSEC

Required for Major (Prerequisites, 65 credits):

CHEM	201	General Chemistry I (5)
CS	220	Machine Structures and Programming (3)
EE	106	Intro to EE and CE I (3)
EE	107	Intro to EE and CE II (3)
EE	230	Circuit Analysis I (3)
EE	231	Circuit Analysis II (3)
EE	235	Microprocessor Engineering Lab I (1)
EE	240	Evaluation of Circuits (1)
EE	295	Computer Hardware and Organization (3)
ENG	101	Composition I (4)
ENG	271	Technical Communication (4) OR
SPEE	233	Public Speaking for Technical Professionals (3) OR
SPEE	102	Public Speaking (3)
MATH	121	Calculus I (4)
MATH	122	Calculus II (4)
MATH	180	Mathematics for Computer Science (4)
MATH	223	Calculus III (4)
MATH	321	Ordinary Differential Equations (4)
MATH	354	Concepts of Probability and Statistics (3) OR
ME	291	Engineering Analysis (3)
PHYS	221	General Physics I (4)
PHYS	222	General Physics II (3)
PHYS	323	General Physics III (3)

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Memorandum

To: Course and Curriculum Committees

CC: [Click **here** and type name]

From: William B Hudson, Chair ECET

Date: October 30, 2007

Re: Computer Engineering Curriculum Change

Attached please find the revised curriculum for the Computer Engineering degree program. The changes listed are being made to support the changes made in required Physics courses.

Specific points to note:

- No changes are being proposed in course work other than Physics.
- Changes in this program do not change current engineering general education requirements
- The total credit hours required for the Computer Engineering degree would not change with the proposed curriculum changes.

Provided in support of this proposal and identified as attachment 2 are the required program student learning outcomes as defined by our accreditation agency ABET. These outcomes listed as topics a-k are supported by course outcomes which have been created for all courses and mapped to the provided learning outcomes.

Minutes of department meetings supporting these changes are provided and marked as attachment 3.

Our program accreditation requires both assessment and improvement. Accreditation Criteria 2 requires that we evaluate and determine that the Computer Engineering program prepares students to meet career and professional requirements normally one to five years after graduation. It is required that we have in place a process by which we determine this and use the results to improve our Computer Engineering program. Further Criteria 3 of our accreditation requires that we assess program outcomes (competencies at graduation) and use these results to improve the Computer Engineering program. An overview of the assessment plan for the Computer Engineering program is provided as attachment 4.

Resources

No new ECET resources will be required to support these changes – all changes are occurring outside of the ECET department

Staffing

No new ECET staffing will be required to support these changes – all changes are occurring outside of the ECET department

Library Needs

Library needs required by the ECET program will not change as a result of this program change – all

Bulletin Copy

Changes in bulletin copy should only reflect changed course offering as defined by the changes in the Physics course sequence as provided previously.

Computer Engineering			
Current Program		Proposed Program	
English Composition (4 Credits)	**Credit Hours**	**English Composition (4 Credits)**	**Credit Hours**
ENG 101 Composition	4	ENG 101 Composition	4
Mathematics (20 Credits)		**Mathematics (20 Credits)**	
MATH 121 Calculus I	4	MATH 121 Calculus I	4
MATH 122 Calculus II	4	MATH 122 Calculus II	4
MATH 223 Calculus III	4	MATH 223 Calculus III	4
MATH 321 Ordinary Differential Equations	4	MATH 321 Ordinary Differential Equations	4
MATH 180 Mathematics for Computer Science	4	MATH 180 Mathematics for Computer Science	4
Chemistry (5 Credits)		**Chemistry (5 Credits)**	
CHEM 201 General Chemistry I	5	CHEM 201 General Chemistry I	5
Physics (10 Credits)		**Physics (10 Credits)**	
PHYS 221 General Physics I	5	*PHYS 221 General Physics I*	*4*
PHYS 222 General Physics II	5	*PHYS 222 General Physics II*	*3*
		PHYS 223 General Physics III	*3*
Computer Science (6 Credits)		**Computer Science (6 Credits)**	
COMS 320 Computer Architecture	3	COMS 320 Computer Architecture	3
COMS 360 Systems Programming	3	COMS 360 Systems Programming	3
Mechanical Engineering (2 Credits)		**Mechanical Engineering (2 Credits)**	
ME 299 Thermal Analysis	2	ME 299 Thermal Analysis	2
General Studies (3 Credits One of the following)		**General Studies (3 Credits One of the following)**	
ENG 271 Technical Communication	4	ENG 271 Technical Communication	4
SPEE 233 Public Speaking for Technical Professiona	3	SPEE 233 Public Speaking for Technical Professionals	3
SPEE 102 Public Speaking	3	SPEE 102 Public Speaking	3
Humanities (6-7 Credits)**		**Humanities (6-7 Credits)****	
Social Sciences (6-7 Credits)**		**Social Sciences (6-7 Credits)****	
Economics (3 Credits)		**Economics (3 Credits)**	
ECON 201 Principles of Macroeconomics	3	ECON 201 Principles of Macroeconomics	3
ECON 202 Principles of Microeconomics	3	ECON 202 Principles of Microeconomics	3
Business (3 Credits)		**Business (3 Credits)**	
EE 450 Engineering Economics	3	EE 450 Engineering Economics	3
Required Courses (52 Credits)		**Required Courses (52 Credits)**	
EE 230 Circuit Analysis I	3	EE 230 Circuit Analysis I	3
EE 231 Circuit Analysis II	3	EE 231 Circuit Analysis II	3
EE 240 Evaluation of Circuits	1	EE 240 Evaluation of Circuits	1
EE 332 Electronics I	3	EE 332 Electronics I	3
EE 333 Electronics II	3	EE 333 Electronics II	3
EE 334 Microprocessor Engineering	3	EE 334 Microprocessor Engineering	3
EE 337 Principles of Engineering Design	1	EE 337 Principles of Engineering Design	1
EE 342 Electronics Laboratory	1	EE 342 Electronics Laboratory	1
EE 344 Design and Evaluation of Microprocessors	1	EE 344 Design and Evaluation of Microprocessors	1
EE 467 Principles of Engineering Design I	1	EE 467 Principles of Engineering Design I	1
EE 477 Principles of Engineering Design II	1	EE 477 Principles of Engineering Design II	1
ME 291 Engineering Analysis or	3	ME 291 Engineering Analysis or	3
MATH 354 Concepts of Probability and Statistics	3	MATH 354 Concepts of Probability and Statistics	3
EE 106 Introduction to EE and CE I	3	EE 106 Introduction to EE and CE I	3
EE 107 Introduction to EE and CE II	3	EE 107 Introduction to EE and CE II	3
CS 220 Machine Structures and Programming	3	CS 220 Machine Structures and Programming	3
EE 235 Microprocessors I Lab	1	EE 235 Microprocessors I Lab	1
EE 295 Computer Hardware and Org	3	EE 295 Computer Hardware and Org	3
EE 341 Signals and Systems	3	EE 341 Signals and Systems	3
EE 336 Principles of Engineering Design I	1	EE 336 Principles of Engineering Design I	1
EE 381 Digital Systems and Testability	3	EE 381 Digital Systems and Testability	3
EE 382 Digital Systems and Testability Lab	1	EE 382 Digital Systems and Testability Lab	1
EE 358 Control Systems	3	EE 358 Control Systems	3
EE 350 Engineering Electromagnetics	3	EE 350 Engineering Electromagnetics	3
EE 368 Control Systems Lab	1	EE 368 Control Systems Lab	1
~~EE 385 Electronics II for Computer Engineering~~	~~3~~	~~EE 385 Electronics II for Computer Engineering~~	~~3~~
~~EE 387 Computer Interfacing~~	~~3~~	~~EE 387 Computer Interfacing~~	~~3~~
~~EE 389 Computer Interfacing Lab~~	~~1~~	~~EE 389 Computer Interfacing Lab~~	~~1~~
Elective Courses (7 Credits)*		**Elective Courses (7 Credits)***	
Total Credits	**128**	**Total Credits**	**128**
* Selected from 400 level EE courses			

Minutes

Sept 25, 2007

12:00 – 12:50

(Most items will be brief!!)

In attendance: Dr. Hudson, Dr. Huang, Dr. Nair, Dr. Dvorak, Dr. Hendrickson, Dr. Mandojana, Dr. Khaliq, Dr. Allen, Dr. Zhang, Andrew Miner, John Caven, Dr. Kapadia, and Dr. Winstead.

1. Minutes
2. Good News
3. Graduation (December) – anyone who would like to participate should sign up on the list.
4. Review of Trafton Remodel Plans – Comments must be submitted to John Caven by Friday.
5. Course and Curriculum
    a. EE 620 – Dr. Huang – The CS department also has a wireless class, and we want to prevent a conflict.
    b. Three semester physics sequence

        i. Revision of EE and CE curriculum to support physics – They included the Quantum Mechanics and split off the labs so they would not be required in the second and third course per our request. Dr. Mandojana moves that we approve the new 3 course sequence minus the last two labs (10 credits total) and Gale seconds, the motion was approved by all.

        ii. Chemistry 191 - will be discussed at a future time

6. Review of Programs - the current CET advising sheet requires EET 430 in both semesters, and the second one should be EET 431
    a. EET -1)want a hardware and software experience to begin with 141-143 2) 340
    b. CET -1)want a hardware and software experience to begin with 141-143 2) 310
    c. CE - why did we wait so long for accreditation? 1)too heavy a reliance on CS 2)insufficient staffing
7. Review of Educational Objectives - what they are capable of doing in the world following graduation
8. Review of Educational Outcomes – what they have proven that they are capable of doing here
9. CET and CE enrollment numbers – 1) lack of accreditation and inability of taking the FE (for the CEs)
10. Course Level Survey – possible revisions – 1) do we want to include the ability for the student's to identify specific labs or courses that they feel do not meet their needs? The decision was made to leave the survey as is.
11. Refinements to Assessment and Rubrics -

12. Library Allocation - $1164 general and $2300 high tech available for purchases, October 1st and January 28th are the deadlines.
13. Position Description – Hendrickson, Mandojana all approved. Are we offering recruitment inducements?
14. PRC representatives: Bill

Attachment 2 - The Computer Engineering Student Learning Outcomes

Students completing the Computer Engineering degree program will be able to:
(a) to apply knowledge of mathematics, science, and engineering
(b) to design and conduct experiments, as well as to analyze and interpret data
(c) to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
(d) to function on multi-disciplinary teams
(e) to identify, formulate, and solve engineering problems
(f) understand professional and ethical responsibility
(g) to communicate effectively
(h) have the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
(i) understand the need for, and an ability to engage in life-long learning
(j) understand contemporary issues
(k) use the techniques, skills, and modern engineering tools necessary for engineering practice.

ATTACHMENT 4

Electrical and Computer Engineering and Technology Department
Program and Course Assessment

Educational Objective Assessment (1-5 years after graduation)
Efforts are made to contact graduates of all department programs for at least five years following graduation. Surveys are used based on the major that ask graduates for their impressions on how their program of study prepared them for their career. Information from these surveys is fed back into the program to make improvements. Both students and faculty are involved in this effort.

Constituent Input
Input from Internship employers is gathered through internship reports to assist in program assessment and improvement. Further input is obtained by faculty through the use of company survey forms to determine specific company skill set needs. Information from these surveys and reports is used to refine curriculum to better meet the needs of employers as they use ever evolving technologies.

Course Assessment
Outcomes are established for each course that map to the required ABET a-k outcomes for each of the degree offerings. Each instructor in the ECET department is responsible for assessing student competency in each course outcome area. This information is gathered each semester and is reviewed by the department assessment committee which then makes recommendations to the ECET faculty regarding possible improvement areas. All department faculty scan examples of student work to create assessment portfolios to support our accreditation and assessment efforts.

Student Input for Assessment
Input from students in all department programs is solicited by a student advisory board meeting and through the use of online surveys supported through MSU assessment office. The surveys are offered students each semester and solicit and analyze responses by program of study and by year in the program. As with all of the other assessment tools this information is fed back into the assessment loop to support program improvement efforts.