

CS596 IoT Syllabus

Introduction to Internet of Things

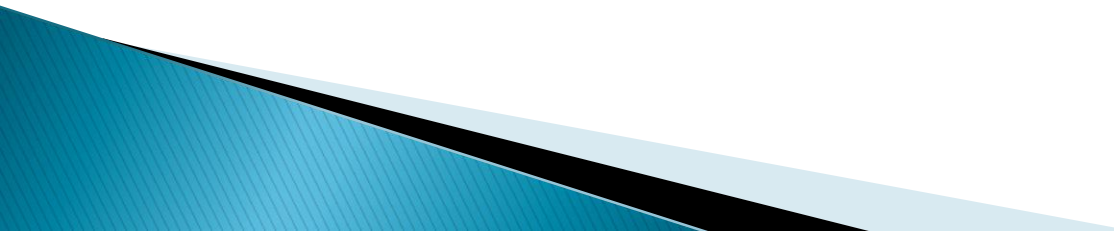
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Gartner:

“World will need 300,000 IOT developers by year 2017. Anything we buy that costs over \$100 will be IoT enabled by 2018”



Class

- ▶ Credit: 3
 - Lecture/Discussion Hours: 3
- ▶ Class:
 - 15 weeks,
 - 13 Lectures
 - 2 Tests (Mid Term 10/31, Final 12/19)
 - 1 Project or 1 Report
 - Hands-on Demo Project
 - Experience in Linux, C/Java or similar Computer Language useful
- ▶ References
 - More Info on Class Web

- **Audience:**

- Seniors or Graduate Student in Computer Engineering and Computer Science

- **Scope:**

- An overall picture and technologies introductions of Internet of Things with entry –level hands-on project demo.
- Intensive readings of extra curriculum materials are required for project research & homework.

- **Level:**

- Introductory/intermediate level
 - Primary initial course in IoT.
 - Fundamentals and the framework in IoT technologies.
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Class Communications and Lectures

- ▶ Additional class communication is highly Internet Based: web site and email etc...
 - You're "**required**" to sign up the website and mailing list.
- ▶ Course Web Site and group email:
 - Provide your email address to SVU Admin Office to be included in the updated class roster
 - Class Web Site TBD
- ▶ Lecture Notes and Homeworks are posted on class web.

Grading (% subject to change)

• ATTENDANCE	
• /CLASS PARTICIPATION	10 %
• HOMEWORK	15 %
• QUIZZES	15 %
• MID EXAM	20 %
• IOT PROJECT	15 %
• IOT REPORT	20 %
• FINAL EXAM	20 %
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	115 %

RANGE OF NORMALIZED GRADES:

From	To	Rank
-	59.9	F
60.0	62.0	D-
62.1	67.9	D
68.0	69.9	D+
70.0	72.0	C-
72.1	77.9	C
78.0	79.9	C+
80.0	82.0	B-
82.1	87.9	B
88.0	89.9	B+
90.0	92.0	A-
92.1	97.9	A
98.0	100.0	A+

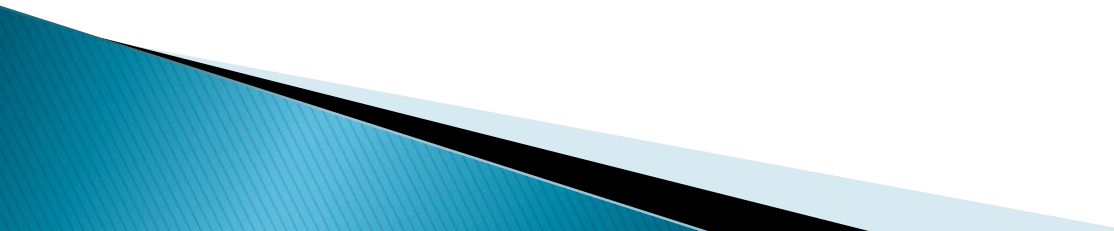
IoT Hardware/Design Project

- ▶ You can choose Hardware or Design Project
 - **Hardware Project:** Must present with IoT Hardware Implementation and code projects
 - **Design Project:** Must provide business model, application user cases and GUI layout.
- ▶ **Hardware prototype/demo project:**
 - Pick a Hardware and Design/Implement an IoT Project
 - Arduino is best for beginner, and sensor focused project
 - Raspberry Pi 2 is more suitable for advanced programmer with Python skills
 - Intel Galileo or Beaglebone are other options
 - 6 Students per Group
 - Must present the hardware/firmware demo per group and a report per student
- ▶ **Design Project:**
 - 1~2 students per team. Must be in sufficient details for system implementation. → must be close to market and product specification documents.
- ▶ Final Demo scheduled for the last week before final exam
- ▶ Project Draft due three weeks before final exam (11/28).
- ▶ Project Report deadline before final exam (turn in paper report during final exam, send an electronic copy by the same time)


Misc.

- Make-up Work:
 - If you do not have Project turned in, you get zero points, period.
 - No Make-up test is allowed for mid-term and final exam. Unless you're seriously ill with doctor's proof.
 - Extra work/credit allowed for term project before final exam.
- Quiz on Homework/Assigned Readings:
 - There maybe unannounced *short quiz* on the required readings or homeworks at the beginning of class *each week*.

Connected World examples

- ▶ Wireless Sensor Networks
 - ▶ Internet-connected wearables
 - ▶ Low power embedded systems
 - ▶ RFID enabled tracking
 - ▶ Use of mobile phones to interact with the real world
 - ▶ Devices that connect via Bluetooth enabled mobile phones to the
 - ▶ Internet
 - ▶ Smart Homes
 - ▶ Connected Cars
 - ▶ etc.
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Class Outline

1. Introduction/IoT Overview (9/12)
 1. Definition
 2. History
 3. Eco-System
 4. Market Trend
 5. Framework
 2. IoT Application Overview (9/19)
 1. Connected Car
 2. Home Automation / Smart Home / Smart Building
 3. Healthcare
 4. Smart City
 5. Smart Grid
 6. Transportation / Asset Management
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Class Outline ~ continued

3. IoT Standards (9/26)

1. Comprehensive Consortium

1. AllJoyn/AllSeen
2. Industrial Internet Consortium
3. OIC (Open Internet Consortium)
4. Thread
5. HomeKit

2. Smart Object ID / Labeling

1. GS1 OIot (Open Language of IoT)

Class Outline ~ continued

- 4. IoT Architecture (& Project Discussion)
(10/3)
 - 1. Architecture Model
 - 1. Device
 - 2. Gateway
 - 3. Cloud
 - 4. Software
 - 5. Application
 - 2. Sensor Network
 - 3. Cloud Computing
 - 4. Fog Computing
 - 5. Addressability (Auto-ID Lab)

Class Outline ~ continued

5. IoT Sensor Technologies

1. Sensor
2. Actuator
3. MEMS
4. Properties

6. IoT Connectivities/Networks

1. RFIC
2. Bluetooth (802.15.4)
3. ZigBee
4. Z-Wave
5. WiFi
6. NFC
7. Network/Connectivity Design Issues/Concerns
 1. Delay
 2. Scalability
 3. Interoperability

Class Outline ~ continued

7. IoT Hardwares / Embedded Design

1. Open Source Hardware

1. Arduino
2. Raspberry Pi
3. Beaglebone
4. Intel Galileo

2. Electronics 101

1. Electronic Circuit
2. Schematic
3. PCB
4. EDA: Fritzing
5. Industrial Design

3. Electronics Shops

1. [SparkFun Electronics](#)
2. [Adafruit Industries, Unique & fun DIY electronics and kits](#)

8. Mid-Term (

Class Outline ~ continued

9. IoT Protocols/Security

1. Protocols

1. http
2. uPnP
3. CoAP
4. MQTT
5. XMPP

2. Security

10. IoT Softwares / Platforms

1. IoT Web Services


1. SOAP
2. REST
3. XML
4. JSON

2. API

3. IoT OS

4. Embedded System Design

Class Outline ~ continued

11. IoT Design, UX and Interface / Vertical Market Case Study (Select 1 or 2)
 1. Memory
 2. Security
 3. Privacy
 4. UI/UX
 5. Connected Device Experience
 6. Power consumption/Battery life
 7. Software updates
 8. Recovering from network failures & other failures
 9. Connectivity and communications
 10. Device Management
 11. Data collection, analysis, and actuation
 12. Scalability
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Class Outline ~ continued

- 12. IoT and Big Data / Machine Learning / Drone
 - 1. Big Data
 - 2. Machine Learning
 - 3. Drone / Robotics
 - 13. SDN Networks / IPv6
 - 1. SDN and IoT
 - 2. IPv6
 - 14. Project Demo / Report
 - 15. Final (12/19)
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