2018-19 Senior Design projects

487 AEROSPACE PROJECTS

Professor Bai B1

Energy-efficient UAVs

Description: The goal of this project is to design, fabricate, and test an UAV that can exploit solar energy and atmospheric convection to extend flight duration, increase performance and reduce energy consumption. The design and fabrication shall be finished by the fall. Flight testing will be done in the spring. The basic requirements include:

- The UAV can use solar and thermal energy.
- The UAV can fly with a specified speed.
- The UAV shall fly within the lateral and vertical boundaries of some predefined operating area.
- The UAV can avoid possible objects along the path, such as trees if fly outdoor or walls if fly indoor.
- The UAV can safely land on the ground any time through a button away from UAV.

Professor Bilgen B2

A Novel Quad-Copter “Drone” with Solid-State Rotors

The goal of this project is the design, analysis, fabrication and testing of a small quad-copter unmanned aerial vehicle (UAV) that utilizes smart materials to achieve control and improvement of performance of its rotor blades.
The team will design, fabricate and test multiple iterations of the solid-state rotors as well as power/sensing electronics and control algorithms. The prototypes will be implemented on a quad-copter for demonstration purposes.

The students should be very comfortable with at least one of the following: 1) Design and analysis software such as Matlab, XROTOR, XFOIL, AVL, Ansys, Fluent, Solid Works, Siemens NX or other CAD packages, LabVIEW, etc.; 2) Simple analog or digital electronics such as resistors, capacitors, op-amps, microcontrollers (i.e. Arduino), simple wiring, etc.; 3) Fabrication techniques such as 3D printing, bonding, vacuum bagging, manual fabrication, etc.

All team members are expected to have an exceptional work ethic and dedication to the project. Students having a high course load in their senior year should consult Dr.

Bilgen before applying. Students from all backgrounds who are interested in continuing to graduate school are highly encouraged to join. Please contact Dr. Bilgen via email to arrange a tour of the Smart Systems Laboratory.

Similar working models can be seen at the YouTube link below:
[http://www.youtube.com/watch?v=KxTJBp53nO0]

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Professor DeMauro D1

GoFly Competition

Delta Wing: Group will be required to build and fly a working delta wing airplane. The delta wing will be controlled from the ground and will be required to takeoff, land, and perform a coordinated turn. The first semester will specifically focus on the design and analysis work; the second semester will focus on building each plane. By the end of the first semester, the groups are expected to produce detailed working drawings, 3D CAD drawings, and a 3D assembly drawing. Tolerances must be provided on the working drawings. The major requirements for the aircraft are:

a. Fixed delta wing
b. Provide justification for the selection of the wing airfoil shape
c. Take-off and land under its own power
d. Can perform a coordinated turn
e. The wingspan of the aircraft cannot be larger than 4 feet

The mission profile for the plane includes taxi, takeoff, climb, cruise, descent, and landing, with at least one turn. The plane will be judged based on how it meets the criteria, maximum weight, flight speed, etc., and the total budget. Also, justifications must be provided for design choices, such as airfoil selection, aspect ratio, tail design, etc. Groups are expected to give weekly project updates via PowerPoint. It is highly encouraged that students have taken are will be taking aerodynamics and flight dynamics.

Professor Diez D2
Professor Diez D3

Professor Knight K1

Design of Model Rocket Engine Thrust Stand

Introduction and Eligibility

There will be two groups (K1 and K2) with a maximum of five students per group. Groups K1 and K2 are open to Aerospace Engineering majors only.

Design Project

Each group will design a tabletop test stand for measuring the thrust of a model rocket engine.

Conceptual Design

A literature survey will be performed to assess the state-of-the-art.

Preliminary Design

A preliminary design will be completed by the eighth week of class and submitted to the instructor as a report from each group.

Final Design

The final design including all drawings and specifications will be completed by the end of the Fall semester and submitted to the instructor as a report from each group. The report will include all parts and budget.

Fabrication and Testing

Fabrication and testing will be performed during the Spring semester. All tasks will be completed by the end of the twelfth week.

Final Report

The final report from each group will be due during the last week of class.

Tasks

The following tasks will be performed: 1) design of test stand including Graphical User Interface, 2) CAD model of test stand, 3) fabrication and validation of test stand, 4) maintain up-to-date budget within the limit set by the Department, 5) maintain Sakai website with all results .

Meetings

There will be weekly meetings with the instructor. For each group, one member will make a 15 min Power-Point presentation including the following information: 1) Tasks accomplished during the previous week, 2) Tasks assigned for the next week (each person named), 3) Technical challenges and questions. The presenter for each group will rotate among the entire group.

Professor Knight K2

Design of Model Rocket Engine Thrust Stand

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