

EEM 541: Linear Systems Theory I

2023-2024 Fall Semester Syllabus

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Important Notice: [click here](#)

Text Book: C.T. Chen, *Linear System Theory and Design*. Holt, Rinehart and Winston, 1984.

IMPORTANT NOTE: You have to use the 1984 edition; the other editions do not contain all the material and the section numbers do not match.

Additional Material: Class Notes ([click here](#)).

Tentative Course Outline:

Week 1: No class (see [Important Notice](#))

Week 2: (4-hour class) Introduction (Chapter 1 of Chen); Fields and vector spaces (Sections 2.1, 2.2, and 2.3 of Chen); Linear operators and matrix representations (Sections 2.4 and 2.5 of Chen and Sections 1-3 of Part I of Class Notes).

Week 3: (4-hour class) Analytic functions (Appendix B of Chen); Square operators (Sections 2.6 and 2.7 of Chen and Sections 4-6 of Part I of Class Notes).

Week 4: (4-hour class) Norms and inner products (Section 2.8 of Chen and Section 7 of Part I of Class Notes).

Week 5: Modeling (Sections 3.1, 3.2, 3.3, 3.4, and 3.5 of Chen).

Week 6: Solutions to state-space equations (Chapter 4 of Chen).

Week 7: Discrete-time Systems (Section 3.7 of Chen and Sections 1-4 of Part II of Class Notes).

Week 8: Composite systems (Section 3.6 of Chen and Section 5 of Part II of Class Notes).

Week 9: Controllability and observability (Sections 5.1, 5.2, 5.3, 5.4 and Appendix C of Chen).

Week 10: Kalman's decompositions and Jordan forms (Sections 5.5 and 5.6 of Chen).

Week 11: Controllability and Observability of Discrete-time Systems (Sections 6 through 11 of Part II of Class Notes and Appendix D of Chen).

Week 12: Realizations (Sections 6.1, 6.2, 6.3 and 6.4 of Chen and Section 12 of Part II of Class Notes).

Week 13: Input-output stability (Sections 8.1, 8.2, 8.3 and 8.6 (input-output part) of Chen and Section 13 of Part II of Class Notes).

Week 14: Internal stability (Sections 8.4, 8.5 and 8.6 (state-space part) of Chen and Section 14 of Part II of Class Notes).