

COEN/ELEC 490 Project Description:

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- **Project Title: Final Year Aircraft Design Project**

Description:

This project is being offered by the NSERC Chair in Aerospace Design Engineering (NCADE), Dr. Catharine Marsden.

Project description

Students enrolled in this project will form a single integrated product development team (IPDT) and will design an entire aircraft from a blank sheet of paper. The IPDT will be modeled after a typical industrial aerospace design team, and each individual will be assigned a discipline for which he/she will be responsible within the team (structure, powerplant, avionics, electrical, systems, performance, stability and control, aerodynamics, control systems, etc.).

Project outline

The IPDT will be provided with a Request for Proposals (RFP) in September 2016. The RFP will detail the customer needs for the new aircraft in terms of anticipated mission, performance and cost requirements and constraints.

Over the course of the first semester, the IPDT will be expected to perform the following conceptual design tasks:

- Determine detailed customer needs and formulate the design problem
- Establish performance parameters and measurable measures of merit for functional requirements
- Collect data on existing designs and brainstorm multiple design concepts that meet the requirements
- Decide on a single design concept using a systematic decision-making process (trade study) and produce a simple geometric model
- Perform aerodynamic analysis and propulsion modeling in support of a constraint analysis to demonstrate that the concept meets the customer requirements and constraints
- Carry out mission analysis, weight prediction and aircraft sizing tasks
- Analyze anticipated costs and compare to customer cost constraints
- Provide a preliminary structural layout

Over the course of the second semester, the IPDT will be expected to perform the following tasks in support of the preliminary systems design:

- Aerodynamic analysis supported by modeling and test
- Avionics and control systems development supported by modeling and test
- Cockpit configuration to meet visibility requirements, instrument and flight controls layout supported by modeling and test
- Development of a refined structural concept with material selection and stress analysis of major components supported by modeling and test
- Aircraft systems (electrical, fuel, landing gear, hydraulic, environmental, etc.) selection, definition and layout supported by modeling/simulation and test
- Create detailed three-dimensional CAD models of the aircraft external surfaces, structure and systems
- Provide detailed cost estimates, risk analyses and certification plan.

Project format

The IPDT will meet formally for three hours, once a week in the NCADE Design Office. **Attendance is mandatory.** At the beginning of the year, the meetings will be used for short seminars on topics with which the students may not be familiar, and to introduce them to available resources and research material. After the first 4 weeks, the meetings will be used for the IPDT to present their Weekly Design Review detailing the status of the design with respect to the Design Requirements, the work accomplished and the objectives for the following week. The Weekly Design Reviews will be open to invited guests from faculty and industry who will question students, comment on the validity and/or feasibility of the design and provide advice.

There will be two major design reviews at the end of each semester. Students will be responsible for inviting and hosting guests, preparing the venue for the design review, presenting the design and responding to questions.

Text

It is strongly recommended that students have a copy of the following text:

Aircraft Design: A Conceptual Approach by D.P. Raymer

Student Requirements:

- The enrollment for this project is limited to 10-15 students and the project is cross-disciplinary. Students may be from any engineering discipline as long as their knowledge base can be applied to the design and development of aircraft systems.
- Students must be genuinely interested in aircraft and aerospace engineering. There will be a significant amount of independent and peer-learning required.
- Students must be prepared to work hard and devote many hours to the project.
- Attendance at once a week meetings is mandatory.

Number of Students: 10-15 total from all disciplines