

Course Syllabus (Preliminary, Fall 2022)

AE500 – Synthetic Design of Aerospace Engineering (IE 577 – Fundamentals of Systems Engineering)

Course Introduction

AE500/IE577 is jointly offered by the department of Aerospace Engineering and the department of Industrial and Systems Engineering. The course provides a holistic view for systems design and engineering. Lectures will cover 1) fundamentals of systems engineering – the “V” model, 2) discussions on system (of systems) – level analysis methodologies, and 3) applications of the systems engineering. Some guest lectures by experts from research institutes and companies will be arranged so that engineering and business insights based on real-world experience can be delivered to students.

Undergraduate / graduate students from all majors that are interested in systems engineering and system design are encouraged to register in this course. There are no formal prerequisites.

Learning Objectives

After completing this course, students shall have gained: 1) knowledge on important Systems Engineering models and standards, 2) knowledge on key steps in the systems engineering processes that start with stakeholder analysis and end with operations, and 3) familiarity with system-level analysis methodologies such as cost/benefit analysis, risk analysis, project management.

Instructors

Prof. Jaemyung Ahn (Aerospace Engineering, X-3730, jaemyung.ahn@kaist.ac.kr)

Meeting Times and Location: Monday / Wednesday, 9-10:30 AM, N7-3301.

Textbook: Course Note - will be provided electronically.

Reference

- [BF] B. Blanchard and W. Fabrycky, *Systems Engineering and Analysis (5th Edition)*, Prentice Hall.
- NASA Systems Engineering Handbook, NASA/TP-2007-6105, Rev I
- INCOSE Systems Engineering Handbook, A Guide for System Lifecycle Processes and Activities, INCOSE-TP-2003-002-03, version 3, International Council on Systems Engineering (INCOSE), 2006
- ISO/IEC 15288:2008(E), IEEE STD 15288-2008, Second edition, 2008-02-01 Systems and software engineering — System life cycle processes
- MIL-STD 499C, Systems Engineering, U.S. Department of Defense, 2005

Grading (Tentative): The grading will occur on the letter scale A-F based on the following composition.

- Assignments (Including Case Reports) 30%
- Midterm Exam / Final Exam 70% (30% + 40%)

Lecture Schedule (subject to change)

(A: Lecture by Prof. Jaemyung Ahn, L: Lecture by Prof. Taesik Lee, G: Guest Lecture)

Week 1

L01: Course Introduction

L02: Systems Engineering Process ([BF] Ch. 1, 2)

Week 2

L03: Stakeholder Analysis / SE Standards ([BF] Ch. 1, 2)

L04: Requirement Generation ([BF] Ch. 3)

Week 3

L05: Concept Generation ([BF] Ch. 3)

L06: Concept Selection (1) ([BF] Ch. 7)

Week 4

L07: Concept Selection (2) ([BF] Ch. 7)

L08: System Architecture (I) ([BF] Ch. 3, 4)

Week 5

L09: System Architecture (II) ([BF] Ch. 3, 4)

Week 6

L10: Design Optimization ([BF] Ch. 9)

[Week 6]

L11: Case Discussion I

Week 7

L12: Design Structure Matrix (DSM)

Week 8

Week 9

L13: Guest Lecture 1

L14: Verification and Validation (V&V) ([BF] Ch. 6)

Week 10

L15: Risk Analysis / Reliability (1) ([BF] Ch. 19)

L16: Project Management ([BF] Ch. 11)

Week 11

L17: Risk Analysis / Reliability (2) ([BF] Ch. 12)

L18: Economic Appraisal of Project Value (1) ([BF] Ch. 8, 17)

Week 12

L19: Economic Appraisal of Project Value (2) ([BF] Ch. 8, 17)

Case Discussion II

Week 13

L20: Advanced Topics (1)

Week 14

L21: Advanced Topic (2)

Week 15

L22: Guest Lecture

L23: Course Wrap-Up

Week 16

Final Exam