

APPROVED



University of Kentucky

Office of the Chair
University Senate Council
10 Administration Building
University of Kentucky
Lexington, Kentucky 40506-0032
(859) 257-5872; FAX (859) 323-1062
Senate Website: <http://www.uky.edu/USC/>

3 July 2000

TO: Members, University Senate

FROM: University Senate Council

RE: Course/Program Actions: Effective Date: Fall Semester, 2000,
UNLESS OTHERWISE NOTED.

The Senate Council circulates for your approval the following curricular actions. Objections will be accepted from University Senators and faculty members on or before August 25, 2000. All other requirements for the courses or programs as approved below must be met.

GRADUATE COUNCIL

Proposal for the establishment of a multidisciplinary seminar course and a Graduate Certificate in Sensing Technologies

The Graduate Council approved the request from the Integrated Graduate Education and Research Training (IGERT) program, for a new multidisciplinary graduate level certificate in Sensing Technologies to be established by the Departments of Chemistry, Chemical and Materials Engineering, Electrical Engineering, and the College of Pharmacy. To accomplish this, the IGERT will need to establish a new multidisciplinary seminar course. Below find the new course. [A copy of the proposal to establish a Certificate Program in Sensing Technologies is attached.]

THE GRADUATE SCHOOL

New Course

GS 660 Multidisciplinary Sensing Technology Seminar (1)
A multidisciplinary seminar in Sensors and Sensing Architectures.
Prereq: Graduate status.

7437C

Proposal to Establish a Certificate Program in Sensing Technologies

Objective: Enhance graduate education through a cross-disciplinary curriculum in Sensors and Sensing Architectures. As the field of sensing development is an inherently multidisciplinary endeavor, the program will yield scientists and engineers with the ability to transcend traditional boundaries in their professional careers. The success of such students would also serve to increase the prestige of the departments and research ongoing at the University.

Qualifications: M.S. and Ph.D. students at the University of Kentucky.

Requirements:

1. A total of 12 credit hours.
2. 3-4 credit hours of a multidisciplinary seminar (GS 660). This will be offered every semester as a 1-credit hour course. Up to 1 credit hour may be replaced by a Professional Ethics course.
3. A sensors-related course from outside the student's home department (2-3 credit hours).
 - Bioanalytical Sensors (Chemistry) (currently taught as CHE 580)
 - Molecular Design (Chemistry) (currently taught as CHE 580)
 - Biochemical Engineering (Chemical & Materials Engineering) (CME 680)
 - Membrane Science and Technology (Chemical & Materials Engineering) (currently taught as CME 599)
 - Microsensors and Microelectromechanical Systems (Electrical Engineering)
 - Sensors and Sensing Technology (Electrical Engineering) (currently taught as EE 599)
 - Chemometrics and Parallel Instrumentation (Pharmacy)
 - Home Testing Kits (Pharmacy) (currently taught as PHR 895)
 - Multidisciplinary Sensors Laboratory (currently taught as EGR 599)
4. 6 credit hours from courses selected from a list of approved courses that include those mentioned above. These could be courses from the student's home department. These courses relate to topics that are important to sensors and sensing technologies. Specifically, they deal with detection/analysis principles (optical, electrochemical, electromagnetic, etc.), sensor materials (polymers, ceramics, semiconductors, etc.), signal processing, (bio)molecular recognition/separations, and electronics (including packaging of electronic components). Several of these courses are taught by the participating faculty.

- Chemical Instrumentation (Chemistry) (CHE 524)
- Chemical Separations (Chemistry) (CHE 526)
- Biological Chemistry (Chemistry) (currently taught as CHE 580)
- Electrochemical Methods of Analysis (Chemistry) (CHE 620)
- Optical Methods of Analysis (Chemistry) (CHE 625)
- Advanced Analytical Chemistry (Chemistry) (CHE 626)
- Chemical and Physical Processing of Polymer Systems (Chemical & Materials Engineering) (CME 554)
- Principles of Polymer Characterization and Analysis (Chemical & Materials Engineering) (CME 558)
- Bioseparations (Chemical & Materials Engineering) (currently taught as CME 599)
- Signals and Systems I (Electrical Engineering) (EE 421G)
- Signals and Systems II (Electrical Engineering) (EE 422G)
- Introduction to Electronics (Electrical Engineering) (EE 461G)
- Semiconductor Device Design (Electrical Engineering) (EE 560)
- Electric and Magnetic Properties of Materials (Electrical Engineering) (EE 561)
- Hybrid Microelectronics (Electrical Engineering) (EE566)
- Introduction to Lasers and Masers (Electrical Engineering) (EE 567)
- Fiber Optics (Electrical Engineering) (EE 568)
- Electronic Packaging Systems and Manufacturing Processes (Electrical Engineering) (EE 569)
- Modern Methods in Pharmaceutical Analysis (Pharmacy) (PHR 510)

List of Faculty Participants

Kimberly W. Anderson (*Chemical and Materials Engineering*)

Leonidas G. Bachas (*Chemistry*)

Dibakar Bhattacharyya (*Chemical and Materials Engineering*)

Arthur Cammers-Goodwin (*Chemistry*)

Sylvia Daunert (*Chemistry/Pharmacy*)

Craig Grimes (*Electrical Engineering*)

Robert A. Lodder (*Chemistry/Pharmacy*)

Janet K. Lumpp (*Electrical Engineering*)

Memorandum

To: Dean Michael T. Nietzel

From: Dr. Leonidas G. Baches (PI -IGERT Program)

L. Baches

Date: 4/25/00

Subject: Establishment of a Multidisciplinary Seminar Course and a Graduate Certificate
in Sensing Technologies

The Integrated Graduate Education and Research Training (IGERT) Program, a multi-disciplinary program in the Departments of Chemistry, Chemical & Materials Engineering, Electrical Engineering, and the College of Pharmacy, would like to establish a new cross-disciplinary graduate level Certificate in Sensing Technologies. To accomplish this, we will need to establish a new multidisciplinary seminar course. Below are proposals for establishing the course and the certificate. The proposals were formulated through discussion among the IGERT faculty; their implementations were also recommended by the IGERT Advisory Board. Please let me know if you need any additional information.

RECEIVED

APR 25 2000

APPLICATION FOR NEW COURSE

1. Submitted by College of Graduate School Date April 24, 2000

Department/Division offering course N/A

2. Proposed designation and Bulletin description of this course Multi-disciplinary Sensing Technology Seminar

a. Prefix and Number GS660 b. Title* Technology Seminar
*NOTE: If the title is longer than 24 characters (including spaces), write
A sensible title (not exceeding 24 characters) for use on transcripts Sensing Technol. Seminar

c. Lecture/Discussion hours per week 1 d. Laboratory hours per week 0

e. Studio hours per week 0 f. Credits 1

g. Course description
A Multi-disciplinary Seminar in Sensors and Sensing Architectures

h. Prerequisites (if any)
Graduate Status

i. May be repeated to a maximum of N/A (INDEFINITELY) (if applicable)

4. To be cross-listed as:
N/A Prefix and Number Signature, Chairman, cross-listing department

5. Effective Date Summer 2000 (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)

8. Why is this course needed?
Enhance graduate education through a cross-disciplinary seminar in Sensing Technologies. Will help institutionalize UK's investment in the IGERT program.

9. a. By whom will the course be taught? Dr. Leonidas G. Bachas

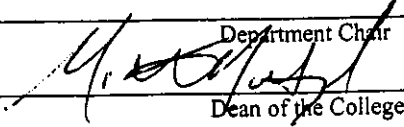
b. Are facilities for teaching the course now available? Yes No
If not, what plans have been made for providing them?

10. What enrollment may be reasonably anticipated? 15-20
11. Will this course serve students in the Department primarily? This is a GS course Yes No
 Will it be of service to a significant number of students outside the Department? Yes No
 If so, explain.
This seminar class is a multidisciplinary course open to all students at the
University.
- 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: Yes No
 If yes, which?
Graduate Certificate in Sensing Technologies
14. Will adding this course change the degree requirements in one or more programs?* Yes No
 If yes, explain the change(s) below

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 Leonidas G. Bachas Phone Extension 257-6350

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

Signatures of Approval:



Department Chair

Dean of the College

Date
4/26/00

Date

*Undergraduate Council

Date of Notice to the Faculty

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

Multidisciplinary Sensing Technologies Seminar GS 660

Course Coordinator: Leonidas G. Bachas

- **Teaching Objectives**

Seminar presentations and discussion of issues related to the multidisciplinary field of sensors and sensing architectures. Attention will be given to the integration of concepts from the different disciplines in Science and Engineering that contribute to advances in sensing technologies.

- **Grading**

The grade in the course will be determined by the seminar reports, which should be completed on a word processor and be 1-2 pages in length. The reports should summarize the seminar, and should speculate on how the information presented may be of value to the student's own research or impact the field of sensor development/sensor science. Reports will be due one week after the seminar is given. Active participation and reading of background material will be required. Course grade will be based on the quality of the reports and on class participation.

- **Syllabus**

This multidisciplinary seminar has been offered as part of our Integrated Graduate Education and Research Training (IGERT) program. The IGERT seminar list for the last 2 years has been attached.

Attendance → mandatory (please specify).

grading standards.

Fall '98
Seminar Schedule

Sept. 17 Dr. James Tour, University of South Carolina

"Molecular Scale Electronics"

Sept. 23 Stephen Ritchie (IGERT Student)

"Modeling of Polyelectrolyte-Metal Ion Interaction in the Bound Phase and Experimental Results"

Oct. 1 Dr. Bill McKeachie, University of Michigan

"Changes in Teaching Strategies, Attitudes, and Priorities"

Oct. 7 R. Daniel Johnson (IGERT Student)

"Molecular Astericks as Recognition Elements in Ion-Selective Electrodes"

Oct. 13 Dr. Eva Sevick, Purdue University

"Fluorescence Lifetime Imaging and Biodiagnostic Spectroscopy Using Measurements of Photon Migration"

Oct. 21 Jennifer Lewis (IGERT Student)

"Sensing Strategies with a pH-Sensitive Green Fluorescent Protein"

Oct. 26 Dr. Robert Dunn, University of Kansas

"Submicron Structure and Dynamics of Thin Lipid Films"

Nov. 4 Charlie Symons (IGERT Student)

"A Near-IR Near Field Scanning Optical Microscope"

Nov. 11 Dr. Julius Rebek, Jr., Scripps Research Institute

"Molecular Assembly and Encapsulation"

Nov. 20 Dr. Dave Walt, Tufts University

"Optical Sensor Arrays, Microarrays and Nanoarrays"

Dec. 8 Dr. Chong Ahn, University of Cincinnati

"Microelectronic Sensors & MEMS"

Spring '99
Seminar Schedule

Jan. 15 Dr. Francois Diederich, ETH-Zentrum

"The Covalent Chemistry of Fullerenes"

Jan. 20 Dr. Leonidas G. Bachas (IGERT Program Director)

Organizational Meeting for IGERT Students

Jan. 25 Dr. John Sundeen, University of Cincinnati

"Structural Development & Resistive Sensor Properties of Solution Derived Ni-ZrO₂ Film"

Feb. 4 Phillip Douglass (IGERT Student)

"Biosensing Systems: An Approach to Drug Discovery and Detection"

Feb. 15 Anne Grosvenor (IGERT Student)

"Detection of Biomolecules in Picoliter Volume Vials"

Feb. 26 Dr. Richard M. Crooks, Texas A&M University

"Chemical Sensors & Interfacial Design"

March 8 Peter Willis (IGERT Student)

"Research Presentation"

March 31 Dr. Ashok Mulchandani, University of California at Riverside

"Biosensors for Environmental Monitoring"

April 16

Naff Symposium Lectures. For more information visit the Naff Symposium site

April 19 Agatha Feltus (IGERT Student)

"Development of a Fluorescence Sensing System for cAMP Based on the cAMP Receptor Protein"

April 26 Chris Ball (IGERT Student)

"Electrochemical Nanovial Fabricated by Screen Printing and Excimer Laser Machining"

Fall '99
Seminar Schedule

Sept. 9 Dr. Bill Heineman, University of Cincinnati

"Analytical Chemistry in the New Millennium"

Sept. 23 Dr. Leonidas Bachas, University of Kentucky

"IGERT Students Orientation"

Sept. 30 Keith Loiselle (IGERT Student)

"Student Research Presentation"

Oct. 14 Dr. Richard Zare, Stanford University

"Breaking Up Is Never Easy: A Twisted Tale of a Photofragment's Escape from the Bonds of Molecular Matrimony"

Oct. 21 Donald Owens (IGERT Student)

"Student Research Presentation"

Oct. 28 Jamie Hestekin (IGERT Student)

"Mechanisms of Metal Sorption on Polyamino Acid Functionalized Membranes"

Nov. 11 Dr. Lumpp & IGERT Students

"Student Research Presentation"

Nov. 18 Dr. Lumpp & IGERT Students

"Student Research Presentation"

Dec. 3 Dr. Werner Kuhr, University of California at Riverside

"Chip-Level DNA Sequencing and Hybridization Assays with Integrated Electrochemical Detection"

Dec. 10 Dr. Bob Kennedy, University of Florida

"Detection of Insulin Secretion by Amperometry and Confocal Microscopy"

Spring '00
Seminar Schedule

Jan. 18 Dr. Leonidas G. Bachas (IGERT Program Director)

Organizational Meeting for IGERT Students

Feb. 1 Calvin Gregory (IGERT Student)

"Development of Competitive Binding Assays using Biomimetic Peptides"

Feb. 10 Phillip Douglass (IGERT Student)

"Fluorescence - Based Drug Detection on a Novel Microfluidic Platform"

Feb. 16 Dr. Adam Heller, University of Texas at Austin

"Monitoring the Glycemia of a Brittle Diabetic Chimpanzee with a Miniature Subcutaneously Implanted "Wired" Glucose Oxidase Electrode"

Feb. 22 Casey Mungle (IGERT Student)

"Magnetoelastic Transducers"

March 1 E.M. Logothetis, Ford Motor Company (Retired)

"Gas Sensors For Automotive Applications"

March 21 Dr. Tim McClintock, University of Kentucky

"Molecular Biotechnology and Odor Information Processing"

April 3 Dr. Craig Tuerk, Morehead State University

"Aptamers toward HIV Proteins"

April 5 Dr. L. Antonio Estevez, University of Puerto Rico

"Research on Supercritical Fluids"

April 19 Dr. Paul G. Tratnyek, Oregon Graduate Institute of Science and Technology

"Remediation of Organic Contaminants with Iron Metal: Surface Electrochemistry in a Complex Geochemical Environment"

April 28 Dr. Steve Weber, University of Pittsburgh

"Aspects of Selectivity in Molecular Recognition-based Analysis"

Proposal to Establish a Certificate Program in Sensing Technologies

Objective: Enhance graduate education through a cross-disciplinary curriculum in Sensors and Sensing Architectures. As the field of sensing development is an inherently multidisciplinary endeavor, the program will yield scientists and engineers with the ability to transcend traditional boundaries in their professional careers. The success of such students would also serve to increase the prestige of the departments and research ongoing at the University.

Qualifications: M.S. and Ph.D. students at the University of Kentucky.

Requirements:

1. A total of 12 credit hours.
2. 3-4 credit hours of a multidisciplinary seminar (GS 660). This will be offered every semester as a 1-credit hour course. Up to 1 credit hour may be replaced by a Professional Ethics course.
3. A sensors-related course from outside the student's home department (2-3 credit hours).
 - Bioanalytical Sensors (Chemistry) (currently taught as CHE 580)
 - Molecular Design (Chemistry) (currently taught as CHE 580)
 - Biochemical Engineering (Chemical & Materials Engineering) (CME 680)
 - Membrane Science and Technology (Chemical & Materials Engineering) (currently taught as CME 599)
 - Microsensors and Microelectromechanical Systems (Electrical Engineering)
 - Sensors and Sensing Technology (Electrical Engineering) (currently taught as EE 599)
 - Chemometrics and Parallel Instrumentation (Pharmacy)
 - Home Testing Kits (Pharmacy) (currently taught as PHR 895)
 - Multidisciplinary Sensors Laboratory (currently taught as EGR 599)
4. 6 credit hours from courses selected from a list of approved courses that include those mentioned above. These could be courses from the student's home department. These courses relate to topics that are important to sensors and sensing technologies. Specifically, they deal with detection/analysis principles (optical, electrochemical, electromagnetic, etc.), sensor materials (polymers, ceramics, semiconductors, etc.), signal processing, (bio)molecular recognition/separations, and electronics (including packaging of electronic components). Several of these courses are taught by the participating faculty.

- Chemical Instrumentation (Chemistry) (CHE 524)
- Chemical Separations (Chemistry) (CHE 526)
- Biological Chemistry (Chemistry) (currently taught as CHE 580)
- Electrochemical Methods of Analysis (Chemistry) (CHE 620)
- Optical Methods of Analysis (Chemistry) (CHE 625)
- Advanced Analytical Chemistry (Chemistry) (CHE 626)
- Chemical and Physical Processing of Polymer Systems (Chemical & Materials Engineering) (CME 554)
- Principles of Polymer Characterization and Analysis (Chemical & Materials Engineering) (CME 558)
- Bioseparations (Chemical & Materials Engineering) (currently taught as CME 599)
- Signals and Systems I (Electrical Engineering) (EE 421G)
- Signals and Systems II (Electrical Engineering) (EE 422G)
- Introduction to Electronics (Electrical Engineering) (EE 461G)
- Semiconductor Device Design (Electrical Engineering) (EE 560)
- Electric and Magnetic Properties of Materials (Electrical Engineering) (EE 561)
- Hybrid Microelectronics (Electrical Engineering) (EE566)
- Introduction to Lasers and Masers (Electrical Engineering) (EE 567)
- Fiber Optics (Electrical Engineering) (EE 568)
- Electronic Packaging Systems and Manufacturing Processes (Electrical Engineering) (EE 569)
- Modern Methods in Pharmaceutical Analysis (Pharmacy) (PHR 510)

List of Faculty Participants

Kimberly W. Anderson (*Chemical and Materials Engineering*)

Leonidas G. Bachas (*Chemistry*)

Dibakar Bhattacharyya (*Chemical and Materials Engineering*)

Arthur Cammers-Goodwin (*Chemistry*)

Sylvia Daunert (*Chemistry/Pharmacy*)

Craig Grimes (*Electrical Engineering*)

Robert A. Lodder (*Chemistry/Pharmacy*)

Janet K. Lumpp (*Electrical Engineering*)