UNIVERSITY OF ALASKA ANCHORAGE
SCHOOL OF ENGINEERING
COURSE CONTENT GUIDE

CSE A438 Design of Computer Engineering Systems

Department: Bachelor of Science in Engineering (BSE) **Date**: 10/27/08

Course Prefix, Number, and Title: CSE A438 Design of Computer Engineering Systems

I. Course Description
Capstone course in which computer systems engineering students design a computer component or system starting with the initial design specification to the implementation and testing. Students apply knowledge and skills learned in their undergraduate curriculum.

II. **Course Design**

A. **Fundamental intent**: Provide computer systems engineering undergraduate students with a capstone design experience and present information important to employment and success as a professional engineer in practice.

B. **Number of Semester Credits**: Three (3)

C. **Course schedule**: Standard semester timeframe.

D. **Lecture hours/week**: Three (3)

E. **Laboratory hours/week**: N/A

F. **Total time of work expected outside of class**: Five (5) to eight (8) hours per week.

G. **Programs that require this course**: Bachelor of Science in Engineering with specialization in Computer Systems Engineering

H. **Grading**: A-F

I. **Coordination with affected units**: UAA faculty list-serve

J. **Justification for action**: This course requires approval as the General Education Requirement capstone course for the Bachelor of Science in Engineering degree program with Computer Systems Engineering specialization.

K. **Prerequisite**: N/A

L. **Registration Restrictions**: Student must be in senior year of BSE degree program or obtain faculty permission. Completion of GER TIER 1 (Basic College-level skills) courses.

III. **Course level justification**

Students are required to apply knowledge from courses completed in the 3rd year of the Bachelor of Science in Engineering degree program with Computer Systems Engineering specialization.

IV. **Course Outline**

A. Introduction and Project Determination
B. Job hunting skills
C. Team concepts and team building
D. Design drawing formats as needed for computer systems engineering practice and design
E. Specification writing formats as needed for computer systems engineering practice and design
F. Design codes and regulations as required for computer systems engineering practice and design
G. Project management
H. Safety or security considerations in computer systems engineering design
I. Legal considerations in computer systems engineering design
J. Professional registration and the business of computer systems engineering
K. Professional engineering volunteer organizations
L. Engineering ethics
M. Public presentation
N. Project Implementation
O. Project Testing
P. Self-Evaluation
Q. Peer Evaluation
R. Presentation and Faculty Evaluation

V. **Instructional Goals and Student Outcomes**

A. Instructional Goals. The instructor will:

1. Enable students to understand and apply concepts, principles, and skills learned in the undergraduate engineering curriculum, and
2. Prepare senior computer systems engineering students for professional practice.

B. Student Outcomes and Assessment Methods

CSE A438 Student Learning Outcomes and Corresponding Methods of Assessment	
Outcome: Students will	**Method of Assessment**
1. Identify problems and opportunities, develop related engineering design criteria, and formulate alternative solutions to meet project specifications while protecting applicable public health, safety, or security concerns	Faculty and other applicable evaluations of interactions with multi-disciplinary team members, instructors, and course mentors, interim and final oral presentations of project progress and findings, and contributions of technical drawings, visualizations, and narrative text to interim and final reports.
2. Apply knowledge and skills learned in the computer systems engineering undergraduate curriculum including the ability to	Faculty evaluations of interactions with multi-disciplinary team members, instructors, and course mentors, interim and final oral presentations of project progress and findings, and contributions of technical
3. Function effectively on multi-disciplinary teams to collaborate on iterative design of a complex computer systems engineering system with conflicting technical, social, economic, and aesthetic objectives	Faculty evaluation of interactions with multi-disciplinary team members, instructors, and course mentors, interim and final oral presentations of project progress and findings, and contributions of technical drawings, visualizations, and narrative text to interim and final reports. Peer evaluations of team performance.
4. Demonstrate professional, legal, and ethical responsibilities of practicing computer systems engineers	Faculty evaluation of interactions with multi-disciplinary team members, instructors, and course mentors, interim and final oral presentations of project progress and findings, and contributions of technical drawings,
5. Demonstrate ability to engage in life-long learning in the context of computer systems engineering professional practice	Faculty evaluation of work products with emphasis on evidence of self initiated learning of principles not covered in the curriculum to obtain needed information to solve the design problem.
6. Communicate effectively with engineering drawings and technical visualizations, design specifications, written technical reports, and public oral presentations	Faculty evaluation of interim and final oral presentations of project progress and findings, and contributions of technical drawings, visualizations, and narrative text to interim and final reports

VI. **Course Activities**: Students work together in teams to design a computer systems engineering devices or systems to meet the project specifications. In addition to the project, weekly lectures cover general topics of concern to practicing engineers. See the Section IV for a typical course outline. Half of the lecture time is spent covering the listed topics. The remaining time is spent in a “staff meeting” to discuss projects and their progress.

VII. **Course Evaluation:** No exams are given in this course. Grades are based on individual and group performance relative to the assigned project. The instructor(s) are to implement a performance assessment process that is similar to that which would be used for employee performance evaluation in a commercial or agency engineering office that consists of faculty and other applicable evaluations of interactions with multi-disciplinary team members, instructors, and course mentors, interim and final oral presentations of project progress and findings, and contributions of technical drawings, visualizations, and narrative text to interim and final reports.

VIII. **Capstone Requirement Justification**

This course satisfies all of the criteria for a capstone course including the following:

a. *Knowledge integration is incorporated as part of the course design,*
b. *Knowledge integration is specifically addressed as part of outcomes assessment,*
c. *Four instructional goals and student outcomes are part of the course design including,*
    i. *Effective communication*
    ii. *Critical thinking*
    iii. *Informational literacy*
    iv. *Quantitative perspectives*
d. *Performance in Knowledge Integration and instructional goals and student outcomes are assessed,*
e. *Student artifacts are generated that demonstrate achievement of student outcomes.*

Teams of students design complex computer components or systems under the scrutiny of faculty and other appropriate reviewers that may include a client or project sponsor. This experience integrates knowledge at multiple levels. The design project is chosen that is multidisciplinary in nature meaning that it will incorporate knowledge from the whole BSE curriculum experienced prior to the senior year. Application of scientific principles and advanced engineering computations are required, using computer software and other tools common to current professional engineering practice.

Assessments are conducted in a manner that is essentially equivalent to performance evaluations in the engineering workplace, as conducted by commercial enterprises and public agencies that employ engineers.

Verbal, written, and graphical technical communication at an advanced level, often involving commercially competitive software, is intensely exercised from beginning to end of the course. Inevitable conflicts among design criteria, implementation conditions, and social and economic constraints require critical review and decision-making by the students in the course. Detailed data and related design parameters must be acquired by students in the course from public sources.

Individual students and each specialty team produce a written report with accompanying digital products that is completely professional in appearance, depth of inquiry, technical detail, and excellence of narrative, tabulations, and graphical presentation.

IX. **Suggested Text:** Students will use a variety of reference material, codes and regulations that are applicable to the project of the year.

http://www.acm.org/. The world's largest educational and scientific computing society, delivers resources that advance computing as a science and a profession. ACM provides the computing field's premier Digital Library and serves its members and the computing profession with leading-edge publications, conferences, and career resources.

X. Bibliography and Resources

Students will use a variety of reference material that is applicable to their projects.

http://www.ieee.org/portal/site
Homepage of the Institute of Electronic and Computer systems Engineers. It includes information on certification, publications, codes, standards and membership information.

http://www.theiet.org
Institution of Engineering and Technology website provides information on publications, news and an online interactive journal, The Computer Forum.

http://www.spie.org
Society of Photo-Optical Instrumentation Engineers website includes society news and information as well as an e-newsletter, OE Reports.

http://www.computer.org/
Online catalog of the Computer Society of IEEE. The site describes publications related to software engineering and information technology.

http://www.intute.ac.uk/sciences/computing/
Science, Engineering and Technology-Computing Gateway of engineering materials which can be searched or used as a directory. Each website is carefully selected with summaries and very few broken links.

http://sunsite.berkeley.edu/NCSTRL/
Networked Computer Science Technical Reference Library "NCSTRL is an international collection of computer science technical reports from CS departments and industrial and government research laboratories, made available for non-commercial and educational use."

http://www.netlib.org/

The Netlib repository contains freely available software, documents, and databases of interest to the numerical, scientific computing, and other communities. The repository is maintained by AT&T Bell Laboratories, the University of Tennessee and Oak Ridge National Laboratory, and by colleagues world-wide.

http://www.csse.monash.edu.au/mirrors/bibliography/
Collection of Computer Science Bibliographies currently contains 1.4 million references (mostly journal articles, conference papers and technical reports), clustered in about 1400 bibliographies.

http://www.library.cmu.edu/Research/EngineeringAndSciences/CS+ECE/subjects.html
Carnegie Mellon University Library contains an alphabetical list of websites about all aspects of Computer Engineering.

http://www.computer.org/portal/site/seportal/
Software Engineering Online website from IEEE Computer Society is a source of practical software engineering knowledge.

XI. Relationship of Course to Program Outcomes

This course relates to the following Program Outcomes:

a. an ability to apply knowledge of mathematics, science and engineering

b. an ability to design and conduct experiments, as well as to analyze and interpret data

c. an ability 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. an ability to function on multi-disciplinary teams

e. an ability to identify, formulate and solve engineering problems

f. an understanding of professional and ethical responsibility

g. an ability to communicate effectively

h. the broad education necessary to understand the impact of engineering solutions in a global, economic and societal context

i. a recognition of the need for, and an ability to engage in life-long learning

j. a knowledge of contemporary issues

k. an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.