EMCH 201 – Numerical Methods

Credit hours – 3  Contact hours – 50 minutes MWF or 75 minutes TTh

Instructor – Sarah Baxter


Specific Course information:
  a. EMCH 201 - Numerical Methods, (3) Introduction and application of numerical methods to the solution of physical and engineering problems. Techniques include iterative solution techniques, methods of solving systems of equations, and numerical integration and differentiation.
  b. Corequisite: MATH 142  Prerequisites: MATH 141
  c. Required for BSE in Mechanical Engineering

Course Goals:
  a. Outcomes
   1. Comprehend the mechanics of elementary methods of numerical analysis that can be applied to engineering/physical problems.
   2. Understand elementary linear algebra techniques and how to apply them to engineering problems.
   3. Demonstrate the application of elementary numerical methods using technological platforms, i.e., programming languages, symbolic manipulators, software packages.
   4. Synthesis of problem solving techniques: Definition of the problem through identification with standard engineering problem types, choice of solution method, and implementation of the method via an appropriate platform.

b. Relationship of Course to Program Objectives: The importance of each course objective to meeting the program outcomes is indicated with the following scale: 3 = major importance; 2 = moderate importance; 1 = minimal importance. Blank if not related.

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<tr>
<th>Program Outcomes (see list for complete description)</th>
<th>Course Outcomes</th>
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<tr>
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<td>CO 1</td>
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<tr>
<td>1.1. analyze, design and realize</td>
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<td>1.2. computation techniques</td>
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<td>1.3. design and interpret experiments</td>
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<td>1.4. apply linear algebra, calculus</td>
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<td>1.5. apply statistical methods</td>
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<td>1.6. understand chemistry and physics</td>
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<td>2.1. engineering economic analyses</td>
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2.2. plan and execute projects
2.3. oral and written communications
2.4. professional responsibility
2.5. multi-disciplinary teams
2.6. life-long learning
3.1. engineering in modern society
3.2. literature, arts, humanities.
3.3. foreign language

Topics Covered
1. Mathcad and Elementary Programming
2. Elementary matrix theory including systems of linear equations
3. Root finding technique (Non-linear equations and systems of equations)
4. Polynomial approximation and curve fitting techniques: Interpolation
5. Numerical differentiation and integration
6. Numerical solutions to first order differential equations
7. Curve fitting and regression analysis; statistics of data

Person Who Prepared This Description and Date of Preparation:
Prepared by Sarah C. Baxter, 2000
Reviewed by Sarah C. Baxter, 02/09/2005
Reviewed by Sarah C. Baxter, 5/15/2010
Reviewed by Sarah C. Baxter 3/1/2011
Steve McNeill formatted for ABET 2011 – 3/1/11

Changes since 2005 ABET Visit
The co-requisite EMCH 200 was removed.
Objective 2 was added to address ABET 2005 concerns about linear algebra content in
our curriculum and Topic 2 was rewritten to correspond to the new objective.