جامعة الملك عبدالله
للعلوم والتقنية
King Abdullah University of
Science and Technology

Course Syllabus: Contemporary Topics in Applied Math - AMCS 394C

Division	Computer, Electrical and Mathematical Sciences & Engineering
Course Number	AMCS 394C
Course Title	Contemporary Topics in Applied Math
Academic Semester	Spring
Academic Year	2018/2019
Semester Start Date	01/27/2019
Semester End Date	05/23/2019
Class Schedule (Days & Time)	09:00 AM - 10:30 AM | Tue Thu

Instructor(s)

Name	Email	Phone	Office Location	Office Hours
Dominik Ludewig Michels	dominik.michels@kaust.edu.sa	+966128080256		after class

Teaching Assistant(s)

Name	Email
Dr. Dmitry A. Lyakhov	dmitry.lyakhov@kaust.edu.sa

Course Information

Comprehensive Course Description	The course provides are detailed and mathematically precise introduction to Fourier, Wavelet and multiresolution analysis from a computational point of view. This includes algorithmical aspects, complexity analysis, and exemplary applications relevant to scientific and visual computing. -detailed information are availalbe via http://csg.kaust.edu.sa/teaching/amcs394-2018.html
Course Description from Program Guide	
Goals and Objectives	The course is algorithmically oriented aiming to enable the students to develop principled computational methods for problems related to Fourier, Wavelet and multiresolution analysis.
Required Knowledge	The course will assume solid knowledge (calculus and linear algebra) such as taught in undergraduate mathematics courses or in AMCS 101, 131, and 151.
Reference Texts	-J. C. Goswami and A. K. ChanFundamentals of Wavelets: Theory, Algorithms, and ApplicationsWiley, 2011 -G. KaiserA Friendly Guide to WaveletsBirkhäuser, 2011 -K. P. Ramachandran, K. I. Resmi, and N. G. SomanInsight into Wavelets: From Theory to PracticePHI, 2010 -D. K. Ruch and P. J. Van FleetWavelet Theory: An Elementary Approach with ApplicationsWiley, 2009 -E. J. Stollnitz, A. D. DeRose, and D. H. SalesinWavelets for Computer Graphics: Theory and ApplicationsMorgan Kaufmann, 1996
Method of evaluation	**50.00**% - Homework /Assignments **50.00**% - Final exam

Nature of the assignments	There will be a problem set assigned each week. This homework track is mostly theoretical, but it will include smaller programming tasks along the way.
Course Policies	The students may collaborate on the assignments provided each student writes up his or her own solutions and clearly lists the names of all the students in the group (grading policy: 50% homework assignments and 50% final exam). If a student misses or anticipates missing more than three days of classes, she or he should contact the instructor to ensure the student is still on track.
Additional Information	

Tentative Course Schedule

(Time, topic/emphasis & resources)

Week	Lectures	Topic
1	Tue 01/29/2019 Thu 01/31/2019	-Function Spaces and Fourier Series
2	Tue 02/05/2019 Thu 02/07/2019	-Continuous-time Fourier Transform (CTFT)
3	Tue 02/12/2019 Thu 02/14/2019	-Laplace Transform and Bromwich Integral
4	Tue 02/19/2019 Thu 02/21/2019	-Discrete-time Fourier Transform (DTFT)
5	Tue 02/26/2019 Thu 02/28/2019	-Fast Fourier Transform (FFT) and the Cooley-Tukey FFT Algorithm
6	Tue 03/05/2019 Thu 03/07/2019	-Rader's FFT Algorithm
7	Tue 03/12/2019 Thu 03/14/2019	-Chirp Z-transform (CZT) and Bluestein's Algorithm
8	Tue 03/19/2019 Thu 03/21/2019	-Windowed Fourier Transform (WFT) and Heisenberg’s Uncertainty Principle
9	Tue 03/26/2019 Thu 03/28/2019	Spring Break
10	Tue 04/02/2019 Thu 04/04/2019	-Wavelet Functions
11	Tue 04/09/2019 Thu 04/11/2019	-Haar's Theorem
12	Tue 04/16/2019 Thu 04/18/2019	-Continuous-time Wavelet Transform (CTWT)
13	Tue 04/23/2019 Thu 04/25/2019	-Discrete-time Wavelet Transform (DTWT)
14	Tue 04/30/2019 Thu 05/02/2019	-Mallat's Multiresolution Analysis (MRA)
15	Tue 05/07/2019 Thu 05/09/2019	-Fast Wavelet Transform (FWT)
16	Tue 05/14/2019 Thu 05/16/2019	Q&As / exam preparation

17	Tue 05/21/2019 Thu 05/23/2019	Final Exam Week

Note

The instructor reserves the right to make changes to this syllabus as necessary.