## King Fahd University of Petroleum and Minerals Department of Mathematics Math 472 - Term 222 – Syllabus (Proposal)

Title	Numerical Analysis II		
Credit	3-0-3		
Textbook	Numerical Analysis" by Richard L. Burden, J. Douglas Faires 10th (2016)		
References	<ol> <li>Scientific Computing - An Introduction using Maple and MATLAB by Walter Gander Martin J. Gander Felix Kwok</li> <li>Applied Numerical Methods with MATLAB for Engineers and Scientists by Steven Chapra</li> </ol>		
Description	Approximation of functions: Polynomial interpolation, spline interpolation, least squares theory, adaptive approximation. Differentiation. Integration: basic and composite rules, Gaussian quadrature, Romberg integration, adaptive quadrature. Solution of ODEs: Euler, Taylor series and Runge-Kutta methods for IVPs, multistep methods for IVPs, systems of higher-order ODEs. Shooting, finite difference and collocation methods for BVPs. Stiff equations.		
Learning Outcomes	<ul> <li>Upon completion of this course, students should be able to:</li> <li>1. Interpolate functions and data using Taylor series and polynomials</li> <li>2. Approximate functions and data using Least Square Approximation</li> <li>3. Approximate derivatives and integrations.</li> <li>4. Calculate numerical solutions of IVP for ODEs.</li> <li>5. Solve numerically BVP for ODEs;</li> </ul>		

Homework - Computer Assignments - mini-project - Mid-Term Exam - Final Exam

## Grading Assignments

Pacing Schedule

Interpolation and Polynomial Approximation           3.1         Interpolation and the Lagrange Polynomial           3.5         Cubic Spline Interpolation           3.6         Parametric Curves           3.7         Numerical Software           Approximation Theory         3           8.1         Discrete Least Squares Approximation           4         8.2         Orthogonal Polynomials and Least Squares Approximation           4         8.4         Rational Function Approximation           6         8.5         Trigonometric Polynomial Approximation           6         8.6         Fast Fourier Transforms (FFT)           7         4.1         Numerical Software           7         4.1         Numerical Differentiation           4.3         Elements of Numerical Integration           7         4.1         Numerical Software           8         4.5         Romberg Integration           9         4.7         Gauss Quadrature           10         Initial-Value Problems for Ordinary Differential Equations           11         5.4         Runge-Kutta Methods           12         5.9         Higher-order Taylor Methods           13         5.10         Stability           13<	Week	Section	Topics	
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