



UNIVERSITY OF KENTUCKY

FEB 16 2004

TRANSMITTAL

DATE: February 11, 2004

TO: Rebecca Scott
Senate Council

FROM: Lissa Holland 
Graduate Council

The Graduate School
351 Patterson Office Tower
Lexington, KY 40506-0027
(859) 257-4613
Fax: (859) 323-1928
www.rgs.uky.edu/gsl

The Graduate Council met on December 11, 2003 and approved the following:

COLLEGE OF ENGINEERING

Electrical Engineering

EE 664 Multidisciplinary Sensors Laboratory (3 credits)

To be cross-listed as CHE/CME/MSE 664. A multidisciplinary laboratory course with laboratory experiences in areas related to sensors and sensing architectures, typically including chemistry, chemical and materials engineering, and electrical engineering.

Lecture: 1 hour, Lab: 2 hours.

Prerequisites: One year of college chemistry, calculus, and physics. GS 660 (Multidisciplinary Sensing Technologies) or by consent of instructor.

Signatures of Approval:

Don E. Ham
Department Chair

11/26/02
Date

Dean of the College

Date

Date of Notice to the Faculty

*Undergraduate Council

Date

*University Studies

Date

*Graduate Council

Date

*Academic Council for the Medical Center

Date

*Senate Council (Chair)

Date of Notice to University Senate

*If applicable, as provided by the Rules of the University Senate

ACTION OTHER THAN APPROVAL

Signatures of Approval:

Boyd E. Haley (CHEMISTRY)
 Department Chair

David Lepp (A+S)

11-18-02

Date

11/20/02

Date

Date of Notice to the Faculty

*Undergraduate Council

Date

*University Studies

Date

Jammin Blackwell

*Graduate Council

12/15/03

Date

*Academic Council for the Medical Center

Date

*Senate Council (Chair)

Date of Notice to University Senate

*If applicable, as provided by the Rules of the University Senate

ACTION OTHER THAN APPROVAL

Signatures of Approval:


 Department Chair

 Dean of the College

3/3/03
 Date
 10/6/03
 Date

Date of Notice to the Faculty

*Undergraduate Council

Date

*University Studies

Date

*Graduate Council

Date

*Academic Council for the Medical Center

Date

*Senate Council (Chair)

Date of Notice to University Senate

*If applicable, as provided by the Rules of the University Senate

ACTION OTHER THAN APPROVAL

APPLICATION FOR NEW COURSE

1. Submitted by College of Engineering, Arts & Sciences Date October 8, 2002

Department/Division offering course Elec. and Comp. Eng., Chem. and Materials Eng., Chemistry

2. Proposed designation and Bulletin description of this course

a. Prefix and Number EE 664 b. Title* Multidisciplinary Sensors Laboratory

*NOTE: If the title is longer than 24 characters (including spaces), write
A sensible title (not exceeding 24 characters) for use on transcripts Multidis Sensors Lab

c. Lecture/Discussion hours per week 1 d. Laboratory hours per week 2

e. Studio hours per week 0 f. Credits 3

g. Course description

A multidisciplinary laboratory course with laboratory experiences in areas related to sensors and sensing architectures, typically including chem, chem/mat Eng, & ECE

h. Prerequisites (if any)

One year of college chemistry, calculus, & physics. GS 660 (Multidisciplinary Sensing Technologies) or by consent of instructor.

i. May be repeated to a maximum of _____ (if applicable)

4. To be cross-listed as CHE/CME/MSE 664 see attached sheets
Prefix and Number Signature, Chairman, cross-listing department

5. Effective Date Spring 2003 (semester and year)

6. Course to be offered Fall Spring Summer

7. Will the course be offered each year? Yes No
(Explain if not annually)

The course will be offered every other year as there are sufficient interested students.

8. Why is this course needed?

To introduce graduate students from various departments to lab facilities and fabrication techniques available for sensors research

9. a. By whom will the course be taught? Dr. Janet Lumpp, Electrical and Computer Engineering

b. Are facilities for teaching the course now available? Yes No
If not, what plans have been made for providing them?

10. What enrollment may be reasonably anticipated? 8

11. Will this course serve students in the Department primarily? Yes No

Will it be of service to a significant number of students outside the Department?
If so, explain. Yes No

This is an interdisciplinary course that will benefit students in all three
departments.

Will the course serve as a University Studies Program course? Yes No

If yes, under what Area? _____

12. Check the category most applicable to this course

traditional; offered in corresponding departments elsewhere;

relatively new, now being widely established

not yet to be found in many (or any) other universities

13. Is this course part of a proposed new program:
If yes, which? Yes No

14. Will adding this course change the degree requirements in one or more programs?*

If yes, explain the change(s) below

Yes No

15. Attach a list of the major teaching objectives of the proposed course and outline and/or reference list to be used.

16. If the course is a 100-200 level course, please submit evidence (e.g., correspondence) that the Community College System has been consulted.

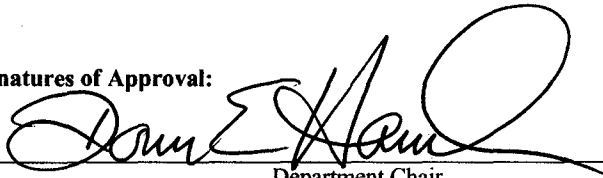
17. Within the Department, who should be contacted for further information about the proposed course?

Name Janet K. Lump

Phone Extension 7-4985

*NOTE: Approval of this course will constitute approval of the program change unless other program modifications are proposed.

Signatures of Approval:



Department Chair

11/26/02

Date

Dean of the College

Date

Date of Notice to the Faculty

*Undergraduate Council

Date

*University Studies

Date

*Graduate Council

Date

*Academic Council for the Medical Center

Date

*Senate Council (Chair)

Date of Notice to University Senate

*If applicable, as provided by the Rules of the University Senate

ACTION OTHER THAN APPROVAL

Signatures of Approval:

Bryce Haley (CHEMISTRY)
Department Chair

11-18-02

David Lee (A+S)
Dean of the College

11/20/02

Date of Notice to the Faculty

*Undergraduate Council

Date

*University Studies

Date

*Graduate Council

Date

*Academic Council for the Medical Center

Date


*Senate Council (Chair)

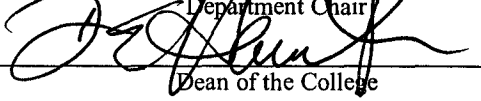
Date of Notice to University Senate

*If applicable, as provided by the Rules of the University Senate

ACTION OTHER THAN APPROVAL

Signatures of Approval:



 *Department Chair


 Dean of the College

3/3/03

 Date
 10/6/03

 Date

_____ Date of Notice to the Faculty

_____ *Undergraduate Council

_____ Date

_____ *University Studies

_____ Date

_____ *Graduate Council

_____ Date

_____ *Academic Council for the Medical Center

_____ Date

_____ *Senate Council (Chair)

_____ Date of Notice to University Senate

*If applicable, as provided by the Rules of the University Senate

_____ ACTION OTHER THAN APPROVAL

EE/CHE/CME/MSE 664 Multidisciplinary Sensors Laboratory

Instructor: Dr. Janet K. Lumpp, Electrical Engineering Dept.
697 F. Paul Anderson Tower
257-4985
ijklumpp@engr.uky.edu

Textbooks:

Fundamentals of Microfabrication, Marc Madou, CRC Press, 1997.
Handbook of Modern Sensors: Physics, Designs and Applications, Second Edition,
Jacob Fraden, AIP Press, 1996.

Course Description:

A multidisciplinary course with laboratory experiences in areas related to sensors and sensing architectures, typically including chemistry, chemical and materials engineering, and electrical engineering.

Objectives

1. To overview various sensing methods and fabrication techniques.
2. To provide an interdisciplinary team environment to work on a sensor design project.

Outcomes

1. Describe various process steps used to fabricate sensor devices.
2. Compare and contrast sensor performance characteristics.
3. Work on a multidisciplinary team to design, fabricate and test a prototype sensor and document the results.

Organization

- Introductory lectures from each discipline, Chemistry, Electrical Engineering, Chemical & Materials Engineering
- Interdisciplinary groups of 2-3 students
- Laboratory lessons and demonstrations
- Design and fabrication of a prototype sensor device

Grading

- 10% Class participation
- 30% Project proposal
- 30% Final presentation
- 30% Final report

Letter grades

Letter grades will be assigned as follows: 90-100% = A, 80-89% = B, 70-79% = C, 60-69% = D, <60% = E.

Course Emphasis

Structures

- Laser machined microchannels
- Laser machined microvials
- Laser machined nanovials
- Screen printed electrodes and circuit interconnects
- Screen printed sensor films
- Cast membranes
- Deposited and patterned thin films
- Deposited and patterned magnetic foils
- Media for biochemical sensors
- Immobilization of enzymes - site directed, patterned

Measurement Methods

- Electrical – direct measurement of current, voltage, resistance
- Optical – bioluminescence, fluorescence, absorption
- Magnetic – resonance shift
- Temperature
- pH
- Discrimination - identification of stimulants and analytes
- Concentration of stimulants and analytes

Design and Build Prototype Devices

- Choose a sensor and target analytes
- Choose a structure type
- Design structure and fabricate
- Design measurement method
- Calibration
- Test
- Considerations
 - Single element vs. array of elements
 - Array of identical elements (homogeneous) vs. heterogeneous array
 - Single use vs. reusable, how to clear and reset detector before next measurement
 - Sampling and delivery of sample to sensor element(s)
 - Overlapping response to multiple stimuli, temperature, pH, humidity
 - Converting raw data to displayed data
 - User interface
 - Reliability
 - Accuracy
 - Sensitivity
 - Range
 - Lifetime, shelf life, storage conditions
 - Packaging

Team Project

Interdisciplinary teams will be organized to develop prototype sensor devices. Teams are not in competition with each other. Collaboration, consultation, and cross-training are encouraged. Each team will select a project topic and prepare a proposal, final report and oral presentation defining the type of sensor, applications, transduction method, fabrication technologies, testing methods, and plans for scaling up the device. The format of the final report will be that of a journal paper.