# Course specification

**University/Academy:** Damanhour University  
**Faculty/Institute:** Science  
**Department:** Mathematics

<table>
<thead>
<tr>
<th>Course code:</th>
<th>Course title:</th>
<th>Academic year/level:</th>
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<tbody>
<tr>
<td>Math406</td>
<td>Functional Analysis</td>
<td>2010-2011</td>
</tr>
<tr>
<td></td>
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<td>Fourth year - Second term</td>
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**Specialization:** Special Mathematics  
**No. of instructional units:**  
*lecture 3*  
tutorial *2*  
practical *-*

### 2. course Aim

Demonstrate theoretical knowledge and have practical skills in the theory of analysis. Demonstrate an ability to initiate and sustain in-depth research relevant to functional analysis. Have an opportunity to put theory into practice via applications of functional analysis on a real life problems.

### 3. Intended learning outcome

**a) Knowledge and understanding**

a1. Summarize the theories and concepts used in the functional analysis.

a2. Identify the steps required to carry out a piece of research on a topic within functional analysis.

a3. Recognize the contribution and impacts of functional analysis in applied science.

**b) Intellectual skills**

b1. Apply appropriate theories, principles and concepts relevant to the functional analysis.

b2. Assess and evaluate the literature within functional analysis.

b3. Demonstrate a reasoned argument to the solution of familiar and unfamiliar problems relevant to functional analysis.
c) Professional skills
   c1. Plan practical activities using techniques and procedures appropriate to functional analysis.
   c2. Execute a piece of independent research using functional analysis media and techniques.

d) General skills
   d1. Deal with an appropriate effective written and oral communication skills relevant to functional analysis.
   d2. Work effectively as part of a group, involving leadership, group dynamics and interpersonal skills such as listening, negotiation and persuasion relevant to functional analysis.
   d3. Use organization skills (including task and time management) relevant to functional analysis both individually and in a group situation.
   d4. Set tasks and solve problems relevant to functional analysis using ideas and techniques some of which are at the forefront of the discipline.

4. course content
   1- Metric space.
   2- Convergence, Cauchy sequence and completeness
   3- Contraction mapping principle – Fixed point theorem and its Applications
   4- Normed linear space and Banach space
   5- Bounded linear operators and functionals – the norm of a bounded operator
   6- Topological space and Hausdorff space
   7- Inner product space - Hilbert space
   8- Orthogonal complements and direct sums
   9- Hilbert adjoint operators
   10- Self – Adjoint, Unitary and Normal Operators
   11- Representation of functionals on Hilbert spaces
   12- Projection operators in Hilbert space
   13- Spectral theory of a bounded linear self – adjoint operators
| 5. Teaching and learning methods | 5.1 Lectures.  
5.2 Tutorials  
5.3 Homework  
5.4 Oral discussion |
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<tr>
<td>6. teaching and learning methods for students with special needs</td>
<td>Non</td>
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<tr>
<td>7. Student Assessment</td>
<td></td>
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<tr>
<td>a. Procedures used:</td>
<td>Final exam</td>
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<tr>
<td>b. Schedule:</td>
<td>Assessment 1  Final exam  Week 15</td>
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<tr>
<td>c. Weighing of Assessment</td>
<td>Final exam 150 Marks</td>
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<td>8. List of Textbooks and References:</td>
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<tr>
<td>a. Course Notes</td>
<td>Course notes provided by the staff member of Math department, to be handed at the beginning of the semester.</td>
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<td>b. Required Books (Textbooks)</td>
<td>None</td>
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<tr>
<td>1- Recommended Books</td>
<td>None</td>
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<tr>
<td>2- Periodicals, web sites, etc</td>
<td>None</td>
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**Course Instructor:** Dr. Ragab Omar Abd El-Rahman

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

**Date:** / /