



*Prince Hussein bin Abdullah II Academy of Civil Protection  
Department of Fire Safety Engineering*

*Mathematical Methods for Fire Safety Engineering  
First Semester 2015/2016*

**Course Catalog**

**3 Credit hours.** This course introduces students to the formulation, methodology, and techniques for mathematical solution of fire safety engineering interest. These methods can be used to solve problems in Fluid Flow, Heat and mass Transfer, and Thermodynamics. This course involves various engineering mathematical concepts with the focus on fire safety engineering applications. The material covered in the course includes first, second and higher order ordinary differential equations, system of first order ordinary differential equations in addition to series solutions, Laplace transforms and Fourier analysis. By the end of the course solution of simple partial differential equations will be covered as well.

**Instructor**

Instructor	Dr. Yousef Mubarak E-mail: ymubarak@ju.edu.jo	Office: CHE 3 <sup>rd</sup> Floor Office 315 Tel: 22891 Web: fetweb.ju.edu.jo/staff/che/ymubarak
------------	--	---

**Prerequisites**

<b>Prerequisites by topic</b>	Calculus I and II
-------------------------------	-------------------

**Text book**

<b>Title</b>	Advanced Engineering Mathematics 10 <sup>th</sup> Edition
<b>Author(s)</b>	Kreyszig, E.
<b>Publisher</b>	John Wiley & Sons
<b>Year</b>	2009
<b>Edition</b>	10 <sup>th</sup> Edition

**References**

<b>Books</b>	<ol style="list-style-type: none"> <li>1. Brannan, J.R. and Boyce, W.E., "Differential Equations: An Introduction to Modern Methods and Applications", John Wiley, 2007.</li> <li>2. Hunt, B.R., Lipsman, R.L., Osborn, J.E., and Rosenberg, J.M., "Differential Equations With Matlab", 2<sup>nd</sup> edition, John Wiley, 2005.</li> <li>3. Greenberg, M.D., "Advanced Engineering Mathematics", 2<sup>nd</sup> edition, Prentice Hall, Upper Saddle River, 1998.</li> <li>4. Farlow, S.G., "An Introduction to Differential Equations and Their Applications", McGraw-Hill, 1994.</li> <li>5. Derrick, W.R. and Grossman, S.I., "Elementary Differential Equations with Applications", Wesley.</li> <li>6. Boyce, W.E. and DiPrima, R.C., "Elementary Differential Equations and Boundary Value Problems", 5<sup>th</sup> edition, John Wiley, 1992.</li> <li>7. R.K. Jain, S.R.K. Iyengar, "Advanced engineering mathematics", CRC Pr I Llc, 2002.</li> <li>8. Thomas L. Harman, James Dabney, Norman Richert, "Advanced engineering mathematics using MAT-LAB V.4", 1997.</li> <li>9. Dennis G. Zill, Michael R. Cullen, "Advanced engineering mathematics", 1992.</li> <li>10. Glyn James, David Burley, and et al., "Advanced modern engineering mathematics", 1993.</li> <li>11. C. Ray Wylie, Louis C. Barrett, "Advanced engineering mathematics", 6<sup>th</sup>-Edition, 1995.</li> <li>12. Grant B. Gustafson, Calvin H. Wilcox, "Analytical and computational methods of advanced engineering mathematics", 1998.</li> </ol>
--------------	---

<b>Objectives and Outcomes</b>	
<b>Objectives</b>	<b>Outcomes</b>
<p>1. Translating given fire safety engineering problems into a mathematical model.</p> <p>2. Solving the model by selecting and applying suitable mathematical methods.</p> <p><b>First Order Differential Equations</b> (<i>Separable differential equations, Reduction to separable forms, Exact differential equations, Integrating factors, Linear differential equations, Reduction to linear form</i>)</p> <p><b>Second and Higher Order Differential Equations</b> (<i>Second Order D.E. reducible to the first order, Homogeneous Equations with constant coefficient and Euler-Cauchy Equation, Nonhomogeneous Equations with constant coefficients and Euler-Cauchy equations and their solution by Undetermined Coefficients and by Variation of Parameters</i>)</p> <p><b>System of Differential Equations</b> (<i>Homogeneous Linear Systems with Constant Coefficients, Nonhomogeneous Linear Systems and their solution by the Method of Undetermined Coefficients and the Method of Variation of Parameters</i>)</p> <p><b>Series Solution of Differential Equations</b> (<i>Power Series Method about an Ordinary Point, Frobenius Method about regular singular point</i>)</p> <p><b>Laplace Transform</b> (<i>Laplace Transforms, Transforms of Derivatives and Integrals, Differentiation and Integration of Transforms, Linear D.E. with Constant Coefficients, Laplace Transforms inversion by Partial Fractions, System of D.E.</i>)</p> <p>3. Understanding the meaning and the implications of the mathematical solution for the original problem.</p>	<p>Students who successfully complete the course will be able to:</p> <ol style="list-style-type: none"> <li>1. Demonstrate knowledge and understanding of the concepts, principles, solution approaches and operational techniques for the various topics covered in the course.</li> <li>2. Learn how to translate a variety of problems in traditional and emerging chemical engineering fields into mathematical problems and how to solve them analytically.</li> </ol>

**Course Assessment:** The assessment of objectives will be achieved through homework assignments, quizzes, and common examinations with common grading.

<i>Evaluation</i>		
<i>Assessment Tool</i>	<i>Expected Due Date</i>	<i>Weight</i>
Homework & Quizzes	One week after homework problems are assigned and there will be a quiz every two weeks.	20 %
Mid Exam	Wednesday 11/11/2015 Lecture time	30 %
Final Exam	According to the Academy final examination schedule	50 %

<i>Topics Covered</i>		
<i>Week</i>	<i>Topics</i>	<i>Chepters in Text</i>
2	Concepts of Differential Equations	Handouts
3-5	First Order Differential Equations Applications to Chemical Engineering Problems	Chapter 1
6-8	Second Order Differential Equations Applications to Chemical Engineering Problems	Chapter 2
9-10	Third Order Differential Equations	Chapter 3
11-12	System of Differential Equations Applications to Chemical Engineering Problems	Chapter 4
13-14	Series Solution of Differential Equations	Chapter 5
15	Laplace Transform	Chapter 6
16	Introduction Partial Differential Equations	

50 AM Page i ffirs.qxd 11/4/10 10:50 AM Page ii ffirs.qxd 11/8/10 3:50 PM Page iii ADVANCED ENGINEERING MATHEMATICS  
ffirs.qxd 11/4/10 10:50 AM Page iv ffirs.qxd 11/8/10 3:50 PM Page v 10 TH EDITION ADVANCED ENGINEERING MATHEMATICS  
ERWIN KREYSZIG Professor of Mathematics Ohio State University Columbus, Ohio. The book has helped to pave the way for the  
present development of engineering mathematics. This new edition will prepare the student for the current tasks and the future by a  
modern approach to the areas listed above. We provide the material and learning tools for the students to get a good foundation of  
engineering mathematics that will help them in their careers and in further studies. Start by marking "Advanced Engineering  
Mathematics, 10th Edition" as Want to Read: Want to Read saving | Want to Read. Currently Reading. Read. Other editions. Enlarge  
cover. Want to Read saving | We love your help. Let us know what's wrong with this preview of Advanced Engineering  
Mathematics, 10th Edition by Erwin Kreyszig. Problem: It's the wrong book It's the wrong edition Other. Details (if other):  
Cancel. Advance Engineering Mathematics 10th. Collection. opensource; community. Language. English. Advance Engineering  
Mathematics 10th. Identifier. AdvancedEngineeringMathematics10thEdition\_201508. Identifier-ark. ark:/13960/t4nk7052h.  
Engineering Mathematics, 10th Edition Erwin Kreyszig|In collaboration with Herbert Kreys Solutions Manual to Advanced Modern  
Engineering Mathematics, 4th Edition. 688 Pages 2011 3.88 MB 26,366 Downloads. Modern Engineering Mathematics, 4th Edition.  
Solutions Manual to Advanced Modern Engine Advanced Engineering Mathematics with MATLAB, Fourth Edition. 1,005  
Pages 2016 23.76 MB 14,545 Downloads New! instructors and students. Advanced Engineering Mathematics with MATLAB,  
Fourth Edition Duf Solution Manuals Of ADVANCED ENGINEERING MATHEMATICS ERWIN. 417 Pages 2010 2.28 MB 65,110  
Downl