Modelling and Programming   IT & Health

Course Overview

Timetable

Calender weeks: 39–41 + 43–50

Weekly timetable: [Division into lectures and exercises is not immutable.]

Tuesday	9–11	lecture
	11–12	exercises
	13–15	lecture
	15–17	exercises
Friday	9–11	lecture
	11–12	exercises
	13–15	exercises

Calender weeks 42, 51, 1: Project work
Calender week 2: Presentation preparation
Calender week 3: Exams

Text Books

C Claudia Neuhauser. *Calculus for Biology and Medicine*, second edition, Pearson Prentice Hall, 2004.

LA Hans Bruun Nielsen. *Linear Algebra for IT & Health*, course notes, DTU Informatics, 2008.

P B. Dammann, P. C. Hansen, M. Rojas, J. B. Sand. *An Introduction to Programming Using* MATLAB, course notes, DTU Informatics, 2009.

Weekly Schedule

[Page counts exclude problem pages.]

Week	Subject	Curriculum	Exercises
21/9 -25/9	intro. to modelling, intro. to linear algebra, intro. to programming	**C**: Sections 1.2–1.3.3 (44 pages) **LA**: Section 1.1 (3 pages) **P**: Chapters 1–3 and Sections 9–9.2 (35 pages)	worksheet: *Week 1*, Section 1 of *Report 1*
28/9 -2/10	differential equations, vectors and matrices, programming elements	**C**: Sections 4.1, 4.6, 8.1–8.1.2 (34 pages) **LA**: Sections 1.2–1.4 (9 pages) **P**: Chapters 4–5 (20 pages)	worksheet: *Week 2*, Section 2 of *Report 1*
5/10 -9/10	dynamical systems, linear systems of equations, control structures	**C**: Sections 2.1, 4.8, 9.2.5 and pp. 702–704 (23 pages) **LA**: Pages 17-19 (3 pages) **P**: Chapters 6–8 (29 pages)	worksheet: *Week 3*, Section 3 of *Report 1*
19/10 -23/10	systems of differential equations, eigenvalues and eigenvectors, vector and matrix operations	**C**: Sections 11.1.1–11.1.3 w/o Case 2 (16 pages) **LA**: Sections 3–3.2.1 (9 pages) **P**: Appendix C (11 pages)	worksheet: *Week 4*, Section 4 of *Report 1*
26/10 -30/10	intro. to pharmacokinetics, Gaussian elimination, functions in MATLAB	Book appendix* (3 pages) **LA**: Sections 1.5, 3.2.2, 2.1–2.3 (17 pages) **P**: Chapter 10 (12 pages)	worksheet: *Week 5*, Section 1 of *Report 2*, finalise *Report 1*

Week	Subject	Curriculum	Exercises
2/11 -6/11	applications of differentiation, matrix factorization, software documentation	**C**: Sections 5.3, 5.4 (23 pages) **LA**: Sections 2.4–2.6 (12 pages) article** (2 pages)	worksheet: *Week 6*, Section 2 of *Report 2*, midterm evaluation
9/11 -13/11	the least squares method, software development, Google PageRank (example)	**LA**: Chapter 4 (12 pages) **P**: Chapter 12 (15 pages) **LA**: Section 3.2.3 (4 pages)	worksheet: *Week 7*, Section 3 of *Report 2*
16/11 -20/11	sequences, l'Hospital's rule, Taylor expansions	**C**: Sections 2.2, 2.3 (22 pages) **C**: Section 5.5 (10 pages) **C**: Section 7.7–7.7.2 (8 pages)	worksheet: *Week 8*, groups for *Report 3*, finalise *Report 2*
23/11 -27/11	compartment models, simulation, object oriented programming	**C**: Sections 8.2, 8.3, 11.2.1 (30 pages) Infectious Disease Modelling*** (13 pages) (slides)	worksheet: *Week 9*, group work
30/11 -4/12	multivariate functions, partial derivatives, MATLAB graphics	**C**: Sections 10–10.1 (12 pages) **C**: Sections 10.3.1, 10.3.2, 10.6.3**** (10 pages) **P**: Sections 9.3–9.5 (11 pages)	worksheet: *Week 10*, group work
7/12 -11/12	applications, inspiration, repetition		group work
8/1			hand in *Report 3*

* Appendix I-C of the book: M. Rowland and T. N. Tozer. *Clinical Pharmacokinetics: Concepts and Applications*, 3rd ed., Lippincott Williams & Wilkins, 1995.

** The internet article "Guidelines for writing software documentation".

*** Sections 7–7.2 "Infectious Disease Modeling" of the book: E. S. Allman and J. A. Rhodes. *Mathematical Models in Biology: An Introduction*, Cambridge University Press, 2004.

**** Skip the final paragraph of this section. The one about "generalization to higher dimensions" (or read Sections 10.5.1 and 10.5.3 first). Also, be aware that this section has errors in its equation references: Replace (8.7) by (10.32), (8.8) by (10.33), etc.

Reports and Assessment

Tuesday morning every scheduled week of the course, except the first, you are expected to hand in the *deliverables* mentioned in the worksheet for the preceding week. Each of the deliverables will be a part of a report, if not a finalized report, such that all hand-ins are relevant to your grade.

During the course you must hand in three reports before the end of the day of the designated deadlines (*Report 1*: 3 November 2009, *Report 2*: 24 November 2009, and *Report 3*: 8 January 2009). Your grade is based on an overall assessment of your finalized reports and your presentation of *Report 3* at the oral examination.

Each reports has a maximum page count of 10 pages using font size 11pt. *Report 1* and *Report 2* are to be handed in individually. *Report 3* is handed in as an assembled group report (multiply the maximum page count by the number of group members).

At the oral exam the work from *Report 3* is presented individually. Every group member prepares a presentation of the entire report and is responsible for the contents of the entire report.

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