



## Course specification

University/Academy: Damanhour University

Faculty/Institute: Science

Department: Mathematics

### 1. course Data:

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| Course code:<br>Math421                    | Course title:<br>Numerical Analysis and<br>Differential Geometry   | Academic year/level:<br>2010-2011<br>Forth year - First term |
| Specialization:<br>Mathematics and Physics | No. of instructional units:<br>lecture <input type="text" value="4"/> tutorial <input type="text" value="2"/> practical <input type="text" value="-"/> |  |

### 2. course Aim

Demonstrate theoretical knowledge and have practical skills in the subjects of Numerical Analysis and Differential Geometry; Demonstrate an ability to initiate and sustain in-depth research relevant to Numerical Analysis and Differential Geometry ; Have an opportunity to put theory into practice via work-based learning the applications of abstract Numerical Analysis and Differential Geometry to the scientific discipline such as physics and chemistry.

### 3. Intended learning outcome

#### a) Knowledge and understanding

- a1. List theories and concepts used in Numerical Analysis and Differential Geometry.
- a2. Identify the steps required to carry out a piece of research on a topic within Numerical Analysis and Differential Geometry.
- a3. Recognize the contribution and impacts of Numerical Analysis and Differential Geometry in real life problem.

#### b) Intellectual skills

- b1. Apply appropriate theories, principles and concepts relevant to the numerical analysis and differential geometry.



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|                                      | <p>b2. Formulate a reasoned argument from a variety of sources relevant to Numerical Analysis and Differential Geometry.</p> <p>b3. Analyze and interpret information from a variety of sources relevant to Numerical Analysis and Differential Geometry.</p> <p>b4. Select a reasoned argument to the solution of familiar and unfamiliar problems relevant to Numerical Analysis and Differential Geometry.</p>  |
| <p><b>c) Professional skills</b></p> | <p>c1. Plan practical activities using techniques and procedures appropriate to Numerical Analysis and Differential Geometry.</p> <p>c2. Design a piece of independent research using Numerical Analysis and Differential Geometry techniques.</p>   |
| <p><b>d) General skills</b></p>      | <p>d1. Think independently, Set tasks and solve problems on ethical scientific basis relevant to Numerical Analysis and Differential Geometry.</p> <p>d2. Communicate with others positively as part of a group, involving leadership, group dynamics and interpersonal skills such as listening, negotiation and persuasion relevant to Numerical Analysis and Differential Geometry.</p> <p>d3. Use information and communication technology to discuss problems relevant to Numerical Analysis and Differential Geometry.</p> |
| <p><b>4. course content</b></p>      | <p><i>Error analysis , Curves in space .</i></p> <p><i>Numerical solution of algebraic equations , Curvature and torsion .</i></p> <p><i>Polynomial approximations , Involutives and evolutes .</i></p> <p><i>Divided differences ; Surfaces in space .</i></p> <p><i>Numerical differentiation and integration, Envelopes.</i></p> <p><i>Approximation by spline functions , Lines of curvature and geodesics .</i></p>   |



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| <b>5. Teaching and learning methods</b>                                 | 5.1 Lectures.<br>5.2 Tutorials<br>5.3 Homework<br>5.4 Oral discussion   |
| <b>6. teaching and learning methods for students with special needs</b> | None  |
| <b>7. Student Assessment</b>  |   |
| <b>a) Procedures used:</b>  | Final exam  |
| <b>b) Schedule:</b>   | Assessment 1    Final exam    Week 15   |
| <b>c) Weighing of Assessment:</b>                                       | Final exam 200 Marks (100%)   |
| <b>List of Textbooks and References:</b>                                |   |
| <b>d) Course Notes</b>  | Course notes provided by the staff member of Math department, to be handed at the beginning of the semester.  |
| <b>e) Required Books (Textbooks)</b>                                    | 1- Kendall Atkinson and Weimin Han, Theoretical Numerical Analysis, Springer Verlag, 1999.<br>2- S. Helgason , Differential geometry and symmetric spaces (1962), Academic Press, New York.<br>3- S. Kobayashi and K. Nomizu, Foundations of Differential Geometry Vol I (1991), John Wiley and Sons. |



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| <b>f) Recommended Books</b>              | None |
| <b>g) Periodicals, web sites,...,etc</b> | None |

**Course Instructor:** Dr. Ragab Omar Abd El-Rahman

**Head of Department:** Dr. Ragab Omar Abd El-Rahman

**Date:** / /