TO: The Faculty of the College of Engineering

FROM: The School of Aeronautics and Astronautics

RE: New Graduate Course AAE 58500 Air Transportation Systems

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

Course No: **AAE 58500 Air Transportation Systems**
Sem. 1, Cr 3; Lecture 3
Prerequisites: Graduate Standing in Engineering or consent of instructor.

Description: This course provides an overview of civil air transportation system design and operations, ranging from the economics of airlines, to air traffic control. The course is divided into two general theme areas: Airline Economics and Scheduling; and Airline Flight Operations and Air Traffic Control. This course will prepare students for positions in the civil aviation industry and for graduate research in civil aviation topics.

Reason: Air transportation related research and careers are increasingly being pursued by our faculty and students. For example, in AAE, at least four faculty members are doing research on air traffic control, aviation environmental impact, and airline economics. Our students are also being hired by airlines, the FAA and aviation consulting companies to do similar work. This course is one of the "context courses" in Aerospace Systems and was created to help prepare students for research and careers in Air Transportation Systems.

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 #3 Date 10-18-16
Chairman ECC

Office of the Registrar
FORM 40G REV. 4/13

PURDUE UNIVERSITY
REQUEST FOR ADDITION, EXPIRATION,
OR REVISION OF A GRADUATE COURSE
(50000-60000 LEVEL)

PRINT

DEPARTMENT: School of Aeronautics and Astronautics EFFECTIVE SESSION: Fall 2017

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

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

PROPOSED:		EXISTING:	
Subject Abbreviation	AAE	Subject Abbreviation	AAE
Course Number	58500	Course Number	59000
Long Title	Air Transportation Systems		
Short Title	Air Transportation Systems		

Abbreviated title will be entered by the Office of the Registrar if omitted. (30 CHARACTERS ONLY)

TERMS OFFERED
Check All That Apply:
[x] Fall [ ] Spring [ ] Summer

CAMPUS(ES) INVOLVED
- [ ] Calumet
- [ ] Cont Ed
- [ ] Ft. Wayne
- [ ] Indianapolis
- [ ] N. Central
- [ ] Tech Statewide
- [x] W. Lafayette

CREDIT TYPE
1. Fixed Credit: Cr. Hrs. 3
2. Variable Credit Range:
   Minimum Cr. Hrs
   (Check One) To [ ] Or [ ]
   Maximum Cr. Hrs
3. Equivalent Credit: Yes [ ] No [x]
4. Thesis Credit: Yes [ ] No [x]

COURSE ATTRIBUTES: Check All That Apply
1. Pass/Not Pass Only [ ]
2. Satisfactory/Unsatisfactory Only [ ]
3. Repeatable [ ]
   Maximum Repeatable Credit: [ ]
4. Credit by Examination [ ]
5. Fees [ ] Coop [ ] Lab [ ] Rate Request [ ]
   Include comment to explain fee
6. Registration Approval Type
   Department [ ] Instructor [ ]
7. Variable Title [ ]
8. Honors [ ]
9. Full Time Privilege [ ]
10. Off Campus Experience [ ]

Schedule Type	Minutes Per Mtg	Meetings Per Week	Weeks Offered	% of Credit Allocated
Lecture	150	2	15	100
Recitation				
Presentation				
Laboratory				
Lab Prep				
Studio				
Distance				
Clinic				
Experiential				
Research				
Ind. Study				
Pract/Observ				

Cross-Listed Courses
IE

COURSE DESCRIPTION (INCLUDE REQUISITES/RESTRICTIONS):

See supporting docmuments

*COURSE LEARNING OUTCOMES:

see attached documents

	Date		Date		Date
Calumet Department Head		Calumet School Dean		Calumet Director of Graduate Studies	
Fort Wayne Department Head		Fort Wayne School Dean		Fort Wayne Director of Graduate Studies	
Indianapolis Department Head		Indianapolis School Dean		IUPUI Associate Dean for Graduate Education	
North Central Department Head		North Central School Dean		North Central Director of Graduate Studies	
West Lafayette Department Head	4/6/16	West Lafayette College/School Dean		Date Approved by Graduate Council	
Graduate Area Committee Convener		Graduate Dean		Graduate Council Secretary	
				West Lafayette Registrar	

OFFICE OF THE REGISTRAR

(Grad Form 40G [Excel format] - Does not include the Graduate Council's required supporting document. See pdf version of Form 40G)

Supporting Document to the Form 40G
for a New Graduate Course

To: Purdue University Graduate Council

From: Faculty Member: Karen Marais

Department: School of Aeronautics and Astronautics

Campus: West Lafayette

Date:

Subject: Proposal for New Graduate Course

Contact for information if questions arise:

Name: Karen Marais
Phone: 4940063
Email: kmarais@purdue.edu
Address: ARMS3325

Course Subject Abbreviation and Number: AAE58500

Course Title: Air Transportation Systems

Course Description:

This course provides an overview of civil air transportation system design and operations, ranging from the economics of airlines, to air traffic control. The course is divided into two general theme areas: Airline Economics and Scheduling; and Airline Flight Operations and Air Traffic Control. This course will prepare students for positions in the civil aviation industry and for graduate research in civil aviation topics.

Semesters Offered:

This course is offered in alternating Fall semesters in odd years.

A. Justification for the Course:

- Air transportation related research and careers are increasingly being pursued by our faculty and students. For example, in AAE, at least four faculty members are doing research on air traffic control, aviation environmental impact, and airline economics. Our students are also being hired by airlines, the FAA and aviation

consulting companies to do similar work. This course was created to help prepare students for such research and careers.

- The course is being offered at the 500-level to allow both graduate and undergraduate students to participate. It has been offered three times, each time with enrolment ranging from 26 to 63. This enrolment is usually split about 60/40 between graduate and undergraduate students.
-
- The course requires a combination of individual work and small (2 or 3 students) team work. Grades are based on (1) individual biweekly essays, (2) team "mini lectures", (3) an individual final exam, and (4) final team project and presentation.

- Anticipated enrollment
  - Undergraduate 10
  - Graduate 20

B. Learning Outcomes and Method of Evaluation or Assessment:

Describe the course objectives and student learning outcomes that address the objectives (i.e., knowledge, communication, critical thinking, ethical research, etc.). Expand lists and sub lists as needed.

- Objectives and Student Learning Outcomes
  - Provide a background in and understanding of Airline Economics and Scheduling
    - Able to describe the operation of an airline from the company perspective;
    - Able to understand, critique, and conduct basic economic analysis on airline operations;
    - Able to understand, critique, and conduct capacity analysis for airspace and airports;
    - Able to understand and conduct basic optimization for air transportation systems;
    - Able to understand, critique, and conduct basic cost/benefit calculations for aviation;
    - Familiar with common modeling and simulation methods used in air transportation;
  - Provide a background in and understanding of Airline Flight Operations and Air Traffic Control
    - Able to describe the organization and basic functions of the air traffic control system;

- Able to describe the operation of a civil transport aircraft from the pilot's perspective;
- Able to understand, critique, and conduct basic aviation environment analysis;
- Familiar with common safety analysis methods used in air transportation;
- Familiar with typical human factors issues in air transportation;
- Able to converse intelligently about NextGen research issues;
- Able to conduct research and development in air transportation systems.

- Methods of Evaluation

  Describe the methods of evaluation or assessment of student learning outcomes. (Include evidence for both direct and indirect methods.) Expand table rows as needed.

Learning Objective	**Methods of Evaluation**
Able to describe the operation of an airline from the company perspective;	(1) individual biweekly essays, (2) team "mini lectures", (3) an individual final exam, and (4) final team project and presentation.
Able to understand, critique, and conduct basic economic analysis on airline operations;	(1) individual biweekly essays, (2) team "mini lectures", (3) an individual final exam, and (4) final team project and presentation.
Able to understand, critique, and conduct capacity analysis for airspace and airports;	(1) individual biweekly essays, (2) team "mini lectures", (3) an individual final exam, and (4) final team project and presentation.
Able to understand, critique, and conduct basic cost/benefit calculations for aviation;	(1) individual biweekly essays, (2) team "mini lectures", (3) an individual final exam, and (4) final team project and presentation.
Familiar with common modeling and simulation methods used in air transportation;	(1) individual biweekly essays, (2) team "mini lectures", (3) an individual final exam, and (4)

	final team project and presentation.
Able to describe the organization and basic functions of the air traffic control system;	(1) individual biweekly essays, (2) team "mini lectures", (3) an individual final exam, and (4) final team project and presentation.
Able to describe the operation of a civil transport aircraft from the pilot's perspective;	(1) individual biweekly essays, (2) team "mini lectures", (3) an individual final exam, and (4) final team project and presentation.
Able to understand, critique, and conduct basic aviation environment analysis;	(1) individual biweekly essays, (2) team "mini lectures", (3) an individual final exam, and (4) final team project and presentation.
Familiar with common safety analysis methods used in air transportation;	(1) individual biweekly essays, (2) team "mini lectures", (3) an individual final exam, and (4) final team project and presentation.
Familiar with typical human factors issues in air transportation;	(1) individual biweekly essays, (2) team "mini lectures", (3) an individual final exam, and (4) final team project and presentation.
Able to converse intelligently about NextGen research issues;	(1) individual biweekly essays, (2) team "mini lectures", (3) an individual final exam, and (4) final team project and presentation.
Able to conduct research and development in air transportation systems.	(1) individual biweekly essays, (2) team "mini lectures", (3) an individual final exam, and (4) final team project and presentation.

- Grading Criteria

  Grading criteria (select from checklist); include a statement describing the criteria that will be used to assess students and how the final grade will be determined. Add and delete rows as needed.

Grading Criteria (replace with check for all that apply)	**Weight Toward Final Grade**
Exams and Quizzes	30%
Papers and Projects	45%
Homework	10%
Laboratory Exercises	0%
Attendance and Class Participation	15%
Extra Credit	0%

- Methods of Instruction

  Identify the method(s) of instruction and describe how the methods promote the likely success of the desired student learning outcomes. Add and delete rows as needed.

Hours per Week	**Method of Instruction** (replace with check for all that apply)	**Contribution to Outcomes**
2	Lecture	Each class includes a lecture on the topic of the day. This lecture builds on an assigned reading for each class.
	Recitation	0
1	Presentation	In each class, a team gives a "mini lecture" that gives a contemporary aspect of the topic of the day. For example, if the topic is safety, the mini lecture might cover a recent accident. Teams also give a final presentation in conference style (30 mins, 20 mins talk + 10 mins questions) at the end of the semester
	Laboratory	0
	Lab Prep	0
	Extra Credit	0
	Studio	0

	Distance	0
	Clinic	0
	Experiential	0
6	Research	Students must perform research both for their mini lectures and their final project.
3	Independent Study	Students must do the assigned readings and write response essays every week.
	Practice/Observation	0
	Seminar	0

C. Prerequisite(s):

List prerequisites and/or experiences/background required. If no prerequisites are indicated, provide an explanation for their absence. Add bullets as needed.

- Permission of instructor. Students with senior standing in an engineering discipline are prepared to take this course since they must by definition have passed basic Math.

D. Course Instructor(s):

Provide the name, rank, and department/program affiliation of the instructor(s). Is the instructor currently a member of the Graduate Faculty? (If the answer is no, indicate when it is expected that a request will be submitted.) Add rows as needed.

Name	**Rank**	**Dept.**	**Graduate Faculty or expected date**
Karen Marais	Associate Professor	AAE	No.
Steven Landry	Associate Professor	IE	

E. Course Outline:

Provide an outline of topics to be covered and indicate the relative amount of time or emphasis devoted to each topic. If laboratory of field experiences are used to

supplement a lecture course, explain the value of the experience(s) to enhance the quality of the course and student learning. For special topics courses, include a sample outline of a course that would be offered under the proposed course. **(This information must be listed and may be copied from syllabus).**

August					
Tuesday			Thursday		
25	1	Logistics. The Airline Industry: Trends, Challenges, and Strategies	**27**	2	Historical Perspective
September					
Tuesday			Thursday		
1	3	Guest Lecturer – Professor Valasek	**3**	4	Guest Lecturer – Mr. Lacher
8	5	Regulators and Associations Ch.2 Team Proposals Due Mini lecture: Team 5	**10**	6	The General Aviation Industry Mini lecture: Team 1
15	7	The Airline Industry Economic Characteristics of the Airlines Ch.3 Mini lecture: Team 3	**17**	8	Airline Markets and Demand Ch.3 Mini lecture: Team 4
22	9	Pricing and Revenue Management Ch.4	**24**	10	Operating Costs and Measures of Productivity Ch.5 Mini lecture: Team 7
29	11	Airline Planning—Scheduling Ch.6 Mini lecture: Team 2			
October					
Tuesday			Thursday		
			1	12	Airline Planning II—Routes, Fleets Ch.7
6	13	Airports Mini lecture: Team 6	**8**	14	Boeing Guest Lecture
13		October Break	**15**	15	Aviation Safety Mini lecture: Team 9
20	16	Aviation Safety Mini lecture: Team 7	**22**	17	Aviation Safety Mini lecture: Team 5
27	18	Air Traffic Control I Mini lecture: Team 6	**29**	19	Air Traffic Control II Mini lecture: Team 2
November					
Tuesday			Thursday		
3	20	Air Traffic Control IIII Mini lecture: Team 3	**5**	21	Environmental Impacts I Project Updates Due Mini lecture: Team 9
10	22	Air Traffic Control IV Mini lecture: Team 5	**12**	23	Environmental Impacts II Mini lecture: Team 4
17	24	NextGen Mini lecture: Team 1	**19**	25	NextGen/Review Take Home Exam Assigned
24		No class Take Home Exam Due by 5 pm	**26**		Thanksgiving

December					
Tuesday			Thursday		
1	26	Team Presentations	3	27	Team Presentations
8	28	Team Presentations	10	29	Team Presentations Final Reports Due Friday 11 December by 5 pm

F. Reading List (including course text):

A primary reading list or bibliography should be limited to material the students will be required to read in order to successfully complete the course. It should not be a compilation of general reference material.

A secondary reading list or bibliography should include material students may use as background information.

- Primary Reading List
  - ***The Global Airline Industry***, Peter Belobaba (Editor), Amedeo Odoni (Co-Editor), Cynthia Barnhart (Co-Editor), ISBN: 978-0-470-74077-4, May 2009
- Secondary Reading List
  - Additional journal papers and chapter extracts based on latest research. Varies by year.

G. Library Resources

Describe any library resources that are currently available or the resources needed to support this proposed course.

- ***The Global Airline Industry***, Peter Belobaba (Editor), Amedeo Odoni (Co-Editor), Cynthia Barnhart (Co-Editor), ISBN: 978-0-470-74077-4, May 2009. Available online through Purdue Libraries.

H. Course Syllabus

(While not a necessary component of this supporting document, an example of a course syllabus is available, for information, by clicking on the link below, which goes to the *Graduate School's Policies and Procedures Manual for Administering Graduate Student Program.*
See Appendix K.

http://www.purdue.edu/gradschool/faculty/documents/Graduate_School_Policies_and_Procedures_Manual.pdf