

Sensor & Controller System Integration [4] Fall 2007 Syllabus

Instructor Information:

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Lab access times: Swipe Card Access to 305 Hammond
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For course admin: <https://angel.psu.edu>*

Students are **required** to sign up for two courses:

EDSGN 497 E [3 credits]: Sensor & Controller System Integration

EDSGN 497 F [1 credit]: Sensor & Controller System Practicum

Meeting Times

Dates: Monday, August 27 – Wednesday, December 12, 2007

	Day(s)	Time	Location
EDSGN 497E	Monday, Wednesday	6pm to 9pm	305 Hammond
EDSGN 497F	Wednesday	5pm to 6pm	307 Hammond

Prerequisites

It is recommended that you have completed PHYS 212 (Electricity and magnetism) for admission to this course.

Course Objectives

The objective of this course is to foster innovation, intrapreneurship and entrepreneurship by providing students the tools and knowledge to quickly assemble proof-of-concept systems leading to new products and better processes. This is an intensive laboratory based course that covers interfacing computers of various form factors to a wide array of sensors, transducers, actuators, instruments and sub-systems. The course covers some of the fundamental engineering concepts of instrumentation, control, signal conditioning, operating systems, etc. Students will also learn the elements of product commercialization through a series of lectures and hands-on workshops on entrepreneurship, intrapreneurship, innovative thinking, intellectual property and patenting, venture funding, and related issues.

The primary goals of this course are:

- **Putting ideas to work:** Students have ideas that are never tested. Providing the tools and means for the students to rapidly test concepts and their ideas will lead to innovation and invention.
- **Lab automation:** Research centers and labs conduct experiments using lab equipment that offers some kind of interface to communicate with computers and other instruments. This capability offers tremendous networking opportunities that are seldom exploited. Automating experiments will boost the productivity and quality of research. Familiarity

with lab automation techniques will increase the market-worthiness of the students and better prepare them for their careers.

- **Learning by doing:** The hands on nature of the course helps students understand the fundamental concepts better and their experiences enable them to solve similar problems faster.

Teaching Methodology:

During the first eight weeks of the course, students will learn essential engineering concepts, programming in the LabVIEW graphical development environment and small-scale System Integration. Venture teams of 3-4 students will be formed towards the start of the semester and will work together to advance their venture concept to a Proof-of-Concept prototype. There will be four 'Adventures' during the first half of the course and five 'Quests' during the second half of the course. There will be numerous workshops & team exercises throughout the course. The course logistics will be discussed in details during the course orientation.

Level of Effort required

There will be two lab periods of 3 hours each and a lecture/workshop of one hour every week. The students will be required to meet outside class times to work on their ventures. The average student *in the class* will be required to devote about 12 hours/week for this course **including** the scheduled lab times.

Textbook

There are no textbooks for this course. Tutorial CD, Reading materials, video clips, podcasts and lab handouts shall be provided through the ANGEL website.

Educational Objectives:

At the end of this course, students will be able to:

- Identify processes and tasks in the research lab that can be automated and ideas stemming from their research which have market potential.
- Define product requirements and formulate specifications.
- Determine how to simultaneously meet system and physical design constraints and identify effective trade-offs between concerns to optimize system performance.
- Determine the hardware and software resources required to interface various kinds of sensors and actuators to a computer.
- Integrate small computer based testing, measurement and automation systems.
- Work in a team environment to develop innovative products/processes or optimize an existing product/process.
- Be aware of what it takes to advance their proof of concept system to a commercially marketable product.

Attendance:

Attendance at all the laboratory classes and workshops is **required**. The intensive hands-on nature of this course makes it very difficult for the students to catch up if they miss even a single laboratory or workshop.

Grading Policy:

EDSGN 497E (3 Credits):

Laboratory related:	Adventures (4)	20%
	Quests (5)	30%
	<i>Subtotal:</i>	<u>50%</u>
Venture related:	Venture Value Proposition (PDR)	5%
	Venture CDR	10%
	Venture FDR + Report	15%
	Teamwork & participation	10%
	<i>Subtotal:</i>	<u>40%</u>
Leadership:	Leadership and Innovation	10%
	<i>Total:</i>	<u>100%</u>

EDSGN 497F (1 Credit):

Adventures:	Adventures (2)	30%
	Venture Value Proposition	10%
Venture related:	Venture CDR	10%
	Venture FDR + Report	10%
Surveys:	Surveys 1 → 3	5%
Participation:	I2V Workshop (Sat, November 10)	15%
	Regular Class	20%
	<i>Total:</i>	<u>100%</u>

The grades for both the course will be curved.

Academic Integrity

Incidents of academic dishonesty will be dealt with according to University policy. The current policy may be found at <http://www.psu.edu/dept/oue/aappm/G-9.html>

Disability Access Statement

The Pennsylvania State University encourages qualified persons with disabilities to participate in this programs and activities and is committed to the policy that all people shall have equal access to programs, facilities, and admissions without regard to personal characteristics not related to ability, performance, or qualifications as determined by University policy or by state or federal authorities. If you anticipate needing any type of accommodation in this course or have questions about physical access, please tell the instructor as soon as possible.



Sensor & Controller System Integration

EDSGN 497 E/F: Fall 2007 Course Schedule

Week	Lab 1: Monday 6 PM - 9 PM, 305 Hammond	Lab 2: Wednesday 6 PM - 9 PM, 305 Hammond	Lecture: Wednesday 5 PM to 6 PM, 307 Hammond
Week 1 Aug 27 - Sep 1	Course Orientation Fundamental Concepts	LabVIEW Basics Modular Programming	Course Venture Orientation
Week 2 Sep 3 - 7	Labor Day	Data structures File operations F1	Elevator Pitches
Week 3 Sep 10 - 14	Program architectures Design Patterns E1	Systems Engineering Advanced LabVIEW	Entrepreneurship Workshop
Week 4 Sep 17 - 21	Data Acquisition Design Review Process E2	Software Interfacing Matlab, C, SQL, MSOffice, ActiveX, .Net	Venture Value Propositions P1
Week 5 Sep 24 - 28	Functional Verification System Characterization	Controlling Devices & Sub-systems	Identifying markets for products & services
Week 6 Oct 1 - 5	Instrument Control Device Drivers E3	Human Factors, Usability Operating system issues	Intrapreneurship Workshop
Week 7 Oct 8 - 12	Proof of Concept Systems Rapid System Integration	N/W and distributed apps Internet integration	Social Entrepreneurship
Week 8 Oct 15 - 19	Signal Processing Signal Conditioning E4	FPGAs, other platforms Team Lab Orientation	Venture Update P2
Week 9 Oct 22 - 26	Quest 1		Invention & Innovation
Week 10 Oct 29 - Nov 2	Quest 2		Teamwork & Leadership
Week 11 Nov 5 - 9	Quest 3		International Issues
Week 12 Nov 12 - 16	Quest 4		Venture CDR P3
Week 13 Nov 19 - 23	Thanksgiving Break		
Week 14 Nov 26 - 30	Quest 5		Patents & Intellectual Property Issues
Week 15 Dec 3 - 7	POC to Product Technical issues	Reflection on course, ventures, ideas	POC to Product Non-technical Issues
Week 16 Dec 10 - 14	Venture	Final Prototype Demos (Design Showcase - Dec 13)	Final Presentations P4
Exam Week Dec 17 - 21	Final Report Due Friday, Dec. 21 F2		
Key:	Adventure x due →	No class today →	
	Presentation x →	Hands-on lab in class →	