DEPARTMENT: School of Aeronautics and Astronautics  
EFFECTIVE SESSION: Spring 2011

INSTRUCTIONS: Please check the items below which describe the purpose of this request.

- [x] New course with supporting documents
- [ ] Add existing course offered at another campus
- [ ] Expiration of a course
- [ ] Change in course number
- [ ] Change in course title
- [ ] Change in course credit type
- [ ] Change in course attributes (department head signature only)
- [ ] Change in instructional hours
- [ ] Change in course description
- [ ] Change in course requisites
- [ ] Change in semesters offered (department head signature only)
- [ ] Transfer from one department to another

PROPOSED:

Subject Abbreviation: AAE  
Course Number: 35103
Long Title: Aerospace Systems Design
Short Title: Aerospace Systems Design

TERMS OFFERED:

Check All That Apply:
- [ ] Summer
- [ ] Fall
- [x] Spring

CAMPUS(ES) INVOLVED:

- Calumet
- Cont Ed
- Ft. Wayne
- Indianapolis
- N. Central
- Tech Slatewide
- W. Lafayette

Abbrivated title will be entered by the Office of the Registrar if omitted. (20 CHARACTERS ONLY)

CREDIT TYPE

1. Fixed Credit: Cr. Hrs. 3
2. Variable Credit Range: Minimum Cr. Hrs. (Check One) Or Maximum Cr. Hrs.
3. Equivalent Credit: Yes  No

SCHEDULE TYPE

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COURSE ATTRIBUTES: Check All That Apply

1. Pass/Not Pass Only
2. Satisfactory/Unsatisfactory Only
3. Repeatable
4. Credit by Examination
5. Special Fees
6. Registration Approval Type
   - Department [ ]
   - Instructor [ ]
7. Variable Title
8. Honors
9. Full Time Privilege
10. Off Campus Experience

COURSE DESCRIPTION (INCLUDE REQUISITES/RESTRICTIONS):

Prerequisite: AAE29100
Aerospace system lifecycle and design process. Stakeholder needs elicitation and requirements generation. Quality function deployment and hierarchical objective trees. Concept generation and creativity techniques. Introduction to safety, risk, cost and value analysis. Critical evaluation of the applicability of systems engineering techniques in specific contexts. Application of these techniques to a term semester design project.

* COURSE LEARNING OUTCOMES:

By the end of this course, it is expected that students will make gains in their ability to:

1) identify appropriate tools, methods and processes to formulate an aerospace system design problem including realistic constraints from technical, economic, social, political, safety, and other relevant contexts
2) apply those tools, methods and processes to generate solutions to the aerospace system design problem.

OFFICE OF THE REGISTRAR
### PURDUE UNIVERSITY
REQUEST FOR ADDITION, EXPIRATION, OR REVISION OF AN UNDERGRADUATE COURSE
(10000-40000 LEVEL)

DEPARTMENT: School of Aeronautics and Astronautics
EFFECTIVE SESSION: Spring 2011

**INSTRUCTIONS:** Please check the items below which describe the purpose of this request.

- [x] 1. New course with supporting documents
- [ ] 2. Add existing courses offered at another campus
- [ ] 3. Expansion of a course
- [ ] 4. Change in course number
- [ ] 5. Change in course title
- [x] 6. Change in course credit/type
- [ ] 7. Change in course attributes (department head signature only)
- [ ] 8. Change in instructional hours
- [ ] 9. Change in course description
- [ ] 10. Change in course prerequisites
- [ ] 11. Change in semesters offered (department head signature only)
- [ ] 12. Transfer from one department to another

**PROPOSED:**

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Abbreviated title will be entered by the Office of the Registrar if omitted. (50 characters only)

**CREDIT TYPE**

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**COURSE ATTRIBUTES:** Check All That Apply

- [ ] 1. Pass/Not Pass Only
- [ ] 2. Satisfactory/Unsatisfactory Only
- [ ] 3. Repeatable
- [ ] 4. Credit by Examination
- [ ] 5. Special Fees
- [ ] 6. Registration Approval Type
- [ ] 7. Variable Title
- [ ] 8. Honors
- [ ] 9. Full Time Privilege
- [ ] 10. Off Campus Experience

**COURSE DESCRIPTION (INCLUDE REQUISITES/RESTRICTIONS):**

Prerequisites: AEAE2500

Aerospace system lifecycle and design process. Stakeholder needs elicitation and requirements generation. Quality function deployment and hierarchical objective trees. Concept generation and creativity techniques. Introduction to safety, risk, cost and value analysis. Critical evaluation of the applicability of systems engineering techniques in specific contexts. Application of these techniques to a team semester design project.

**COURSE LEARNING OUTCOMES:**

By the end of this course, it is expected that students will make gains in their ability to:
1) Identify appropriate tools, methods and processes to formulate an aerospace system design problem including realistic constraints from technical, economic, social, political, safety, and other relevant contexts.
2) Apply these tools, methods and processes to generate solutions to the aerospace system design problem.

**Cross-Listed Courses**

- [ ]
- [ ]
- [ ]

**Calumet Department Head**
Date: 10/4/11

**Calumet School Dean**
Date: 10/4/11

**Fort Wayne Department Head**
Date: 10/4/11

**Fort Wayne School Dean**
Date: 10/4/11

**Indianapolis Department Head**
Date: 10/4/11

**Indianapolis School Dean**
Date: 10/4/11

**North Central Chancellor**
Date: 11/29/11

**West Lafayette Department Head**
Date: 11/29/11

**West Lafayette College/School Dean**
Date: 11/29/11

**West Lafayette Registrar**
Date: 11/29/11

**OFFICE OF THE REGISTRAR**
TO: Faculty of Schools of Engineering
FROM: Faculty of the School of Aeronautics and Astronautics
SUBJECT: New Undergraduate Course, AAE 35100

The faculty of the School of Aeronautics and Astronautics has approved the new undergraduate course. This action is now submitted to the Engineering Faculty with a recommendation for approval.

AAE 35100, Aerospace Systems Design
Sem. 2. Class 3, or 3.
Prerequisite: AAE25100

Course Description: Aerospace system lifecycle and design process. Stakeholder needs elicitation and requirements generation. Quality function deployment and hierarchical objectives trees. Concept generation and creativity techniques. Introduction to safety, risk, cost and value analysis. Critical evaluation of the applicability of systems engineering techniques in specific contexts. Application of these techniques to a team semester design project.

Reason: This course provides students with the knowledge and tools to develop system-level concept designs for complex engineering systems. The examples used in the course are focused on aerospace, but the tools and techniques presented are applicable to any complex design problem. Emphasis is placed on critically selecting and using appropriate design tools, and on determining the domain expertise needed for a given design problem. Many program failures have been traced to poor understanding of customer needs; approximately one third of the course is spent on techniques for eliciting stakeholder needs and the generation of proper verifiable requirements. The second third is spent on techniques for generating concept designs, while the last section of the course presents ways of evaluating concepts in terms of safety, cost, value, reliability, and other "-ilities". This course will prepare students for professional careers in industry, but will also prepare them immediately for our required senior-level capstone design courses, AAE 45000 and 45100. This course has been offered four times under the temporary number AAB49000B, with enrollments of averaging 30 students, all from AAB.

[Signature]
Tom I-P Shih, Professor and Head
School of Aeronautics and Astronautics

APPROVED FOR THE FACULTY
OF THE SCHOOLS OF ENGINEERING
BY THE ENGINEERING CURRICULUM COMMITTEE
ECC Minutes  # 5.
Date  11/16/10
Chairman ECC  R. Cipra
Supporting Documentation
Page 1 of 1

A&AE 35100, Aerospace Systems Design

Justification: Aerospace product development is a complex process made more difficult by the need to bring together diverse technical areas with competing interests and objectives. This course introduces students to concepts and techniques that enable an ordered and disciplined progression from the identification of an initial market need to the realization of a successful system or product. Fundamental to this process is Systems Engineering, a collection of tools and approaches used to conceive, design, develop and operate complex engineering systems. Systems Engineering is particularly relevant to the aerospace system design and development since it requires orderly development of system requirements, conducting a scientific design activity, developing success metrics and working across disciplinary interfaces. The focus of this course is the design portion of product development. To ensure that students have a concrete understanding of product development, including design, manufacturing and marketing of aerospace products, this course provides a study of methods, including Systems Engineering, to develop a student's ability to organize and conduct design activities. Classroom lectures and exercises include a major team design project. Past projects have included the design of a domestic airport and a tourist spaceplane.

Prerequisite: AAB25100.

Course Instructors: Professor Karen Marais, Professor Terrence A. Weisshaar

Course Description: System lifecycle and design process. Stakeholder needs elicitation and requirements generation. Quality function deployment and hierarchical objectives trees. Concept generation and creativity techniques. Introduction to safety, risk, cost, and value analysis. Critical evaluation of the applicability of systems engineering techniques in specific contexts. Application of these techniques to a team semester design project.

Course Outline:


b) Needs Assessment (1 wk)

c) Requirements Engineering, Quality Function Deployment (2 wks)

d) Architecture Concepts—Integrated, modular, and platform (1 wk)

e) Concept Generation. TRIZ, Concept Selection and Pugh Concept Selection. Concept Testing and Prototyping (2 wks)

f) Topics in System Realization: Design for Manufacture, Software Issues (2 wks)

g) Introduction to Reliability and Safety Analysis (1 wk)

h) Cost Analysis (1 wk)

i) Concepts in Financial Analysis (1 wk)

j) Teams: Final Presentations (1 wk)

k) Course evaluation and Lessons Learned (1 wk)

Text: No text. Students are provided with numerous articles and excerpts from the literature along with class notes.

Grading / Assessment: Team project: 70% (Teams of 3-4 students, semester long design project); Individual work: 20% (Approximately ten individual assignments of one week each); Class participation: 10%