SACRAMENTO STATE

Course Change Proposal
Form A

Academic Group (*College*): ECS	Academic Organization (*Department*): EEE	Date: 02/14/2008
Type of Course Proposal: New _x__ Change ___ Deletion ___	Department Chair: Suresh Vadhva	Submitted by: Russ Tatro
Does this course fulfill a requirement for single-subject or multiple subject credential students? Yes ___ No _x__	For Catalog Copy: Yes _x__ No ___ CCE (*Extension*): Yes ___ No ___	Semester Effective: Fall _x__ Spring ___, 2008

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

Change from:

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

Change to:

Subject Area (*prefix*) & Catalog Nbr (*course no.*):	Title:	Units:
EEE 120	Electronic Instrumentation	4

JUSTIFICATION:

This course is the first course in an elective sequence on instrumentation design with emphasis on biomedical instrumentation. This course will prepare students for further work in electronic design, industrial control, instrumentation, and biomedical applications.

NEW COURSE DESCRIPTION: (Not to exceed 80 words, and language should conform to catalog copy. See http://www.csus.edu/acaf/univmanual/crspsl.htm - Guidelines for Catalog Course Description

Fundamental principles of sensors and instrumentation systems, together with their electrical implementation, such as biasing and signal conditioning circuits. Temperature, force, pressure, and mechanical sensors. Optical sensors, including a brief introduction to light sources and detectors. Applications to biomedical engineering and industrial control. Lecture three hours; laboratory three hours. Prerequisite: EEE 108, EEE117; EEE 108 may be taken concurrently. 4 units.

Note:

Prerequisite: EEE 108, EEE 117; EEE 108 may be taken concurrently.
Enforced at Registration: Yes___ No_x__

Corequisite:
Enforced at Registration: Yes___ No___

CAN (California Articulation Number):

Graded: Letter __x___ Credit/No Credit____	Instructor Approval Required? Yes___ No_x__
Course Classification (*e.g., lecture, lab, seminar, discussion*): C4/16	Title for CMS (not more than 30 characters) Electronic Instrumentation
Cross Listed? Yes ___ No__x__	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:

<u>Description of the Expected Learning Outcomes</u>: 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. Analyze circuits with very small sensor outputs.
2. Design sensor signal conditioning and amplification circuits.
3. Acquire knowledge of various sensors types and their application to biomedical and industrial control fields.
4. Apply biometric sensors to typical applications.

**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.

<u>Assessment Strategies</u>: 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:

Midterm exams and a comprehensive final exam.
Multiple formal laboratory reports.

<u>For whom is this course being developed</u>?
Majors in the Dept _x__ 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 _x__
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 __x__
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). <u>None</u>

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:	Suresh Vadhva	3/27/2008
College Dean or Associate Dean:	John Holenberg	4/16/08
CPSP *(for school personnel courses ONLY)*		
Associate Vice President and Dean for Academic Programs	CONDITIONAL APPROVAL 4/18/2008	

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 120 Electronic Instrumentation

EEE Elective

2008 – 2010 Catalog Data: EEE 120. Electronic Instrumentation. Fundamental principles of sensors and instrumentation systems, together with their electrical implementation, such as biasing and signal processing circuits. Temperature, force, pressure, and mechanical sensors. Optical sensors, including a brief introduction to light sources and detectors. Applications to biomedical engineering and industrial control. Lecture three hours; laboratory three hours. Prerequisite: EEE 108, EEE117; EEE 108 may be taken concurrently. 4 units.

Text: *Process Control Instrumentation Technology*, Curtis Johnson. 6th Edition, 2000, Prentice Hall, ISBN: 0-13-938200-3
Bioinstrumentation, John Webster, 2004, Wiley & Sons, ISBN: 0-471-26327-3

Course Goals:

1. To build upon the fundamental electrical engineering analysis and design backgrounds provided by the EEE Core and elective courses.
2. Provide the student with practical engineering knowledge about sensors and instrumentation as applied to biomedical and industrial control.
3. To provide the student with hands-on testing and use of various sensors and signal conditioning circuits.

Prerequisites by Topic:

1. Understanding of network analysis including both time and frequency domain techniques.
2. Knowledge and proper use of standard test and measurement equipment.

Topics Covered/Course Outline/Evaluation:

Week	Lecture Topics	Laboratory Experiment
1	Measurement Systems – Instrumentation overview	Introduction and Lab Safety
2	Errors in measurement, Statistics	Bridge Circuits
3	Analog Signal Conditioning – Principles	Opamps
4	Operational amplifiers and Opamp instrumentation	Instrumentation Opamps
5	Digital Signal Conditioning - Fundamentals	Current to Voltage Converter
6	Converters, Comparators, DAC, ADC	Voltage to Current Converter
7	Thermal Sensors	Analog-to-Digital Converter
8	Midterm	Digital-to-Analog Converter
9	Thermistors, and other Thermal Sensors	Thermistors
10	Mechanical Sensors	Stress/Strain Sensor
11	Heart and Circulation – Electrical Characterization	Motion Sensors
12	Blood Flow, Pressure and Vessel parameters	Electrocardiogram
13	Optical Sources and Detectors	Intro to Lasers, LEDs and Photodetectors
14	Optical Biosensors	Pulse Oximeter
15	Review	Wrapup – last report
16	Final Exam	

Evaluation:

One mid-term exam and one final exam – 70%.
Laboratory reports – 30%.

Science and Design Content Distribution:

Design – 4 units or 100%

Contribution of Course to the Professional Education Component:

1. Examples introduce students to the use of sensors and instrumentation in the acquisition of data.
2. Laboratory experiments include practical device use and testing.

Relationship of Course to Program Outcomes:

1. (b) An ability to design and conduct experiments, as well as to analyze and interpret data.
2. (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.
3. (g) An ability to communicate effectively.
4. (k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Course Coordinator: **Russ Tatro** Date: **February 14, 2008**