Senior Design Project – SDP19

Introduction
10 September 2018

C.V. Hollot
Professor and Head

Baird Soules
Sr. Lecturer and Director of Experiential Learning
SDP19 Clock Starts Ticking

SDP19 Demo Day
26th-27th April 2019

393 days
372 days
228 days
## CSE 2019

**Curriculum Worksheet for the Computer Systems Engineering Class of 2019**

<table>
<thead>
<tr>
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<th>FIRST YEAR</th>
<th>SECOND YEAR</th>
<th>THIRD YEAR</th>
<th>FOURTH YEAR</th>
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<tr>
<td><strong>ENG/WRIT 112</strong></td>
<td>College Writing [3 cr]</td>
<td>Social World Elective [4 cr; Note 2]</td>
<td>Science Elective [3 or 4 cr; Notes 5 &amp; 6]</td>
<td>ENGIN 351 Writing in Engineering [3 cr]</td>
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<td><strong>ENGIN 191</strong></td>
<td>Freshman Seminar [1 cr; Note 3]</td>
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*The curriculum notes can be found on the reverse side of this worksheet.*

**University of Massachusetts Amherst • Department of Electrical and Computer Engineering**

[http://ece.umass.edu/](http://ece.umass.edu/)

Updated June 2015
Students Empowered

- Select your own team
- Select your own project
- Select your own advisor

Empowerment

Responsibility
Course attributes

- Idea → prototype (year-long hackathon)
- Ideas self-generated
- Teams self-form
- Self-learning opportunities
- **Teaming experience**
- Impact on society
- Pre-professional experience in engineering design
- **Minimal classroom interactions**
  - Weekly team/advisor meetings
  - Reviews before faculty evaluators
Takes a Department to do SDP

- Team Member #1
- Team Member #2
- Team Member #3
- Team Member #4

Faculty Advisor

- Faculty Evaluator #1
- Faculty Evaluator #2

COO

CTO

CLT

ECE Department
Baird Soules

M5, Room 5J
SDP19 Reviews (the drumbeat)

Making the Pitch

- Preliminary Design Review (PDR)
  - **Oct**

Demonstrating the Essence

- Midway Design Review (MDR)
  - **Nov**

Working Prototype

- Comprehensive Design Review (CDR)
  - **Feb**

THE Prototype

- Final Project Review (FPR)
  - **April**

Block Diagram

SDP Demo Days 26th, 27th April
SDP19 Course Deliverables

- Project Website
- Review Presentations
  (PDR/MDR/CDR/FPR slide decks)
- Written report
- Demo Poster
- System Prototype
Must include custom PCB

Examples

- 8-bit microcontroller
- sensor board (signal conditioning, intelligence)
- actuator board (power stage)
- power supply
Must include custom PCB (cont’d)

- Arduinos allowed in MDR, but **not allowed in final prototype** – must integrate Arduino’s raw processor (Atmega 328) on PCB – program in C
- Ras-Pi **does not satisfy** custom PCB requirement
SDP19 Process

- Teams of 4 students
  - Choose one team manager

- Advisor
  - Each team chooses its own ECE faculty advisor (due 21st Sept)

- Meetings
  - Weekly team meetings
  - Weekly advisor meetings
  - Course meetings

- Project budget: $500
  - Some parts available in SDP lab or M5
  - We encourage students to secure outside support; e.g., free samples, sponsorships, competitions, ...
Review and Grading Process

- Reviews (PDR, MDR, CDR, FPR)
  - Two ECE faculty evaluators (different from advisor)
  - 20/30 min presentation by team + 20 min Q&A

- The final grade for ECE 415 (and ECE 416):
  - Advisor grade (50%): Given at the discretion of the advisor
  - Review Board grade (30%): Average of review panel grades
  - Course Coordinator grade (20%): Based on project documents and performance
  - Each team member graded individually.
Senior Design Project - SDP19

Welcome to Senior Design Project 2019 (SDP19)

Course Overview: The Senior Design Project provides a capstone experience for undergraduate students in the Department of Electrical and Computer Engineering. Students work in teams of 3-4 students in this year long course sequence to design and prototype a system of their choice. Past projects have included a variety of topics ranging from home automation systems to ultra wide band wireless links, assistive robots, and wireless drumsticks. Each team is advised by a faculty member in the department and projects undergo several formal reviews. The learning goals for the senior design project include technical design, team work, presentation skills, an understanding of realistic constraints, economics, and ethics.

News: Team Forming is complete

http://www.ecs.umass.edu/ece/sdp/sdp19/
To Do List

• Sign up for a lab bench (Marcus Hall, Rm 9A)
• Converge to a project idea
• Connect with a Faculty Adviser
• Register for M5 membership (required)
## Schedule

This schedule shows the main events for SDP19. Please note that the schedule is subject to change.

### September 2018

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Diagnostic Drones (Ashland MA)

“develop and build a collision detection and avoidance system for a drone to operate”

Deadline for expressing interest: email to cvh no later than noon, Tuesday, 11th September, 2018
SDP18 Awards
SDP18 Third Place

SmartDesk

John Melloni, Daniel Mathieu, Tristan Koopman & Aidan Fitzpatrick

Advisor: Paul Siqueira
UMass Amherst

SDP18 Third Place

SmartDesk
HELPING HAND

Corey Ruderman, Dan Travis
Jacob Wyner & Joshua Girard

Advisor: Marco Duarte
SDP18 Second Place

Helping Hand

![Image of people working on a project]

ECE Department
SDP18 Second Place

Helping Hand
SDP18 First Place

DUAL PLAY

SuoAn Gao, Lina Wu, Yujia Huo & Siyu Wu

Advisor: Zlatan Aksamija
SDP18 First Place

Dual Play

- iPad Pro
- Wireless Internet
- MacBook Pro
- HDMI
- Polarized 3D Monitor
- Bluetooth Headphones
- Remote Control
- Special Passive 3D Glasses
- Filtered Images
- Polarized Light
SDP18 First Place

Dual Play
Coordinators’ Choice Award

ACCESS

Ivan Williams, Hassaan Khan, David Downs & Victor Arango

Advisor: Guangyu Xu
Coordinators’ Choice Award

ACCESS

- Spin-coat polystyrene microspheres
- ID un-cloneable - complexity pattern.

- IDs loaded into reader
- Image sent to server for processing
- Result relayed back to user
SDP18 People’s Choice - Third Place

ALFRED

Pat Barron, John Fouad, Ben Ivaldi & Chris Wong

Advisor: Andras Moritz
SDP18 People’s Choice - Third Place

ALFRED
Honorable Mention

SAFE Drone

Bradley Marszalkowski, Jamie Kline & Serena Thomas

Advisor: Bill Leonard
Honorable Mention

SAFE Drone

[Images of a drone flying over a building and a map showing flight paths and signal source]
Honorable Mention

AutoUmp

Tim Adams, Justin Marple, Jason Camiel & Matt Barnes

Advisor: Tilman Wolf
Honorable Mention

AutoUmp
Pegasus-21

Trevor Berry, Istvan Kreiz & Keith Miller

Advisor: Zlatan Aksamija
SDP17 Third Place

Pegasus-21
Smart Hydroponic Greenhouse

Michael D'Anna, Samantha De Groot, Maxwell Joyce & Shaun Palmer

Advisor: Bob Jackson
SDP17 Second Place

Smart Hydroponic Greenhouse

Sensor Array
- Moisture
- pH
- Humidity
- Temperature
- Water Level

Hydroponics
- Pump/Water Cycle Control
- Nutrient Dispersal System

Lighting
- Voltage Regulators and Power Management
- Light Cycle and Intensity Control

Android Application
- Plant Database
- Notification Interface
Step

Joseph Roberts, Ryan Daly, Jared Ricci & Steven So

Advisor: Dennis Goeckel
SDP17 First Place

Step
Assignment

- Converge on project (ok to consult with adviser)
- Reserve lab bench, Monday, 11\textsuperscript{th} Sept’17
- Confirm faculty adviser by Tuesday, 19\textsuperscript{th} September’17
Career planning

• Engineering Career Development and Experiential Learning Center (Cheryl Brooks), Marston 112
  • Walk-in resume/cover letter help
  • Mock interviews (by appointment)
Projects

- What do you want to learn?
- Choose an area – become an expert
- Explore past SDP projects
  - UMass
  - Other ECE departments
- SDP projects are:
  - differentiators at job interviews
  - not PhD dissertations
Real-Time Concussion Analyzer (SDP13)
Hologram Machine (SDP14)
Finger Tracking

1. Linear IR Laser Beam ~790nm
2. A finger breaks the IR beam
3. IR Camera sees finger reflection

Before | After
braillebook (SDP16)
SigninGlove (SDP16)
ECE Students Win First Place in FAA Design Competition By Creating Virtual Geofences to Protect Airports from Drones

The student team of UMass electrical engineering major, Alex Breger, Chris Brezulin, Jason Dennis, and Sandra McQueen received first place for the winning design in the "Runway Safety/Runway Incursions/Runway