Washington State University
MAJOR CURRICULAR CHANGE FORM - - NEW/RESTORE COURSE

- ☐ **Please attach rationale for your request, a complete syllabus**, and explain how this impacts other units in Pullman and other campuses (if applicable).
- ☐ **Obtain all required signatures with dates.**
- ☐ **Provide original stapled packet of signed form/rationale statement/syllabus** PLUS **10 stapled copies** of complete packet to the **Registrar's Office**, campus mail code 1035.
- ☐ **Submit one electronic copy of complete packet** to wsu.curriculum@wsu.edu.

Requested **Future** Effective Date: Fall 2016 (term/year) Course Typically Offered: Spring

DEADLINES: For fall term effective date: **October 1st**; for spring or summer term effective date: **February 1st**. See instructions.

NOTE: Items received after deadlines may be put to the back of the line or forwarded to the following year. Please submit on time.

☒ **New Course** ☐ Temporary Course ☐ **Restore Course**

ECE	501	Fundamentals of Laboratory-on-Chip
course subject/crosslist	course no.	title

(3 -)	None
Credit hrs | lecture hrs per week | lab or studio hrs per week	prerequisite

Description for catalog: Review of LoC Technologies, Operating Principles, Design Basics Fabrication, integration with micro/nanoelectronic devices, sensor, power systems

Additional Attributes: Check all that apply.

☐ Crosslisting (between WSU departments)* ☐ Conjoint listing (400/500):_____

☐ Variable credit:_____ ☐ Repeat credit (cum. max. hrs):_____

Special Grading: ☐ S, F; ☐ A, S, F (PEACT only); ☐ S, M, F (VET MED only); ☐ H, S, F (PHARMACY, PHARDSCI only)

☐ Cooperative with UI ☐ Other (please list request): _____

The following items require prior submission to other committees/depts. (SEE INSTRUCTIONS.)

☐ Request to meet Writing in the Major [M] requirement **(Must have All-University Writing Committee Approval.)**

☐ Request to meet UCORE in _____ **(Must have UCORE Committee Approval › › See instructions.)**

☐ Special Course Fee_____ **(Must submit request to University Receivables.)**

Contact: Praveen Sekhar Phone number: (360) 546-9186 Campus mail code: VECS

Email: praveen.sekhar@wsu.edu Instructor, if different: _____

8/28/15	8/31/15	
Chair/date	**Dean/date**	**All-University Writing Com / date**
Chair (if crosslisted/interdisciplinary)*	**Dean (if crosslisted/interdisciplinary)***	**UCORE Committee Approval Date**
Catalog Subcommittee Approval Date	**GSC or AAC Approval Date**	**Faculty Senate Approval Date**

***If the proposed change impacts or involves collaboration with other units, use the additional signature lines provided for each impacted unit and college.**

Justification: ECE 501 Fundamentals of Lab-on-Chip

The focus of the proposed Master's program in electrical engineering is Lab-on-Chip (LoC). Lab-on-a-chip (LoC) integrates several laboratory functions on a single chip of only millimeters in size. This course serves as an introductory and foundational course for students who like to pursue their thesis in LoC and serves as an overview course for students who wish to take a non-LoC option.

It does not affect other units in Pullman and other campuses.

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057 Revised -
Rec'd 11-6-2015

ECE 501 Fundamentals of Laboratory-on-Chip Spring 2015

Description: Operating principles of laboratory-on-chip (LoC) technologies, basics of design and fabrication, integration with microdevices, digital and high frequency circuits, sensors, and power systems.

Credits: 3

Prerequisites by course: None

Prerequisites by Topic: None

Required Text: Lab-on-a-Chip Devices and Micro-Total Analysis Systems: A Practical Guide, edited by Jaime Castillo-León, Winnie E. Svendsen. ISBN: 9783319086866

Lab-on-a-chip: Techniques, Circuits, and Biomedical Applications, Yehya H. Ghallab, Wael Badawy, Artech House, 2010. ISBN: 9781596934184

Recommended Text: Research papers uploaded by the instructor
Supplementary Materials: Will be posted on Blackboard.

Instructor: Dr. Praveen Sekhar

Office: VECS 201 W
Phone: (360) 546 9186
Email: praveen.sekhar@vancouver.wsu.edu
Office hours: Open Door Policy (E-mail Appointments Preferred)
Lecture Times and Location: VECS 104, MW 9:00-10:15 Am

Graduate Learning Outcomes (GLO)

Students will be able to:

GLO-1: Utilize the in-depth knowledge of LoC to design and fabricate devices for specific applications.

GLO-2: Layout a research problem in LoC topic, execute a research plan, including generating and analyzing research results

Learning Outcomes and Assessment

Student Learning Outcomes for this Course: **At the end of the course, the students should be able to:**	**Course Topics/Dates:** **The following date(s) will address this outcome :**	**Evaluation of Outcome :** **This outcome will be primarily evaluated by:**
Understand the principles of Lab-on-Chip with emphasis on soft lithography and materials choices for fabrication	Week 1 (operating principles) and Week 5, 6, 7 (Fabrication)	Quiz, Homework, Tests
Familiarize with different Lab-on-Chip applications and understand the integration of different systems	Week 8, 9, 10,11 (selection of sensors, integration with digital and power systems)	Quiz, Homework, Tests
Prepare to layout a research problem based on Lab-on-Chip concept and identify solutions	Week 12, 13, and 14 (Case study 1, 2, 3 and 4)	Homework
Design and fabricate Lab-on-Chip devices	Week 1 to Week 14	Homework and Tests

Grading Policy

Homework	30%
Quiz	10%
Midterm Exam	30%
Final Exam	30%

A	94-100	B	83-86	C	73-76	D	60-66
A-	90-93	B-	80-82	C-	70-72	F	< 59
B+	87-89	C+	77-79	D+	67-69		

Composition of final grade: Your course grade maps to the WSU learning outcomes as: 50% GLO-1 and 50% GLO-2.

Descriptions of Required Assignments

Majority of the homework assignments stem from the exercises in the required textbooks. The assignments are due exactly one week after it has been assigned.

Instructional Methods

The instructional methods include instructor lectures, video demonstrations, and student lead discussions.

Instructor Specific Expectations

1. Work cooperatively and effectively with others in class and on group assignments.
2. Participate fully in class activities and discussions.
3. Prepare thoroughly for class sessions by doing the necessary readings. All reading assignments will be posted on the course web site.
4. Treat the instructor with courtesy and respect and maintain decorum in the class.
5. Carefully read the syllabus that is passed out on the first day of class and follow all instructions included in the syllabus.
6. Expect students to let instructor know if they are having problems understanding or working with the material.
7. Expect students to submit assignments on time and according to instructions.
8. Avoid the use of cell phones or laptops in class.
9. Understand the concepts to solve problem apart from textbook exercises.

Attendance Policy

Since majority of the course content is presented in a problem-solving format, daily attendance is preferred. **Lecture attendance is not mandatory**. Each class utilizes tools and concepts learned from previous classes. Please be sure to arrive on time and stay till the end of the class. Not only do excessive absences, tardiness, and early departure suggest a lack of professionalism and commitment, but they also guarantee that you will not attain the objectives of this course.

Website

All course materials (lecture notes, assignments) will be available on the Blackboard website at learn.wsu.edu

Make-up Exam/Assignment Policy

No make-up exam, assignments or quizzes will be given unless a medical or other emergency was the reason for missing the exam or the assignment. For any other reason you must first contact the instructor **before** missing an exam, a quiz or an assignment.

Late Homework Submission Policy

Late homeworks will not be entertained unless dire circumstances warrant it. Without a valid reason, there will be a 10% deduction grade for submitting late by a day. If the submission is two days late, a 20% deduction in grade will be enforced. The homeworks will not be accepted after three days of original submission.

WSU Academic Integrity Statement

Academic integrity is the cornerstone of the university and will be strongly enforced in this course. Any student found in violation of the Academic Dishonesty Policy, which can be found at http://studentaffairs.vancouver.wsu.edu/student-affairs/academic-dishonesty, will be given an "**F**" for the course and will be referred to the Office of Student Conduct. For additional information about WSU's academic integrity policy/procedures, please contact (360) 546 9573.

WSUV Reasonable Accomodation Statement

Accommodations may be available if you need them in order to fully participate in this class because of a disability. Accommodations may take some time to implement so it is critical that you contact Disability Services as soon as possible. All accommodations must be approved through Disability Services, located in the Student Resource Center on the Lower Level of Student Services Center (360) 546-9138.

Emergency Notification System

- Review the Campus Safety Plan (http://www.vancouver.wsu.edu/safety-plan) and visit the WSU Vancouver Police website (www.vancouver.wsu.edu/police) for a comprehensive listing of University policies, procedures, statistics, and information related to campus safety, emergency management, and the health and welfare of the campus community.
- Everyone should also become familiar with the WSU VANCOUG ALERT website (www.vancouver.wsu.edu/alerts) where information about emergencies and other issues affecting WSU will be found. This site also provides information on the communication resources WSU will use to provide warning and notification during emergencies. It should be bookmarked on computers.
- Finally, all faculty, staff, and students should go to the zzusis portal at http://zzusis.wsu.edu and register their emergency contact information for the Crisis Communication System (Mass Notification Sytem). Enter your network ID and password and you will be taken to the zzusis portal page. Look for the Emergency Information box on the left side of the page and click on Update Now to be taken to the registration page where you can enter your cell, landline, and email contact information as well as arrange for emergency text messages to be sent to your cell phone.
- Finally, in case of class cancellation campus-wide, please check local media, the WSU Vancouver web page and/or http://www.flashalert.net/. Individual class cancellations may be made at the discretion of the instructor. Each individual is expected to make the best decision for his or her personal circumstances, taking safety into account. Please refer to the WSU Vancouver safety plan website for more information (http://www.vancouver.wsu.edu/safety-plan).

Week to week Course Outline

The tentative weekly schedule is listed below.

ECE 501 Weekly Schedule

Week	Lectures		HW Due Dates
	Date	**Topic**	
1	TBD	Operating principle: Laboratory-on-Chip	
	TBD	Parts and components of LoC	
2	TBD	Applications of LoC	**HW 1**
	TBD	CMOS based LoC	
3	TBD	PCB LoC	
	TBD	Electric field based LoC	**HW 2**
4	TBD	Microfluidics Theory	
	TBD	Design and Simulation of LoC devices	

5	TBD	Fabrication of LoC Devices	
	TBD	Soft Lithography	**HW 3**
6	TBD	Materials choice for LoC devices	
	TBD	Device packaging	
7	TBD	Review	
	TBD	**Mid-Term**	
8	TBD	Selection of sensors	
	TBD	Integration with sensors	
9	TBD	Integration with Digital Circuits	**HW 4**
	TBD	Choice of power systems	
10	TBD	**Spring Break**	
	TBD		
11	TBD	Current mode circuits	
	TBD	Impedance mode circuits	**HW 5**
12	TBD	Paper-based Diagnostics	
	TBD	Case study 1: Electrochemical Biosensor	
13	TBD	Case study 2: Cell Manipulation	
	TBD	Case study 3: Nanowire Sensors	**HW 6**
14	TBD	Case study 4: DNA Analysis	
	TBD	Case study 5: Environmental Monitoring	
15	TBD	Case study 6: Gas Sensor	
	TBD	**Review**	
16	TBD	**Finals (Closed Book)**	

Important Dates and Deadlines

Students are encouraged to refer to the academic calendar often to be aware of critical deadlines throughout the semester. The academic calendar can be found at www.registrar.wsu.edu/Registrar/Apps/AcadCal.ASPX. Questions regarding the academic calendar can be directed to the Office of Student Affairs in VSSC 100 or call 360-546-9559.