EE595 Capstone Design Presentations

Friday, Dec 13

EMS-E250 Presentations

Team 1: 8:30 – 10:20AM → CNC Electromagnetic Field Probe
Ahmed AlAbdulbaqi, Andrew Krill, Hasan Alzawad, Matthew Rohr

Team 3: 10:30 – 12:20PM → Automated Coffee Pour Over
Nicholas Giovannetti, Joseph Skogman, David Werner, Kyle Wurster

Lunch & Best Project Award Spring 2019: 12:30–12:50PM → Motive Power Digital Hydrometer
Team 5: Sahithi Chatradi, Simone Kolb, Samer Kiblawi, Erik Orlowski, Jeanette Ramos – Sponsor: Storage Battery Systems

Team 4: 1:00 – 2:50PM → Smart Ultrasonic Walking Stick
Sean Clintsman, Muntader Al Nasser, Oluwaseun Osiyemi, Alexander Wabiszewski
EE595 Capstone Design Presentations

Friday, Dec 13

EMS-E237 Presentations

Team 5: 8:30 – 10:20AM → Portable Programmable Signal Generator
Anthony Sadowski, Phillip Steinberg, Michael Striepling

Team 6: 10:30 – 12:20PM → Data Logging Power Meter
Michael Grimm, Adam Rubin, Ryan Willms, Andrew Zendek

Lunch & Best Project Award Spring 2019

Room E250: 12:30–12:50PM → Motive Power Digital Hydrometer
Team 5: Sahithi Chatradi, Simone Kolb, Samer Kiblawi, Erik Orlowski, Jeanette Ramos
Sponsor: Storage Battery Systems
EE-595
CNC E&H Probe

Andrew Krill
Matt Rohr
Hassan Al Zawad
Ahmed Al Abdulbaqi

Source: https://www.youtube.com/watch?v=dEKFAcm_lsk
Purpose of the Project:

This product will scan and generate a map of electric and magnetic (EM) field emission intensity for preliminary Electromagnetic Compatibility (EMC) testing, using a CNC system to move a loop probe over a Device Under Test (DUT).

Key Features:

This device will measure emissions from 30MHz to 1GHz.

Market:

The target market is the United States, specifically companies that design products that need preliminary EMC testing for design.
Product Costs:
Sales Price: $4000, Component Cost: $1000
Assembly and Test Costs: $1000

Environment:
Indoor, Lab Environment
Operating Temp Range: 15°C to 25°C
Operating Humidity: 0% to 70%

Power Inputs:
Commercial USA AC Power: 102V-132V @ 60Hz ± 3Hz
Max Current: 1.6A (p değerlendirmesi)

Major Functions, Quantities Measured:
Frequency Range: 30MHz - 1GHz
Scan Resolution: 1x1mm (minimum)
Should be 2MHz receiver bandwidth (minimum)
Sensitivity: -70dBm (minimum)
A RF Front End: (Andrew Krill)
B Serial and UIs: (Matt Rohr)
C Controllers: (Matt Rohr & Andrew Krill)
D Motor Driver: (Hassan Al Zawad)

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PCB 1  PCB 2  PCB 3  Enclosures 1, 2, 3
EE-595

Automated Pour Over

- Nick Giovannetti
- Joe Skogman
- David Werner
- Kyle Wurster
Project Description

- Replicates the pour over brew method
- Emphasis on precise coffee to water weight ratio
- PID tuned temperature and flow control
- User friendly interface for tracking the brew process
- Comprehensive sensor network for monitoring key variables

"Pour over coffee is regarded as the cleanest and best way to enjoy specialty coffee"
Key Requirements

Cost
- Sales Price: $500
- Component Cost: $250
- Assembly/Testing Cost: $50

Environment
- Home or Commercial use

AC Power
- Min: 102VAC
- Max: 132VAC
- Nom: 120VAC
- @ 10 Amps Max Current

Functions
- Fill Boiler
- Bring Boiler to temp
- Weigh grind / cup
- Brew Process (Step 1 → Step 5)
- On / Off / Idle

Key Tracked Quantities
- Water Temp Control Accuracy
  +/− 3º C
- Water temp Sensor Accuracy
  +/− 2º C
- Flow Control Accuracy
  +/− 5 ml/s
- Flow Sensor Accuracy
  +/− 2 ml/s
- Weight Scale Accuracy
  +/− 2 grams

Never had a pour-over coffee? Try it out during our presentation
Smart Ultrasonic Walking Stick
Team 4

- Alexander Wabiszewski
- Muntader Al Nasser
- Oluwaseun Osiyemi
- Sean Clintsman

Smart Ultrasonic Walking Stick

- Smart walking stick for visually impaired
- Assists in everyday tasks
- Alerts user of nearby obstacles with vibration and audible buzzer
- Volume control for multiple environments
- Intended Market – United States
- Rechargeable
- Long battery life
- Multiple sensors allowing for full forward coverage of obstacle detection
Key Requirements Summary

Cost
- Sale Price: $100, Component Cost: $40, Assembly & Test costs: $20

Environment
- Indoor, Outdoor
- Operating Temp Range: -20°C to 50°C
- Operating Humidity Range: 0-100%

Power Input(s)
- Battery Power: Nominal 3.7V @ 1A max current, Li-Ion 3.7V

Major Functions, Quantities Measured, Displayed
- Functions: On, Off
- Quantity Measured: Range
- Range: 1.5 meters, Accuracy: +/- 0.1 meter, Resolution: 0.1 meter
- Buzzer will operate at a nominal of 80 dBA (Volume Adjustable)
There are two Obstacle Detectors located in different positions in the product case (2 PCBs)
EE-595: Capstone Design Project
Portable-Programmable Signal Generator
Team #5

- Tony Sadowski
- Phil Steinberg
- Mikey Striepling

MTI's 1510A Signal Generator for Field Testing and Calibration
Portable Programmable Signal Generator
High Level Product Description

• Purpose of Product:
  • Portable waveform generator that can output a programmable signal based on user input.

• Product Application:
  • Used for testing and troubleshooting components/equipment in a field setting.

• Major Feature 1:
  • Sine, Square, and Sawtooth signal generation

• Major Feature 2:
  • User capable of adjusting/programming frequency, amplitude, sequence of waveforms, and time delays

• Major Feature 3:
  • Resistive to EMI, water ingress, and mechanical shock.

• Major Feature 4:
  • Portable & Rechargeable
  • Intended for sales in the United States and Canada
Key Requirement Summary

• **Cost:**
  • Sales Price: $500
  • Material Cost: $200
  • Assembly and Test: $50

• **Environment:**
  • Indoor and Outdoor Applications
  • Operating Temp:
    • -20°C to 50°C
  • Operating Humidity:
    • Max 80%

• **Power Inputs:**
  • AC Power: 102 – 132 VAC, Nominal
    120 VAC input @ 2A Max
  • Battery Power: 3.7 VDC Nom.
    Lithium-Ion Battery @ 0.7A Max

• **Major Functions:**
  • On/Off, Waveform, Amplitude, and Frequency Selection

• **Quantities Displayed:**
  • Waveform Type: Show the type
  • Frequency Out: 1 to 1MHz, +/-5%
  • Amplitude Out: 0V to 15V, +/-500mV
EE-595
Data Logging Power Meter
Team #6

- Michael Grimm
- Adam Rubin
- Ryan Willms
- Andrew Zendek
Data Logging Power Meter
High Level Description

Purpose of Product: Real-time measurements of single-phase RMS voltage and RMS current, used to perform power calculations. All measurements and calculated power values can also be logged into a memory card.

Major Feature #1: Has the ability to log measured data into an SD Memory card over long periods of time.

Major Feature #2: Has the ability to calculate real, reactive and apparent power, and power factor.

Major Feature #3: Is a mobile device that contains a rechargeable battery.

Intended Market: U.S. and Canada
# Key Requirements Summary

## Costs:

- Sale Price: $150.00
- Component Cost: $50.00
- Assembly & Test Cost: $50.00

## Environment:

- Usability – For mobile use
- Operating Temperature range: For Indoor & outdoor use between \((-30 \text{ to } 55) \degree\text{C}\)
- Humidity Range: 0 to 90 %

## Power Input(s):

- AC Power: 102 – 132 VAC, @ 0.5 A max
- Battery Power: 3.7V Nom. @ 2A max, Li-Ion Battery
- Power Efficiency greater than 80%

## Major Function(s), Performance Requirements:

- On, Off, Record Data
- Frequency Response Range: 47 – 1 KHz.
- Power Accuracy: +/- 0.5% (Min)
- Update Frequency: 1 Hz
**Block Ownership**

1. Power Supply: Andrew Zendek
2. Microcontroller: Michael Grimm
3. Power Sensing: Ryan Willms
4. Display/Memory: Adam Rubin

**Inside Product Case**

1. Enclosure 1
2. Enclosure 2

**External Power Supply**

- Block 1: Power Supply
  - 120VAC In
  - Power Supply
  - 12VDC Out
  - External Power Supply (Wall Mounted)

- Block 2: Microcontroller
  - Microcontroller
  - Switch Input
  - 3 Switches
  - Digital Interface

- Block 3: Power Sensing
  - Voltage Measurement
  - Current Measurement
  - Real Power Calculation
  - Reactive Power Calculation
  - Power Factor Calculation

- Block 4: Display / Memory
  - SD Card Interface
  - Removable SD Card
  - Display Driver
  - LCD Screen

**Power Distribution**

- Li-Ion Batteries
- Battery Charging
- 3.3VDC
- 5VDC