



Course Syllabus: Engineering Mathematics - AMCS 101

Division	Computer, Electrical and Mathematical Sciences & Engineering
Course Number	AMCS 101
Course Title	Engineering Mathematics
Academic Semester	Fall
Academic Year	2018/2019
Semester Start Date	08/26/2018
Semester End Date	12/11/2018
Class Schedule (Days & Time)	02:30 PM - 04:00 PM Mon Thu

Instructor(s)				
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Ahmed Sultan Salem	Ahmed.Salem@kaust.edu.sa	+966128080416		TBA

Teaching Assistant(s)	
Name	Email
TBA	TBA

Course Information	
Comprehensive Course Description	<p>Functions, inverse functions, graphs. Elementary functions (polynomials, trigonometric functions, exp and log).</p> <p>Limits of functions. Derivatives, Leibniz rule, chain rule. Implicit differentiation.</p> <p>Antiderivative, indefinite integrals. Techniques of integration (integration by parts, substitutions, partial fraction decomposition). The definite integral, the Fundamental Theorem of Calculus. Applications of the integral (area, volume).</p> <p>Introduction to ordinary differential equations. Differential equations of first order, separable equations. Solution of linear differential equations of second order with constant coefficients.</p> <p>Infinite sequences and series, geometric series. Convergence tests for series, comparison, ratio and root tests. Power series and radius of convergence. Taylor series. Taylor series of elementary functions. Error bounds for Taylor approximations.</p> <p>Coordinates and vectors. Lines, circles and parametric equations for curves. Planes. Dot and cross products. Functions of several variables, partial derivatives, tangent planes and normals. Linear approximation, gradient and the differential. Taylor polynomials in several variables.</p>
Course Description from Program Guide	<p>Coordinates, Lines, Circles, Functions and their graphs, Polynomials, trigonometric functions, limits, derivatives, numerical approximation of derivatives, indefinite integrals, the definite integral, the fundamental theorem of calculus, applications of the integral: areas, volumes, numerical integration, transcendental functions, techniques of integration: integration by parts, partial fraction decomposition, substitutions, differential equations of first order, separable equations, numerical integration of differential equations, Euler method, solution of linear differential equations of second order with constant coefficients, Infinite sequences and series, geometric series, convergence tests for series, power series and radius of convergence, Taylor series, approximation of functions by polynomials, exponential, cosine and sine expansions, error bounds. The plane and three-dimensional space, vectors, parametric equations for curves, lines, planes, dot and cross product, functions of several variables, partial derivatives, tangent planes and normals, linear approximation, gradient and the differential</p>
Goals and Objectives	This course is a fast-paced review of calculus of one variable and an introduction to the first concepts of multivariable calculus. The course is intended to organize and review material through exercises.
Required Knowledge	Single-variable calculus and elementary linear algebra.

Reference Texts	<p>James Stewart: Calculus (8th edition, 2015).</p> <p>References:</p> <ol style="list-style-type: none"> 1. A First Course in Calculus, by Serge Lange: https://link.springer.com/book/10.1007/978-1-4419-8532-3 2. Calculus, by Michael Spivak, 3rd Edition: https://archive.org/details/SpivakM.Calculus3rdEd.1994 3. Calculus: Vol. 1, One variable calculus, with an introduction to linear algebra, by Tom Apostol: https://archive.org/details/CalculusTomMApostol 4. Calculus: Basic Concepts and Applications, by R. A. Rosenbaum and G. P. Johnson: https://www.cambridge.org/core/books/calculus/2148F406E2DF4B52BF4D3DBA43E87C09 5. Elementary Analysis: The Theory of Calculus, by Kenneth A. Ross: https://link.springer.com/book/10.1007/978-1-4614-6271-2 6. Introduction to Calculus and Analysis: Vol. I by Richard Courant and Fritz John: https://link.springer.com/book/10.1007/978-1-4613-8955-2
Method of evaluation	<p>25.00% - Final exam 25.00% - Midterm exam 25.00% - Exam 2 25.00% - Exam 1</p>
Nature of the assignments	<p>Four Exams, each worth 25% of the grade. All exams are closed book and closed notes. Problem sets will be given as ungraded homework. The grading is given in a Satisfactory(S)/Unsatisfactory(U) system. To pass the course the final grade should be at least 70%.</p>
Course Policies	<p>The students are required to attend all lectures and to take notes. Students that do not show up for a quiz, a test or for the exam should expect a zero in that assessment. The students will read the corresponding material in advance, and the instructor will present a summary of the topics and work out appropriate examples.</p>
Additional Information	

Tentative Course Schedule

(Time, topic/emphasis & resources)

Week	Lectures	Topic
1	Mon 08/27/2018 Thu 08/30/2018	Functions and their representation. Inverse functions. Essential functions.
2	Mon 09/03/2018 Thu 09/06/2018	The limit of a function. Calculating basic limits. Limits: indeterminate forms. L'Hopital's rule.
3	Mon 09/10/2018 Thu 09/13/2018	.
4	Mon 09/17/2018 Thu 09/20/2018	Continuity. Quiz 1. Differentiation and its rules.
5	Mon 09/24/2018 Thu 09/27/2018	The chain rule. Implicit differentiation. The definite integral. The fundamental theorem of calculus. Substitution.
6	Mon 10/01/2018 Thu 10/04/2018	Techniques of integration: by parts, trigonometric substitution, partial fractions. Quiz 2.
7	Mon 10/08/2018 Thu 10/11/2018	Review for Test 1. Test 1.
8	Mon 10/15/2018 Thu 10/18/2018	Applications of the integral. Differential equations of first order.
9	Mon 10/22/2018 Thu 10/25/2018	Differential equations of first order. Quiz 3. Linear differential equations of second order with constant coefficients.
10	Mon 10/29/2018 Thu 11/01/2018	Sequences and series. Convergence tests.
11	Mon 11/05/2018 Thu 11/08/2018	Power series. Taylor series. Parametric equations, arc length and speed. Polar coordinates and conic sections.
12	Mon 11/12/2018 Thu 11/15/2018	Vectors. Dot and cross product. Planes. Quiz 4. Quadrics. Cylindrical and spherical coordinates.
13	Mon 11/19/2018 Thu 11/22/2018	Review for Test 2. Test 2.
14	Mon 11/26/2018 Thu 11/29/2018	Functions of several variables: limits, continuity and partial derivatives. Tangent planes and normals.
15	Mon 12/03/2018 Thu 12/06/2018	Linear approximations, the directional derivative, the gradient and the differential. Quiz 5. Taylor polynomials in several variables.
16	Mon 12/10/2018	Review. Final Exam.
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Note

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