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

Course Syllabus: Applied Mathematics I - AMCS 201

Division	Computer, Electrical and Mathematical Sciences & Engineering
Course Number	AMCS 201
Course Title	Applied Mathematics I
Academic Semester	Spring
Academic Year	2016/2017
Semester Start Date	01/22/2017
Semester End Date	05/18/2017
Class Schedule (Days & Time)	01:00 PM - 02:30 PM | Sun Thu

Instructor(s)

Name	Email	Phone	Office Location	Office Hours
Lajos Mihaly Loczi	lajos.loczi@kaust.edu.sa	+966542615174	4200-CU12, Level 4, Building 1, 1, Al-Khawarizmi (bldg. 1)	By appointment

Teaching Assistant(s)

Name	Email

Course Information

Comprehensive Course Description	AMCS 201 and 202 may be taken separately or in either order. This course is part of a fast-paced two-course sequence in graduate applied mathematics with emphasis on analytical techniques. Fourier series and their convergence. Linear homogeneous and nonhomogeneous ordinary differential equations (ODEs) of first, second and higher order. Systems of ODEs. Matrix functions. Phase plane. Linear differential operators, Sturm-Liouville problems for second-order ODEs, Green's functions. Series expansions of solutions to ODEs. Some special functions. Second-order linear partial differential equations (PDEs) of parabolic, hyperbolic, and elliptic type. The heat equation, the wave equation and Laplace's equation. Solutions via the separation of variables and Fourier series. The method of characteristics for first-order linear and quasilinear PDEs.
Course Description from Program Guide	Prerequisites: Advanced and multivariate calculus and elementary complex variables. AMCS 201 and 202 may be taken separately or in either order. Part of a fast-paced two (2)-course sequence in graduate applied mathematics for engineers and scientists, with an emphasis on analytical technique. A review of practical aspects of linear operators (superposition, Greens functions, and eigenanalysis) in the context of ordinary differential equations, followed by extension to linear partial differential equations (PDEs) of parabolic, hyperbolic, and elliptic type through separation of variables and special functions. Integral transforms of Laplace and Fourier type. Self-similarity. Method of characteristics for first-order PDEs. Introduction to perturbation methods for nonlinear PDEs, asymptotic analysis, and singular perturbations. No degree credit for AMCS majors.
Goals and Objectives	Solving and analyzing the solutions of certain classes of first- or second-order linear ordinary or partial differential equations with initial and boundary conditions.
Required Knowledge	Advanced and multivariate calculus and elementary complex variables

Reference Texts	D. G. Zill, M. R. Cullen: Advanced Engineering Mathematics (3rd edition, 2006) E. Kreyszig: Advanced Engineering Mathematics (9th edition, 2006) R. Haberman: Applied Partial Differential Equations
Method of evaluation	**26.00**% - Final exam **24.00**% - Homework /Assignments **25.00**% - Exam 2 **25.00**% - Exam 1
Nature of the assignments	There will be 8 homework assignments during the semester; the students should work out the details of the problems individually. During the course there will be two midterm exams and a final exam; all exams are closed-note, closed-book exams, however, a handwritten formula sheet of size A4 can be used. At the end of the course, a standard letter grade is obtained.
Course Policies	Students are expected to attend all classes and exams. They are required to submit every assignment on time. Incomplete grade (I) for the course will only be given under extraordinary circumstances (such as sickness).
Additional Information	Students taking this course as AMCS 201 will obtain standard letter grades (A-F). Students taking this course as AMCS 132 will obtain S or U grades.

Tentative Course Schedule

(Time, topic/emphasis & resources)

Week	Lectures	Topic
1	Sun 01/22/2017 Thu 01/26/2017	Fourier series and their convergence
2	Sun 01/29/2017 Thu 02/02/2017	Fourier series and their convergence
3	Sun 02/05/2017 Thu 02/09/2017	Fourier series and their convergence. First- and second-order ordinary differential equations
4	Sun 02/12/2017 Thu 02/16/2017	First- and second-order ordinary differential equations. 1st midterm
5	Sun 02/19/2017 Thu 02/23/2017	Second- and higher-order linear ODEs
6	Sun 02/26/2017 Thu 03/02/2017	Series expansion solutions to ODEs. Some special functions
7	Sun 03/05/2017 Thu 03/09/2017	Systems of ODEs. Matrix functions. Phase plane analysis
8	Sun 03/12/2017 Thu 03/16/2017	Linear differential operators, Sturm-Liouville problems for second-order ODEs, Green's functions
9	Sun 03/19/2017 Thu 03/23/2017	Linear differential operators, Sturm-Liouville problems for second-order ODEs, Green's functions. 2nd midterm
10	Sun 03/26/2017 Thu 03/30/2017	Second-order linear partial differential equations (PDEs)
11	Sun 04/02/2017 Thu 04/06/2017	The heat equation, the wave equation and Laplace's equation on various domains. Solutions via the separation of variables and Fourier series
12	Sun 04/09/2017 Thu 04/13/2017	The heat equation, the wave equation and Laplace's equation on various domains. Solutions via the separation of variables and Fourier series
13	Sun 04/16/2017 Thu 04/20/2017	Parabolic, hyperbolic and elliptic PDEs of second-order
14	Sun 04/23/2017 Thu 04/27/2017	The method of characteristics for first-order linear and quasilinear PDEs
15	Sun 04/30/2017 Thu 05/04/2017	Final exam
16	Sun 05/07/2017 Thu 05/11/2017	
17	Sun 05/14/2017 Thu 05/18/2017	
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Note

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