



جامعة الملك فهد للبترول والمعادن
King Fahd University of Petroleum & Minerals

KING FAHD UNIVERSITY OF PETROLEUM & MINERALS

DEPARTMENT OF MATHEMATICS & STATISTICS

Dhahran, 31261, Kingdom of Saudi Arabia

MATH 322: Quantitative Methods for Actuaries

Term 152

Instructor: Mr. Yassir M. Khalid, ASA, FCA

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Office Hours: Sunday and Tuesday: **08:15 – 09:45** (or by appointment).

For regular announcements, students are advised to check the **Blackboard** regularly.

Course Descriptions:

Algorithms; simplex and dual method; linear and quadratic programming; Solution of non-linear equations; finite differences; cubic splines; individual risk models; life tables. Floating-point arithmetic and error analysis. Interpolation. Polynomial interpolation. Numerical integration and differentiation. Data fitting. Solution of linear algebraic systems. Initial and boundary value problems of ordinary differential equations.

Credit: (3 – 0 – 3).

Note: Not to be taken for credit with Math 321 or CISE 301.

Prerequisite: MATH201 and either ICS 102 or ICS 103.

Textbook:

Ward Cheney and David Kincaid, *Numerical Mathematics and Computing* (7th Edition), Cengage Learning, 2013.

Reference:

Bowers et. Al, *Actuarial Mathematics*, SOA, 1997.

Grading Policy:

Assessment for this course is based on **class activities (attendance, homework and quizzes), project, two major (written) exams** and a **comprehensive final (written) exam**, as described in the following table:

Activity	Weight
Class Activities ¹	15% (60 points)
Project ²	15% (60 points)
Major Exam I (Materials of Week 1 through Week 5) Date: Monday, February 29, 2016 (Week 7). Time: 09:30-11:30. Location: TBA.	20% (80 points)
Major Exam II (Materials of Week 6 through Week 10) Date: Monday, April 11, 2016 (Week 12). Time: 09:30-11:30. Location: TBA.	20% (80 points)
Final Exam (Comprehensive) Date: Thursday, May 12, 2016. Time: 19:00-22:00. Location: TBA.	30% (120 points)

Grading Scales:

Letter Grade	A+	A	B+	B	C+	C	D+	D	F
Range (in points)	360+	330+	300+	280+	260+	240+	220+	200+	<200

There is no quote on the number of students who can obtain "A+"!

Exam Questions:

- ❖ The questions of the common exams are based on the examples and the exercises of the textbook.

Attendance:

- ✓ **Attendance** on time is *very* important. Mostly, attendance will be checked within the *first five minutes* of the class. Entering the class after that, is considered as one late, and *every two times late* equals to one absence. For every one absence, a one point will be deducted from the classwork.
- ✓ In accordance with the University rules, "**a grade of DN in a course is given if the student's unexcused absences are more than 20% of the lecture and laboratories sessions scheduled for the course**". Therefore, students who accumulate **9**, or more, unexcused absences will receive the **DN** grade.

Academic Integrity: All KFUPM policies regarding **ethics** and **academic honesty** apply to this course.

¹ Class activities are based on 6 quizzes (30 points) and 3 Class Tests (30 points). Tests and Quizzes are of written type and not of multiple choice type questions.

² A case study has to be carefully considered, which aim to apply the numerical techniques to an actuarial problem. The use of **Excel** or any other **Mathematical Software** (such as MATLAB) is needed to generate the required results.

Course Schedule ³

Week # (Dates)	Sections	Topics ⁴
Week 1 (Jan 17 – 21)	1.1 1.2	Introduction Mathematical Preliminaries
Week 2 (Jan 24 – Jan 28)	1.3 1.4	Floating-Point Representation Loss of significance
Week 3 (Jan 31 – Feb 4)	2.1 2.2	Naïve Gaussian Elimination Gaussian Elimination with Scaled Partial Pivoting
Week 4 (Feb 7 – 11)	2.3 3.1	Tridiagonal and Banded Systems Bisection Method
Week 5 (Feb 14 – 18)	3.2 3.3	Newton's Method Secant Method
Week 6 (Feb 21 – 25)	4.1 4.3	Polynomial Interpolation Estimating Derivatives
Week 7 (Feb 28 – Mar 3) ⁵	5.1 5.3	Trapezoid Method Simpson's Rules and Newton-Cotes Rules
Week 8 (Mar 6 – 10)	6.1	First Degree and Second Degree Splines
(March 13 – 17) Midterm Vacation		
Week 9 (Mar 20 – 24)	7.1 7.2	Taylor Series Method Runge - Kutta Methods
Week 10 (Mar 27 – 31)	11.1 11.2	Shooting Method A Discretization Method
Week 11 (Apr 3 – 7)	Guest assigned reading	Utility functions Life Tables
Week 12 (Apr 10 – 14) ⁶		Individual Risk Models Collective Risk Models
Week 13 (Apr 17 – 21)	9.1	Method of Least Squares
Week 14 (Apr 24 – 28)	10.1 10.2 10.3	Random Numbers Estimation of Areas and Volumes by Monte Carlo Techniques Simulation
Week 15 (May 1 – 5)	14.1 14.2	Standard Forms and Duality Simplex Method
Final Exam (Comprehensive): as posted on the registrar website		

³ For *Important Dates* and *Academic Calendar*, check the Registrar's site: <http://regweb.kfupm.edu.sa/>

⁴ Some examples and pages, in these sections, are beyond the syllabus and, therefore, they will not be examined. These will be announced in the Blackboard.

⁵ Major Exam I is scheduled on **Monday, February 29** (Week 7).

⁶ Major Exam II is scheduled on **Monday, April 11** (Week 12).