

Course Programme MVE136 Random Signals Analysis

7.5 credits, 1st quarter Fall 2020

Teacher: Patrik Albin (Lectures 1-10, written exam), email palbin@chalmers.se
Ebrahim Balouji (Consultations, Laboration 1), email balouji@chalmers.se
Tomas McKelvey, (Lectures 11-14, Laboration 2), email tomas.mckelvey@chalmers.se

Course web-page: <http://www.math.chalmers.se/Stat/Grundutb/CTH/mve136/2021/>

Responsible university unit: Mathematica Sciences, Chalmers Tvärgata 3.

Literature. *S.L. Miller and D.G. Childers: Probability and Random Processes With Application to Signal Processing and Communications, 2nd Edition, 2012*, available from Cremona Chalmer's bookshop as well as electronically from Chalmers Library. A first edition of the book was published 2004 and can equally well be used by students: Besides the addition of more exercises to the 2012 edition, the differences between the two editions are purely of a typographical nature. When listing exercises the numbering in the 2012 edition is given first and followed by numbering in 2004 edition afterwards within parentheses. Included material from the book by Miller and Childers: Sections 2.1-2.8 (2.1-2.7 in the 2004 edition), 3.1-3.5, 4.1-4.8, 5.1-5.9, 8.1-8.6, 9.1-9.3, 10.1-10.4 and 11.1-11.6.

Lecture notes "Complement on Digital Spectral Analysis and Optimal Filtering: Theory and Exercises" authored by Mats Viberg, available through the course web-page.

Two laborations available through the course web-page.

Test exam available through the course web-page.

Examination. Written exam (6 credits) is scheduled am Friday 30 October 2020 with reexams pm Monday 4 January 2021 and pm Monday 16 August 2021.

Two laborations (1.5 credits), see the course web-page.

The written exam has 6 tasks that are worth 5 points each. Of the total 30 points you need 12 points for grade 3, 18 points for grade 4 and 24 points for grade 5, respectively.

Since 3rd quarter Spring 2020 all exams have been digital/remote due to covid-19. Students will be notified asap when it has been decided if a particular exam is on campus or remote.

If the exam is at campus permitted aids are either 2 A4-sheets (4 pages) of hand-written notes (xerox-copies and/or computer print-outs are not allowed) or Beta (but not both these aids). If the written exam is digital/remote all aids are permitted.

After the exam has been graded you receive an official result mail from Ladok with your result. You will also have the possibility to see your graded exam as well as to make complaints on the grading by filling in a complaint form.

Lectures are recorded films supported by hand written lecture notes. The tempo of the course is indicated below. All material scheduled for a week will be available at the course homepage at Tuesday 10 AM that week except when made up of two movies/pdf's in which case the second part will be available Wednesday 10 AM.

Lectures	Time	Programme
Lectures 1-2	week 1	Chapter 2-3 in Miller and Childers' book
Lectures 3-4	week 2	Chapter 4-5 in Miller and Childers' book
Lectures 5-6	week 3	Chapter 8 in Miller and Childers' book
Lectures 7-8	week 4	Chapter 9 in Miller and Childers' book
Lectures 9-10	week 5	Chapter 10-11 in Miller and Childers' book
Lectures 11-12	week 6	Viberg lecture notes
Lectures 13-14	week 7	Viberg lecture notes

Consultations that offer help to students (e.g., with exercises and laborations) take place as Zoom meetings Tuesdays 10-11.45 am weeks 2–8.

Solved exercises. Detailed solutions are available from the course homepage for the problems listed below. Students are advised to study these solutions before working with the home exercises for own work. References are given to the 2012 edition of Miller and Childers’s book first and then to the 2004 edition afterwards within parentheses. The non-stared exercises are most important.

Course segment	Exercises
Chapter 3 in book	Exercises 3.12* (3.13*), 3.13 (3.4), 3.16* (3.7*), 3.21 (3.10), 3.36 (3.16), 3.37* (3.17*)
Chapter 4 in book	Exercises 4.29 (4.13), 4.25 (4.15), 4.38* (4.20*), 4.40 (4.22), 4.53 (4.31)
Chapter 5 in book	Exercises 5.51 (5.22), 5.56* (5.28*)
Chapter 8 in book	Exercises 8.9 (8.5), 8.11 (8.7), 8.15 (8.11), 8.18* (8.14*), 8.33* (8.22*), 8.34 (8.23), 8.37 (8.27)
Chapter 9 in book	Exercises 9.22 (9.5), 9.12 (9.9), 9.14 (9.11)
Chapter 10 in book	Exercises 10.11 (10.8), 10.15* (10.12*), 10.19* (10.14*), 10.23 (10.19)
Chapter 11 in book	Exercises 11.5 (11.10), 11.6 (11.11), 11.9 (11.14), 11.34 (11.26)
Viberg lecture notes	Exercises 1, 3*, 4, 5*, 6, 8*

Home exercises. The following exercises are recommended to students as home exercises for own work. Usually we do not publish solutions to these exercises but as this is not a usual course detailed solutions are available from the course homepage for these problems as well. However, we strongly recommend students to really try to do the exercises themselves without using the solutions. References are given to the 2012 edition of Miller and Childers’s book first and then to the 2004 edition afterwards within parentheses. The non-stared exercises are most important.

Course segment	Exercises
Chapter 3 in book	Exercises 3.14 (3.5), 3.20 (3.9), 3.35 (3.14), 3.46* (3.19*)
Chapter 4 in book	Exercises 4.90 (4.3), 4.91* (4.4*), 4.35 (4.17), 4.41 (4.23), 4.50 (4.28), 4.62* (4.36*)
Chapter 5 in book	Exercises 5.10 (5.5), 5.30 (5.29), 5.60* (5.32*), Test exam 1
Chapter 8 in book	Exercises 8.12 (8.8), 8.13 (8.9), 8.16 (8.12), 8.20 (8.19), 8.35* (8.25*), 8.41 (8.28), Test exam 2
Chapter 9 in book	Exercises 9.9 (9.2), 9.23 (9.8), 9.25 (9.17), 9.19* (9.26*), Test exam 3
Chapter 10 in book	Exercises 10.8 (10.5), 10.10* (10.7*), 10.13 (10.10), 10.21 a (10.17), 10.24* (10.20*), Test exam 4
Chapter 11 in book	Exercises 11.1 (11.1), 11.14* (11.5*), 11.7 (11.12), 11.19 (11.4), 11.12 (11.17), 11.22* (11.20*), Test exam 5
Viberg lecture notes	Exercises 2, 7 and 9, Test exam 6