CSci 311: Models of Computation
CSci 500: Fundamental Concepts in Computing
Fall Semester 2015
Lecture Notes and Web Resources

Lecture Notes Information:

- These notes were written primarily to accompany use of the textbook: Peter Linz. *An Introduction to Formal Languages and Automata* Fifth Edition, Jones and Bartlett Learning, 2012. They refer to chapters, sections, examples, and figures in the textbook.
- We wrote most of these lecture notes in Pandoc's Markdown markup language using embedded LaTeX for mathematical notation. Using the Pandoc tool, we then converted them to HTML and LaTeX.
- The HTML notes linked below contain embedded MathML. *For best results, use an up-to-date FireFox browser or some other browser that renders MathML effectively.*
- The PDF notes were generated from the LaTeX markup.

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0. (25 Aug) Review Syllabus and discuss course policies

1. Linz Chapter 1: Introduction to the Theory of Computation [HTML] [PDF]
    - (25 Aug) Introduction [HTML] [PDF]
    - (25-27 Aug) Linz 1.1: Mathematical Preliminaries and Notation [HTML] [PDF]
    - Linz 1.2: Three Basic Concepts [HTML] [PDF]
        - (27 Aug, 1 Sep) Languages [HTML] [PDF]
        - (1 Sep) Grammars [HTML] [PDF]
        - (1 Sep) Automata [HTML] [PDF]
    - (1-3 Sep) Linz 1.3: Some Applications [HTML] [PDF]
    - (3 Sep) Work selected problems from Linz chapter 1 on board

2. Linz Chapter 2: Finite Automata [HTML] [PDF]
    - (8 Sep) Linz 2.1: Deterministic Finite Accepters (DFAs) [HTML] [PDF]
    - (8-10 Sep) Linz 2.2: Nondeterministic Finite Accepters (NFAs) [HTML] [PDF]
    - (10 Sep) Linz 2.3: Equivalence of DFAs and NFAs [HTML] [PDF]
    - (15 Sep) Work selected problems from Linz chapter 2 on board

3. Linz Chapter 3: Regular Languages and Regular Grammars [HTML] [PDF]
    - (15-17 Sep) Linz 3.1: Regular Expressions [HTML] [PDF]
    - (17-22 Sep) Linz 3.2: Connection Between Regular Expressions and Regular Languages [HTML] [PDF]
    - (24 Sep) Linz 3.3: Regular Grammars [HTML] [PDF]
    - (29 Sep) Work selected problems from chapter 3 and assignments 1-2; review for Exam #1 to be given on Thursday, 1 October

***** (1 Oct) Examination #1 covering chapters 1-3 *****

4. Linz Chapter 4: Properties of Regular Languages [HTML] [PDF]
    - (6-8 Oct) Linz 4.1: Closure Properties of Regular Languages [HTML] [PDF]
    - (8-13 Oct) Linz 4.2: Elementary Questions about Regular Languages [HTML] [PDF]
    - (13-15 Oct) Linz 4.3: Identifying Nonregular Languages [HTML] [PDF]
    - Alternative explanations of the Pumping Lemma. Pumping Lemma Outline and Example by Eli Allen

5. Linz Chapter 5: Context-Free Languages [HTML] [PDF]
    - (20 Oct) Linz 5.1: Context-Free Grammars [HTML] [PDF]
    - (20-22 Oct) Linz 5.2: Parsing and Ambiguity [HTML] [PDF]
    - (22 Oct) Linz 5.3: Context-Free Grammars and Programming Languages [HTML] [PDF]
    - (27 Oct Work selected problems from chapters 4-5 and like assignments 4-5; review for Exam #2 to be given on Thursday, 29 October

***** (29 Oct) Examination #2 covering section 3.3, chapter 4, and chapter 5 *****

6. OMIT Linz Chapter 6: Simplification of Context-Free Grammars and Normal Forms

7. Linz Chapter 7: Pushdown Automata [HTML] [PDF]
   - (3 Nov) Linz 7.1: Nondeterministic Pushdown Automata [HTML] [PDF]
   - (3-10 Nov) Linz 7.2: Pushdown Automata and Context-Free Languages [HTML] [PDF]
   - (10 Nov) Linz 7.3: Deterministic Pushdown Automata and Deterministic Context-Free Languages [HTML] [PDF]
   - (10 Nov) Linz 7.4: Grammars for Deterministic Context-Free Grammars [HTML] [PDF]

8. Linz Chapter 8: Properties of Context-Free Languages [HTML] [PDF]
   - (10-12 Nov) MOSTLY OMIT Linz 8.1: Two Pumping Lemmas [HTML] [PDF]
   - (10-12 Nov) Linz 8.2: Closure Properties and Decision Algorithms for CFGs [HTML] [PDF]

***** (19 Nov) Examination #3 covering chapter 5, 7, and 8 *****

9. Linz Chapter 9: Turing Machines [HTML] [PDF]
   - (1 Dec) Linz 9.1: The Standard Turing Maching [HTML] [PDF]
   - (1 Dec) Linz 9.2: Combining Turing Machines for Complicated Tasks [HTML] [PDF]
     Note: The Fall 2015 course did not cover this section in depth.
   - (1 Dec) Linz 9.3: Turing's Thesis [HTML] [PDF]

10. OMIT Linz Chapter 10: Other Models of Turing Machines

11. (3 Dec) Linz Chapter 11: A Hierarchy of Formal Languages and Automata [HTML] [PDF]
    - (3 Dec) Linz 11.1: Recursive and Recursively Enumerable Languages [HTML] [PDF]
    - (3 Dec) Linz 11.2: Unrestricted Grammars [HTML] [PDF]
    - (3 Dec) Linz 11.3: Context Sensitive Grammars and Languages [HTML] [PDF]
    - (3 Dec) Linz 11.4: The Chomsky Hierarchy [HTML] [PDF]

12. (1-3 Dec) Linz Chapter 12: Limits of Algorithmic Computation [HTML] [PDF]
    - (1-3 Dec) Linz 12.1: Some Problems That Cannot Be Solved with Turing Machines [HTML] [PDF]
    - (1-3 Dec) Linz 12.2: Undecidable Problems for Recursively Enumerable Languages [HTML] [PDF]
    - OMIT Linz 12.3: The Post Correspondence Problem
    - (1-3 Dec) Linz 12.4: Undecidable Problems for Context Free Languages [HTML] [PDF]
    - OMIT Linz 12.5: A Question of Efficiency

***** (8-10 Dec, Final Exam Period) Examination #4 covering all material from course *****

UP to CSci 311 root document? to CSci 500?

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