

AE 4331 – Rotorcraft Design I: Conceptual Design

CATALOG DESCRIPTION (25 words or fewer):

Conceptual design of traditional, urban air mobility, unmanned rotorcraft vehicles.

Hours: 2(lecture) + 0(studio) + 3(lab) = **3 credit hours**

PREREQUISITES:

AE 3330

TEXTBOOKS:

J. Leishman, *Principals of Helicopter Dynamics* (2nd ed.), Cambridge University Press, 2006.

COURSE OBJECTIVES:

Analyze rotary wing aircraft design methodology through lectures and applications.

LEARNING OUTCOMES:

Students will complete projects culminating in the conceptual design of a relevant aircraft to meet given specifications. Specifically, students will:

1. Devise an analysis plan and conduct subsystem sizing, trade studies, computational design, and performance evaluation
2. Integrate accepted design principles and methods with design needs and requirements, including ethical and societal obligations and trade studies, into the design process in application specific environments (e.g., rotorcraft; commercial vs. military)
3. Effectively communicate technical information in both written and oral formats
4. Strategize and implement a design project according to specifications using project and time management strategies
5. Demonstrate effective interpersonal communication, leadership, and constructive feedback skills in teamwork settings

TOPICAL OUTLINE:

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| 1. Introduction to Design; Course Logistics | 18. Intro to Rotorcraft Aeromechanics (2 classes) |
| 2. Report Writing Guidelines | 19. Rotorcraft Performance (2 classes) |
| 3. Aerospace System Life Cycle | 20. Intro to Aircraft Sizing |
| 4. Requirements Definition Part I | 21. Trimmed Flight |
| 5. Requirements Definition Part II | 22. Weight & Balance |
| 6. Mission Development & ConOps | 23. Rotor Blade Design |
| 7. System Hierarchy and WBS | 24. Fuselage; Tail; Hub+Fuselage Design |
| 8. Project Management and Scheduling | 25. Propulsion (incl. electric) |
| 9. Introduction to Systems Engineering | 26. Rotorcraft Noise |
| 10. Systems Engineering Tools | |
| 11. TRL and Technology Development | |
| 12. Risk and Reliability | |
| 13. Socio-Economic and Ethical Considerations in Design | |
| 14. Design Optimization Basics | |
| 15. Intro to Rotary Wing Aircraft | |
| 16. Review of Design Methods (as applied to Rotorcraft) | |
| 17. Rotor Types (Design Considerations) | |