EE595 Capstone Design Presentations

**Friday, May 10**

### EMS-E250 Presentations

**Team 3:** 8:30 – 10:20AM → *Automated Animal Crossing Alert System*

Omar Almuteiri, Zhongjian Liu, Chunbing Jiang, Shuyan Wang, Liudong Chen

**Team 4:** 10:30 – 12:20PM → *Portable & Rechargeable Internet Radio*

Kaichun Niu, Salma Alsalem, Ruimin Song, Chenchen Qu, Lingrao Wang

**Lunch, Best Project Award Fall 2018:** 12:30–12:50PM → *Low Cost Polymerase Reaction System*

Team 3: Daniel Brandt, Acher Kalongo, Yuting Lin, Troy Rummell, Aaron Thunes

**Team 5:** 1:00 – 2:50PM → *Motive Power Digital Hydrometer - SBS*

Sahithi Chatradi, Simone Kolb, Samer Kiblawi, Erik Orlowski, Jeanette Ramos
EE595 Capstone Design Presentations

*Friday, May 10*

**EMS-E295 Presentations**

Team 2: 8:30 – 10:20AM  →  *Powerline Ice Removal Robot*
Chenglong Tang, Ruben Gasparini, Minghao Chen, Yu Duan

Team 6: 10:30 – 12:20PM  →  *Forest Fire Early Detection System*
Robert Kahl, Andrew Harpster, Derrick Beaudin, Andrew Sobcinski, Cameron Kielma

**Lunch Room E250**

**Best Project Award Fall 2018: 12:30 – 12:50PM  →  *Low Cost Polymerase Reaction System***
Team 3:  Daniel Brandt, Acher Kalongo, Yuting Lin, Troy Rummell, Aaron Thunes

**Team 1: 1:00 – 2:50PM  →  *Horizontal Impact Tester Controller - GEHC***
Ryan Lisser, Jingyi fang, Jacob Stendel, Zhen Pang
Horizontal Impact Test Machine (Sponsored By GE Healthcare)

Team 1

- Ryan Lisser
- Jingyi Fang
- Jacob Stendel
- Zhen Pang
Team 1: Project Description

- Machine's purpose is to test equipment robustness when subjected to side impact.
- Implementing a control system with sensors to automatically perform tests and log data.
- Source of agitation is pneumatic cylinders controlled by microcontroller.
- Sensors include: weight, position, acceleration, temperature, and humidity.
- There is limited available machinery options from manufacturers. Those available are high cost.
- This device helps determine if packing is proper and packaged goods are safe to transit impacts.
- Our target market is North America where companies want to test their equipment to impact forces.
# Team 1: Key Requirements

<table>
<thead>
<tr>
<th>Cost</th>
<th>Environment</th>
<th>Power Inputs</th>
<th>Major Functions, Quantities Measured, Displayed</th>
</tr>
</thead>
</table>
| • Sales Price: $10000, Component Cost:$1500  
• Assembly & Test Costs:$3000 | • Indoor, Stationary  
• Operating Temp Range: (10ºC to 40ºC )  
• Operating Humidity Range:(0 to 100%) | • 102-132 VAC  
• 5 Amps Maximum AC current  
• 50-60Hz | • Pneumatic actuators for impact cylinder and braking system  
• Range finder: Range 40mm to 4000mm, Accuracy +/- 20mm, Resolution 1mm  
• Temperature sensor: Range -40c to 80c, Accuracy +/- 0.5ºC, Resolution 0.1ºC  
• Relative humidity: Range 0% to 100%RH, Accuracy +/- 2%RH, Resolution 0.1%RH  
• 3 Axis Acceleration 400g: Range 0 – 400g, Accuracy +/- 1g, Resolution 0.1g  
• Load Cell: 4 cells rated at 500lb each |
EE595
Power Line Ice Removal Robot
Team 2

- Chenglong Tang
- Ruben Gasparini
- Minghao Chen
- Yu Duan

EE595
Power Line Ice Removal Robot

Purpose of Product – Our robot is designed to remove ice on Power transmission lines.

Major Feature 1 – It uses high speed motor and sharp blade to remove ice.

Major Feature 2 – It receives power from a removable and rechargeable battery.

Major Feature 3 – It can be remotely controlled by wireless technology.

Intended Market: North America
Key Requirement Summary

- **Cost**
  - Sales Price: $500,
  - Per unit cost of all Components: $140,
  - Per unit cost of all Assembly, Test & Mfg: $50.

- **Environment**
  - Outdoor, Mobile, Snow ice.
  - Operating Temp Range: -30~50 °C
  - Operating Humidity Range: 0~100 %

- **Power Input(s)**
  - Battery Power: 12V Nom Volts; 6 Ahr, AGM VRLA Battery

- **Major Functions, Quantities Measured & Displayed**
  - Function: On, Off, Standby, Measure, Cutting.
  - Quantities Measured - For Each:
    - Motor torque: 14kg*cm,
    - Distance Sensor Range: 0 to 1.5m, Accuracy: +/-0.1m, Resolution: 0.1m
    - Wireless controlling Distance: up to 40 meters
Advanced Block Diagram for Team 2

Block Ownership:
- Chenglong Tang
- Ruben Gasparini
- Minghao Chen
- Yu Duan

Components:
- Battery Charger
- +5VDC +12VDC
- Power Supply
- Wireless Communication Interface
- Microcontroller
- Signal Conditioning
- Ice Sensor
- Motor Driver 1
- Motor Driver 2
- Motor Driver 3
- Enclosure
- User Interface
- Motor 1
- Motor 2
- Motor 3

PCB Layers:
- PCB 1
- PCB 2
- PCB 3
Automated Animal Crossing Alert System

Team 3

- Omar Almuteiri
- Zhongjian Liu
- Chunbing Jiang
- Shuyan Wang
- Liudong Chen

http://kootenaybiz.com/bizblog/article/two_kootenay_projects_receive_wards_of_merit
Automated Animal Crossing Alert System

Description

• To mitigate the occurrences of wildlife-vehicle Crash on road.
• Reliably detects the presence of animals prior to entering into the roadway platform
• Automatically alerts travelers by flashing light based alert signal which is active as long as the animal is present in the detection area
• Provide deterrence for animals by using sound.
• Solar powered rechargeable system.
• Intended Market: United States
Key Requirement Summary

• Cost
  • Sales Price: $3000
  • Component Cost: $800
  • Assembly & Test Costs: $150

• Environment
  • Outdoor
  • Operating Temp Range: (-30~45°C)
  • Operating Humidity Range: (0%~100%)

• Power Input(s)
  • Solar panel 100W @ 12V
  • Battery: 12V @ 10AHr AGM VRLA Battery

• Function:
  • On, Off, Alarm, Measurement

• Quantities Measured:
  Motion sensor  Range: 0~250m  Accuracy: ±0.2m  Update rate: 1 Hz
  Temperature sensor  Range: -40~60°C  Accuracy: ±1°C  Update rate: 0.5 Hz
  Light sensor  Range: 3~5000lux  Accuracy: ±10%  Update rate: 4 times / hr
  Speaker  Sound pressure level < 90dBA
Portable and Rechargeable Internet Radio
Team#4

- Kaichun Niu
  - Lead System Designer
- Salma Alsalem
  - Lead Presentation Manager
- Ruimin Song
  - Lead Report Manager
- Chenchen Qu
  - Lead Prototype Director
- Lingrao Wang
  - Lead Project Integrator

Source: www.internet-radio.com
EE-595
Portable and Rechargeable Internet Radio

High Level Description

- **Purpose of product**
  Listen to various Internet radio stations using Wi-Fi network interface

- **Key Features**
  - Internet radio provides the user access to a large repository of audio content available online
  - High Audio Quality, Portable, Rechargeable and Cost-Effective Solution
  - Interface to other streaming services such as Spotify

- **Market**
  USA
EE-595
Portable and Rechargeable Internet Radio

Key Requirements Summary

☐ Cost:
  • Sales Price: $60, Component Cost: $20, Assembly & Test Costs: $10

☐ Environment:
  • Indoor
  • Operating Temp Range: 0–to 45°C
  • Operating Humidity Range: 0 to 100 %

☐ Power Input(s):
  • Residential AC Power (Charging): 102–132 VAC @ 0.30 Amps Max
  • Battery Power: 3.7 Volts (Nom.), Li-Ion

☐ Major Functions, Quantities Measured, Displayed
  • Battery life: 6 Hrs Audio Streaming
  • Connectivity Interfaces: 802.11 b/g/n
EE-595
Advanced Block Diagram

Block ownership

A Wi-fi interface:
Q. Chenchen

B User interface & Micro controller
W. Lingrao

C Power supply:
S. Salma

D Codec DAC:
S. Ruimin

E Output audio driver:
N. Kaichun
EE-595
Motive Power Digital Hydrometer
Team #5

• Sahithi Chatradi
• Samer Kiblawi
• Erik Orlowski
• Simone Kolb
• Jeanette Ramos
• Sahithi Chatradi
Motive Power Digital Hydrometer

- **Description:** Hand-held, battery powered hydrometer used to determine the state of charge of lead acid batteries.
- **Features:**
  - Measures specific gravity of drawn acid sample with temperature compensation
  - Displays measured values on LCD and transmits stored data via Bluetooth to PC
- **Market:** Global motive lead-acid battery industry
Key Requirements Summary

- **Cost**
  - Sales Price: $999.00, Component Cost: $333.00, Assembly & Test Costs: $167.00

- **Environment**
  - Indoor, Outdoor, Handheld, survive 48” drop
  - Operating Temp Range: 0 – 40º C
  - Operating Humidity Range: 0% - 100%

- **Power Input(s)**
  - Battery Power: 9-Volt Battery, 9 Volts, 20mA max

- **Major Functions, Quantities Measured, Displayed**
  - Temperature Accuracy - Operational Temperature range of 32º F to 110ºF with an accuracy of +/- 0.2ºF
  - Specific Gravity Accuracy: +/- .003
  - Memory to record at least 300 readings and CSV data via Bluetooth transmitter
Advanced block diagram

Block assignments
A. Power - Jeanette Ramos
B. Controller - Erik Orlowski
C. Sensor - Sahithi Chatradi
D. Data Export/Storage - Simone Kolb
E. User Interface - Samer Kiblawi
EE-595
Early Fire Detection
Team 6

- Robert Kahl
- Andrew Harpster
- Derrick Beaudin
- Andrew Sobcinski
- Cameron Kielma
EE-595
Fire Detection
IR fire and smoke detection

• Purpose of Product – To detect forest fires and wirelessly transmit the data to a hub.
• Major Feature 1 – Operates in a Wireless Mesh Network.
• Major Feature 2 – Portable
• Major Feature 3 – Solar Powered
• Intended Market – North America
Cost
- Sales Price: $399.99, Component Cost: $150, Assembly & Test Costs: $120

Environment
- Outdoor, Stationary
- Operating Temp Range: (-55 to 125)*C
- Operating Humidity Range: (0 to 100)%

Power Input(s)
- Battery Power: Qty 1, 6 Volts, Max 500 mA
- Other Power Input: Solar Panel, Nom 12 Volts, Max 1.16 Amps

Major Functions, Quantities Measured, Displayed
- Functions: On, Off, Detect, Sleep, Standby
- Quantities: Fire Detection, Current Range: 60 degrees of sensing range
EE-595
Block Diagram