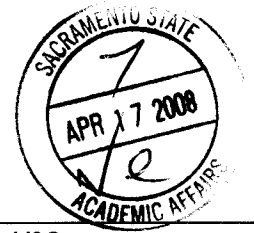




SACRAMENTO
STATE

Course Change Proposal Form A



Academic Group (College): ECS	Academic Organization (Department): EEE	Date: 2/14/08
Type of Course Proposal: New <input checked="" type="checkbox"/> Change <input type="checkbox"/> Deletion <input type="checkbox"/>	Department Chair: Suresh Vadhva	Submitted by: Dennis Dahlquist
Does this course fulfill a requirement for single-subject or multiple subject credential students? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	For Catalog Copy: Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> CCE (Extension): Yes <input type="checkbox"/> No <input type="checkbox"/>	Semester Effective: Fall <input type="checkbox"/> Spring <input checked="" type="checkbox"/> , 2009

This course replaces experimental course Subject Area (prefix) and Catalog Nbr (course number):

Change from:

Subject Area (prefix) & Catalog Nbr (course no.):	Title:	Units:
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Change to:

Subject Area (prefix) & Catalog Nbr (course no.): EEE 124	Title: Embedded Systems Fundamentals	Units: 3
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JUSTIFICATION:

This course is in a series of courses in an elective biomedical engineering (BME) sequence. This course focuses on embedded systems in biomedical applications. The biomedical field is a growing area as is the use of embedded systems; this course will provide a useful option for our students.

NEW COURSE DESCRIPTION: (Not to exceed 80 words, and language should conform to catalog copy. See

<http://www.csus.edu/acaf/univmanual/crsppl.htm> - Guidelines for Catalog Course Description

Introduction to embedded systems hardware and firmware design as applied to biomedical instrumentation, with hands-on exercises. The emphasis of the course is on embedded biomedical systems, but that process is very similar for other applications. Use of Integrated Development Environment (IDE) application development and debugging. Embedded systems and the design process in biomedical applications, engineering and embedded systems ethics, software architecture, and C language refresher. Lecture two hours; laboratory three hours. **Prerequisite:** EEE 174, EEE 122. 3 units.

Note:

Prerequisite: EEE 174, EEE 122

Enforced at Registration: Yes No

Corequisite:

Enforced at Registration: Yes No

CAN (California Articulation Number):

Graded: Letter Credit/No Credit **Instructor Approval Required?** Yes No

Course Classification (e.g., lecture, lab, seminar, discussion):
C4/16 **Title for CMS (not more than 30 characters):**
Embedded Systems Fundamentals

Cross Listed? Yes No **If yes, do they meet together and fulfill the same requirement, and what is the other course.**

How Many Times Can This Course be Taken for Credit? 1

Can the course be taken for Credit more than once during the same term? Yes No

FOR NEW COURSE PROPOSALS OR SUBSTANTIVE CHANGES ONLY:

Description of the Expected Learning Outcomes: Describe outcomes using the following format: "Students will be able to: 1), 2), etc."
See the example at <http://www.csus.edu/acaf/example.htm>

Upon completion of this course the student will be able to:

1. Confidently engage in the process of embedded system design for an application.
2. Engage in best-practice design and understand the engineering tools commonly employed in the embedded systems design process.
3. Carry out necessary embedded systems design, development, and testing.
4. Document the design process and testing process.
5. Avoid common mistakes and pitfalls in the process of product development.

****Attach a list of the required/recommended course readings and activities [Note: it is understood that these are updated and modified as needed by the instructor(s).] This attachment should be forwarded only to your Dean's office, not Academic Affairs.**

Assessment Strategies: A description of the assessment strategies (e.g., portfolios, examinations, performances, pre-and post-tests, conferences with students, student papers) which will be used by the instructor to determine the extent to which students have achieved the learning outcomes noted above:

Homework assignments with problems incorporating practical design requirements and realistic constraints.

Exams

Project reports

For whom is this course being developed?

Majors in the Dept Majors of other Depts ___ Minors in the Dept ___ General Education ___ Other ___

Is this course required in a degree program (major, minor, graduate degree, certificate)? Yes ___ No

If yes, identify program(s):

Does the proposed change or addition cause a significant increase in the use of College or University resources (lab room, computer facilities, faculty, etc.)? Yes ___ No

If yes, attach a description of resources needed and verify that resources are available.

Laboratory resources are already in place within the EEE department

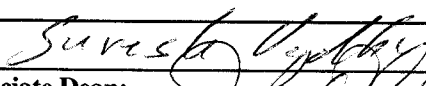
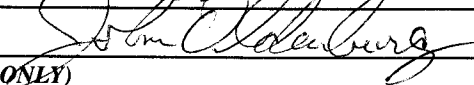
Indicate which department or programs will be affected by the proposed course (if any). None

The Department Chair's signature below indicates that affected programs have been sent a copy of this proposal form.

Approvals: If proposed change, new course or deletion is approved, sign and date below. If not approved, forward without signing to the next reviewing authority, and attach an explanatory memorandum to the original copy.

Signatures:

Date

Department Chair:		3/27/2008
College Dean or Associate Dean:		4/16/08
CPSP (for school personnel courses <i>ONLY</i>)		
Associate Vice President and Dean for Academic Programs		

Distribution: Academic Affairs (original), Department Chair and College Dean. Dean's office to send original after approval to Academic Affairs, at mail zip 6016. An electronic copy must also be sent.

EEE 124 Embedded Systems Fundamentals

EEE Elective

2008 – 2010 Catalog Data: **EEE 124. Embedded Systems Fundamentals.** Introduction to embedded systems hardware and firmware design as applied to biomedical instrumentation, with hands-on exercises. The emphasis of the course is on embedded biomedical systems, but that process is very similar for other applications. Use of Integrated Development Environment (IDE) application development and debugging. Embedded systems and the design process in biomedical applications, engineering and embedded systems ethics, software architecture, and C language refresher. Lecture two hours; laboratory three hours. **Prerequisite:** EEE 174, EEE 122. 3 units.

Text: *An Embedded Software Primer*, David E. Simon, Addison-Wesley, 1999.
If I Only Changed the Software, Why is the Phone on Fire?, Lisa Simone, Newnes, 2007.

Course Goals:

1. To build upon the fundamental electrical engineering analysis and design backgrounds provided by the EEE core and BME elective courses and provide the student with practical engineering knowledge about the process of embedded system design.
2. To provide the student with “real-world” examples of the design process and experience in developing the design and testing for new medical devices.

Prerequisites by Topic:

1. General knowledge of a structured programming language (e.g., C++, Assembly Language, MATLAB).
2. Basic understanding of biomedical instrumentation design.

Topics Covered/Course Outline/Evaluation:

Topics by Week

1. Introduction to embedded systems
2. Embedded systems and the design process in biomedical applications
3. Hardware fundamentals
4. Medical device hardware components
5. C language refresher
6. Embedded software development tools
7. Software signal processing
8. Hardware/firmware partitioning
9. Testing and debugging techniques
10. Controlling and accessing hardware (digital I/O, analog-to-digital conversion)
11. Design performance considerations critical for embedded systems
12. Engineering, biomedical, and embedded systems ethics
13. Medical prototyping and testing

Topics will be illustrated using examples from medical device designs were possible.

Lab Topics

1. Analog sensor conditioning cCircuits for medical applications
2. Power supply: programmable lithium and nickel battery charger
3. Biomedical analog to digital conversion
4. Using digital potentiometers to design low pass adjustable filters for medical applications
5. Sensing light with a programmable gain amplifier
6. Biomedical analog sensor conditioning circuits
7. Biomedical DSP implementation
8. Optical heart rate monitor
9. Biomedical design project

Lab Topics will also allow students to choose some lab topics based on the student's interest.

Evaluation

One to Two Mid-term Exams and one Final Exam – 100 pts. each

(Note: Examinations will be "open book" questions related to text readings, homework, and examples presented in class.)

Design Project Report – 50 pts.

Graded homework assignments labs -- 50 pts.

(Note: Specific due dates for homework will be established. No late homework will be accepted.)

Science and Design Content Distribution

Design – 3 units or 100%

Contribution of Course to the Professional Education Component:

1. Homework and lab assignments include practical device design problems with realistic constraints.
2. Examples introduce students to the use of major professional engineering software tools in the design process.

Relationship of Course to Program Outcomes:

1. 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. This is the major focus of the course.
2. e. An ability to identify, formulate, and solve engineering problems. This course includes actual design examples and problem solving using realistic constraints.
3. k. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice. This course gives the students the ability to use industry-standard software to engage in medical device design and development.

Course Coordinator: Dennis Dahlquist, EEE

Date: February 14, 2008