Aggie Engineering Capstone Design Program

Pilot (Fall 2018 – Spring 2019)

by
Dr. Gabe Garcia
Director of Engineering Design

Aggie Engineering Capstone Design Program

Initiative by the College of Engineering at NMSU to provide students with a capstone experience that is more attuned to real-life experience.

- Expose students to projects defined by industry
- Projects that are interdisciplinary in nature

Traditional Capstone Projects

- Conducted by individual departments
- Projects only involved students from a single engineering discipline
- Instructor supervised all projects
  - Client
  - Mentor
- Projects didn't always meet expectations

Engineering Capstone I/II
ENGR 401/402

Course Objectives

- Work in interdisciplinary teams to meet a common senior design project goal.
- Apply the knowledge gained from their undergraduate courses towards a culminating senior design project.
- Develop alternative designs and implement methodology to identify best design.
- Design prototype, test, and demonstrate design solution.

ENGINEERING CAPSTONE I/II
ENGR 401/402

Topics

- Information and Communication
- Team Dynamics
- Problem Formulation
- Concept Generation
- Optimum Design
- Project Management
- Engineering Economics
- Manufacturing Considerations
- Ethics, safety, product liability
- Entrepreneurship

ENGINEERING CAPSTONE I/II
ENGR 401/402

ENGR 401

- Weekly progress reports
- Conceptual Design Report
- Conceptual Design Presentation
- Preliminary Design Report
- Preliminary Design Presentation

ENGR 402

- Weekly progress reports
- Construction Milestone I
- Construction Milestone II
- Final Design Report
- Final Design Presentation
- Performance Outcomes

Project Management Software

- EduSourced - client-based experiential learning program
    - project submissions
    - matching students into projects
    - monitoring project progress
    - student-client communications
    - outcomes assessment
    - archiving of all records

Aggie Engineering Capstone D...   +

https://engrcdp.nmsu.edu   150%   Q Search

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New Mexico State University

Aggie Engineering Capstone Design Program

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Capstone Projects at NMSU

Watch later   Share

College of **Engineering**

Engineering Is Discovery!

ENGINEERING CAPSTONE I/II
ENGR 401/402

DASHBOARD PROJECTS GLOBAL FILES USERS STUDENTS CLIENTS SETTINGS PROJECT

GABE
LOGOUT

NM STATE
New Mexico State University
College of Engineering

My Projects Proposed Accepted **Active** Archived Declined

nmsucdp

search projects

EMAIL PROJECT BID 🗑 ARCHIVE ALL

Sort By:
alphabetical (A-Z)

Category:
show all

Date:
From: To:

RESET APPLY

Calculex Project

🔖 *Electrical Engineering* 💼 *CALCULEX* 🎓 3 👤 1

ACTIVE
Started on:
Sep 5, 2018

Correlation of simple FEA and actual cantilever beams

🔖 *Mechanical Engineering* 💼 *APTIV* ✉ *Email clients* 🎓 5 👤 1

ACTIVE
Started on:
Aug 31, 2018

Electrostatic Discharge Study

🔖 *Electrical Engineering...* 💼 *Los Alamos National Laboratory* ✉ *Email clients* 🎓 4 👤 1

ACTIVE
Started on:
Aug 8, 2018

Event Detection on Mobile Platform

💼 *Honeywell FM&T* ✉ *Email clients* 🎓 5 👤 1

ACTIVE
Started on:
Aug 20, 2018

SmartGuide

DASHBOARD PROJECTS GLOBAL FILES USERS STUDENTS CLIENTS SETTINGS PROJECT

GABE
LOGOUT

NM STATE
New Mexico
College of E

My Projects | Proposed | Accepted | Active | Archived | Declined

nmsucdp2 ▼

Check Weigher Re-design

PROPOSED

Submitted on:
Nov 28, 2018

🗁 *Agmechtronix* 🔖 *Electrical Engineering, Mechanical Engineering, Agricultural Engineering*

ACCEPT PROPOSAL?

✔ YES | ✖ NO

⬇ show client details ✉ Email clients ✏ Edit this project 🖳 Move to program

OVERVIEW | TEAM | BUDGET | DISCUSSIONS | FILES

OVERVIEW

Description

The Agmechtronix Check Weigher is a device that weighs small bags of produce as they roll over a conveyor belt. If the weight is out of the programmed specifications, it has an arm that kicks the product out of the stream. A new design and prototype is desired to improve the reliability, manufacturability and accuracy of the device. The design will include both the mechanical design of the device as well as the electrical design. The current electrical design is a custom printed circuit board using a Microchip Digital Signal Processor reading the weight from load cells.

Summary

The mechanical and electrical re-design and prototype of a check weigher that can weigh product such as onions as they move over a small conveyor belt. The mechanical design will include bent, laser cut parts. The electrical design will include printed circuit board design and microcontroller/DSP programming in C.

Project Team Discipline Request, Select One For Each Student You Need From The Given Discipline.

Electrical and Computer Engineering

Project Team Discipline Request, Select One For Each Student You Need From The Given Discipline.

Electrical and Computer Engineering

Check Weigher Re-design

Agmechtronix   Electrical Engineering, Mechanical Engineering, Agricultural Engineering

ACCEPT PROPOSAL?

✔ YES   ✖ NO

⬇ show client details   ✉ Email clients   ✏ Edit this project   📋 Move to program

OVERVIEW | **TEAM** | **BUDGET** | **DISCUSSIONS** | **FILES**

TEAM

ADD A TEAM MEMBER

Instructors
None

Mentors
None

Students
None

⬆ **Bidding Results**

Dominick Cordova (1)

Samson Estrada (1)

Cisco Gonzales (1)

Christopher Harlow (1)

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Your Seminar Leader
David Burstein, PE

B.S., M.S. Civil Engineering from NMSU

26 years with Parsons Corp. (environmental subsidiary)
- Project Manager
- Dept. Manager
- Office Manager
- Regional Manager
- U.S. Operations Manager
- President of Parsons Engineering Science, Inc.
- President of Harland Bartholomew Associates

Affiliated with PSMJ since 1979
- Part time from 1979 – 1997
- Full time since 1997

Authored 5 books including 3 on project management

Your Graph Should Look Like This
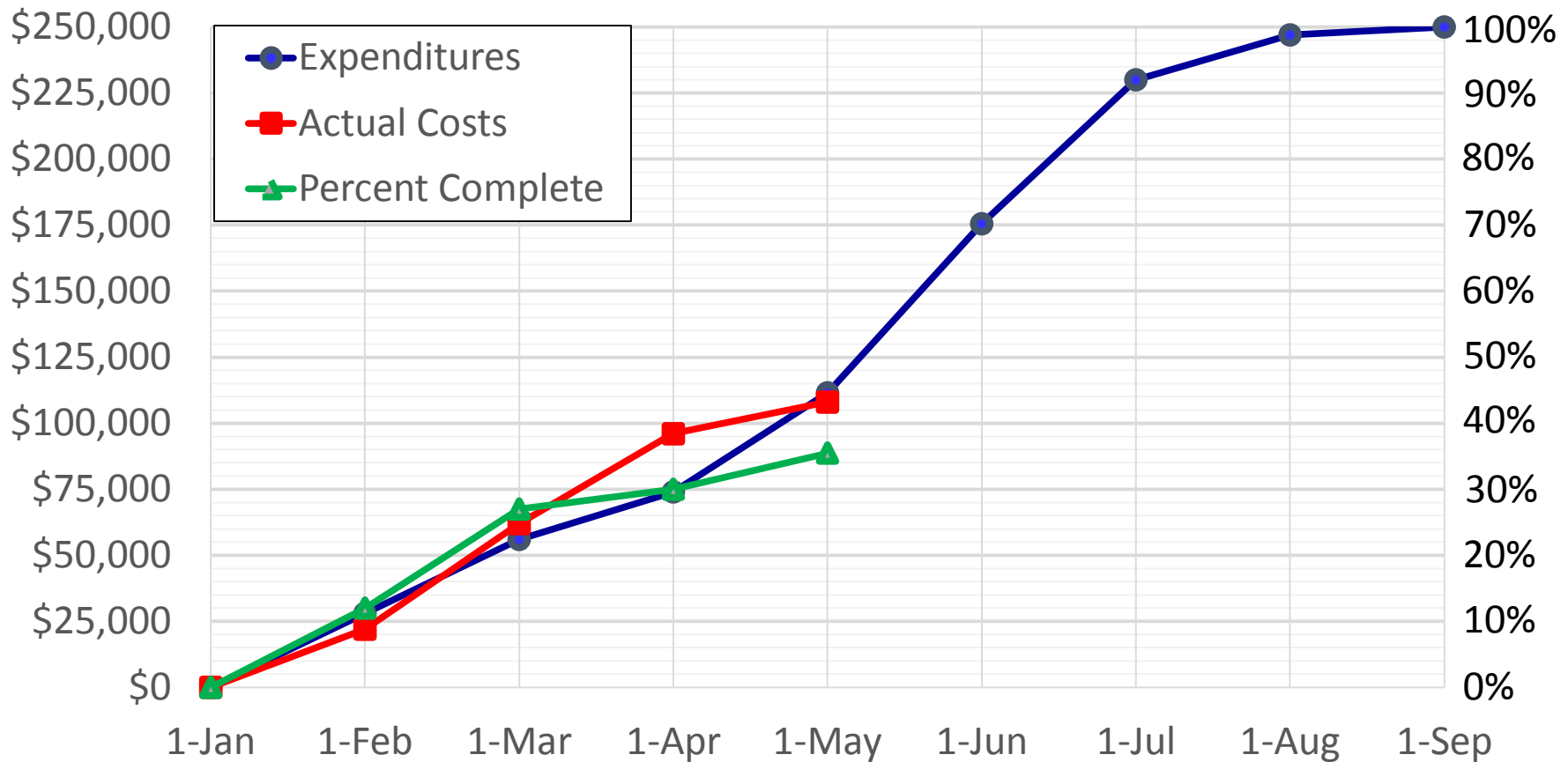
Do You Have What it Takes to Become a Successful PM?

Essential Traits
- Tempo
- Team
- Tolerance of Structure
- Wants to Lead
- Teaching
- Provides Direction
- Collaborative
- Takes Initiative
- Prolific Quality
- Systematic

Traits to Avoid
- Avoids Communication
- Uncertain Disinterest
- Precise But Slow
- Blindly Optimistic
- Cautious Inattention
- Rebellious Autonomy
- Careless Pessimism
- Cool Permissiveness
- Laser Logical
- Authoritarian

Event Detection on Mobile Platform

Started on:
Aug 20, 2018

Honeywell FM&T   Fall 2018

ARCHIVE?

✖ ARCHIVE

⬇ show client details   ✉ Email clients   ✎ Edit this project

| OVERVIEW | TEAM | BUDGET | DISCUSSIONS | FILES | MILESTONES | TASKS | TIME | SURVEYS |

TEAM

EMAIL ▼   ADD A TEAM MEMBER

Instructors

Kevin Farrah

Mentors

Laura Boucheron

Students

Robert Gonzales

Hiram Gleason, *lead engineer*

Lizbeth Ascencio, *project manager*

Caleb Englehart

Jacob Smith, *document engineer*

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Ed Archuleta, PE

- ➢ B.S., M.S. Civil Engineering from NMSU

- ➢ Master of Management degree from UNM

- ➢ Manager of the El Paso Water Utilities Public Service Board (1989 until retirement in 2013)

- ➢ Appointed by President Bush to National Infrastructure Advisory Council and National Academy of Engineering/Science

- ➢ Appointed by President Barack Obama to represent U.S. as Chairman on Pecos River Compact Commission

- ➢ UTEP Director of Water Initiatives (from 2013)

- ➢ Engineering Advisory Board of NMSU and UTEP

- ➢ American Academy of Environmental Engineers Diplomat

- ➢ Active in many local and national civic associations

Kevin Farrah

➢ Retired from the National Aeronautics and Space Administration (NASA) after thirty year career.

➢ Operations Director (OD) of Altitude Systems in White Sands Test Facility (WSTF) Propulsion Test Office.

➢ Controlled resources and budgets by using project management tools such as Work Breakdown Structure (WBS) utilizing Microsoft Project, and utilizing Earned Value Management by monitoring Cost Performance Index (CPI) and Schedule Performance Index (SPI).

➢ Established test requirements and approved test experiment design, test plans, and test preparation procedures for projects.

➢ Served as liaison between WSTF and customer for all assigned projects. Worked with customers from other NASA centers, NASA Headquarters, DOD, MDA, and private industries.

➢ Managed test teams of various disciplines on assigned projects, tiger teams, and investigation boards as appointed.

Statement of Work / Requirements

The capstone group assigned to this project shall construct a working prototype of a mobile system with various sensors including a camera. The system shall leverage machine learning to complement and improve driver performance over a defined course.

An example of project phases are as follows:

- Define performance characteristics (i.e. lap time, smoothness, etc.)
- Define measurement methods (i.e. image processing, other sensors)
- Develop software to analyze performance
- Develop performance optimization system
- Demonstrate system prototype to sponsor

CSF AND SCOPE

CLIENTS ISSUE

Honeywell wants to hire the fastest and safest drivers

CLIENT'S CSF

Build a machine learning mobile system to complement and improve driver performance over a defined course.

SMART OBJECTIVES

Objective 1

To assist driver's performance and improve them

Objective 2

To learn from the best drivers to keep the bar set high for others

Objective 3

To make the safest and fastest drivers

SCOPE

Task 1

Get robot or vehicle to test driver

Task 2

Install sensors, camera on test vehicle/robot

Task 3

Program system to learn from excellent drivers

Task 4

Program system to train low performing drivers

Task 3

Test mobile system

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Event Detection on Mobile Platform

📁 *Honeywell FM&T*   📅 *Fall 2018*

ARCHIVE?

✖ ARCHIVE

⬇ *show client details*   ✉ *Email clients*   ✏ *Edit this project*

| OVERVIEW | TEAM | BUDGET | DISCUSSIONS | 8 FILES | MILESTONES | TASKS | TIME | SURVEYS |

MILESTONES

Weekly Report 1 Public	10/15/2018	📎 ✔
PlanTrax Tutorial Public	10/17/2018	📎 ✔
PlanTrax Project Public	10/22/2018	📎 ✔
Weekly Report 2 Public	10/22/2018	📎 ✔
Conceptual Design Presentation to Client Public	10/26/2018	📎 ✔
Weekly Report 3 Public	10/29/2018	📎 ✔
Conceptual Design Report Public	11/5/2018	📎 ✔
Weekly Report 4 Public	11/12/2018	📎 ✔
Weekly Report 5 Public	11/26/2018	📎 ✔

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Engineering Capstone Design Weekly Progress Report

Project Title	Event Detection on Mobile Platform
Reporting Week	Start Date: 10-22-2018 · End Date: 10-28-2018
Prepared By	Jacob Smith

Agenda for the meeting
1. Decide on what to finish this week
2. Assign task to each member

Accomplishments since last meeting
1. Research standards for "good driving" and Sensors
2. We finish the conceptual design presentation
3. We decided to use raspberry pi
4. Met with Dr. Sun

Tasks completed by each team member since last meeting

Task Description	Team Member	Completed
Talk to Dr. Sun	Lizbeth	yes
Model Scaling	Kaleb	Yes
Hardware and Software Research	Robert	Yes
Conceptual Design Report	Hiram	Yes
Conceptual Design Presentation	Jacob	Yes

Plans for next week
1. Give our presentation to client
2. Get a list of materials
3. Submit final SOW

Tasks assigned to each team member (to be completed before next meeting)

Task Description	Team Member
Purchasing materials and talking to Keith (Client)	Lizbeth
Research and decide on what remote controller to use	Kaleb
Complete a new SOW	Robert
System requirements	Hiram
System requirements and risk / Documentation	Jacob

Difficulties Encountered in Reporting Week
Provide information on the difficulties and issues that you encountered in the reporting week.

Our client was on vacation this week so we are waiting for him to come back to present out conceptual design to him.
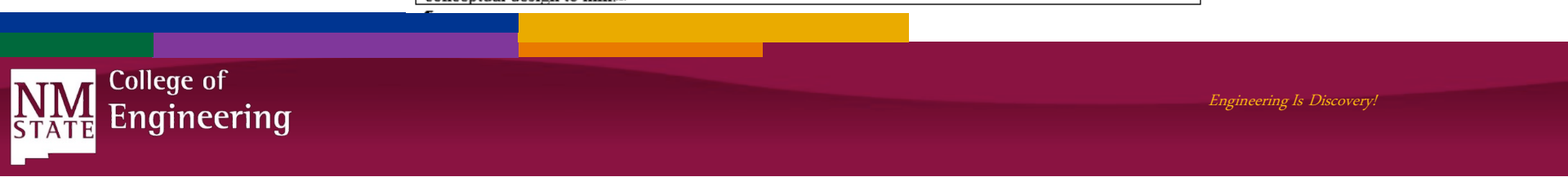
Event Detection on Mobile Platform

ACTIVE

Started on:
Aug 20, 2018

Honeywell FM&T   Fall 2018

ARCHIVE?

✖ ARCHIVE

show client details   Email clients   Edit this project

OVERVIEW	TEAM	BUDGET	DISCUSSIONS	8 FILES	MILESTONES	TASKS	TIME	SURVEYS

TIME

ADD TIME

User	Date	Hours	Description		
Lizbeth Ascencio	Feb 01, 2019	3.50	Making IMU sensor work	✎	🗑
Robert Gonzales	Feb 01, 2019	2.50	Discussed using GPS unit for project. Performed troubleshooting on IMU chip.	✎	🗑
Robert Gonzales	Jan 31, 2019	2.50	Troubleshoot not being able to read values from IMU.	✎	🗑
Caleb Englehart	Jan 31, 2019	2.50	More troubleshooting w/ IMU, research on GPS units	✎	🗑
Jacob Smith	Jan 31, 2019	2.50	Trouble shooting imu trying to get values to read	✎	🗑
Robert Gonzales	Jan 30, 2019	1.00	Research machine learning practices.	✎	🗑
Hiram Gleason	Jan 25, 2019	0.50	Meeting with class instructor	✎	🗑
Hiram Gleason	Jan 25, 2019	2.00	Looked into gps systems to get data from and to PI	✎	🗑
Caleb Englehart	Jan 25, 2019	2.50	Troubleshoot connection issues with Raspberry Pi and IMU. Libraries installed and IMU is enabled, attempted to read gyr	✎	🗑
Robert Gonzales	Jan 25, 2019	0.50	Meeting with class instructor. Instructor gave us a few ideas to aid in our image processing.	✎	🗑
Robert Gonzales	Jan 25, 2019	2.50	Troubleshoot connection issues with Raspberry Pi and IMU. Libraries installed and IMU is enabled, attempted to read gyr	✎	🗑
Lizbeth Ascencio	Jan 25, 2019	0.50	Meeting with Dr. Garcia	✎	🗑
Caleb Englehart	Jan 25, 2019	0.50	Meeting with class instructor.	✎	🗑
Lizbeth Ascencio	Jan 25, 2019	2.50	Troubleshoot connection issues with Raspberry Pi and IMU. Libraries installed and IMU is enabled, attempted to read gyr	✎	🗑

Event Detection on Mobile Platform	10/15/2018 - | 30.25	10/22/2018 - | 24	10/29/2018 - | 27	11/5/2018 - | 21	11/12/2018 - | 22.5
Robert Gonzales	1.24 | 7.5	0.83 | 4	1.11 | 6	1.43 | 6	1.22 | 5.5
Hiram Gleason	0 | 0	0 | 0	1.02 | 5.5	0 | 0	0 | 0
Lizbeth Ascencio	1.36 | 8.25	1.25 | 6	1.11 | 6	0.71 | 3	1.56 | 7
Caleb Englehart	1.24 | 7.5	1.67 | 8	0.74 | 4	1.43 | 6	1.33 | 6
Jacob Smith	1.16 | 7	1.25 | 6	1.02 | 5.5	1.43 | 6	0.89 | 4

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ENGR 401/402

Fall 2018 – Spring 2019

- 77 students working on 16 projects
- 15 faculty mentors
- Engineering Disciplines
  - ME, AE, IE, EE

9 Industry Clients supporting 14 projects and the remaining projects supported by faculty with indirect support from Industry and support by the program

Spring 2019 – Fall 2019

- 62 students working on 10 projects
- 7 faculty mentors
- Engineering Disciplines
  - ME, AE, IE, EE

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Sponsor Benefits

- Access to an enthusiastic team of students with fresh perspectives to solve design problems
- Opportunities to work with faculty members with expertise in their respective fields
- Opportunities to become familiar with top students and potential future employees
- Low-cost solutions to your engineering problems
- Brand recognition
- Access to further research and other resources at the College of Engineering

Budget

- Corporate Sponsor Cost per project -- 6K
  - Design Project budget -- 2K/project

- Program Costs
  - Project mentor costs -- (12K)
  - Faculty Mentors (20K)
  - Software costs (15K)