Course specification

University/Academy: Damanhour
Faculty/Institute: Science
Department: Physics

1. course Data:

<table>
<thead>
<tr>
<th>Course code:</th>
<th>Course title:</th>
<th>Academic year/level:</th>
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<tbody>
<tr>
<td>PHY (404)</td>
<td>Nuclear physics and accelerators</td>
<td>2010-2011 4th year (second term)</td>
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Specialization: Mathematics and physics

<table>
<thead>
<tr>
<th>No. of instructional units:</th>
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<tbody>
<tr>
<td>lecture 3hrs/week</td>
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<tr>
<td>tutorial 1hrs/week</td>
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<tr>
<td>practical 3hrs/week</td>
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2. course Aim

- The course introduces the nuclear forces, reactors and accelerators.

3. Intended learning outcome

a) Knowledge and understanding

A1: Define the nuclear reactors and accelerators and its applications.

A2: Describe the structure of the nucleus in terms of nuclear forces.

A3: Recognize the electric and magnetic properties of the nucleus.

b) Intellectual skills

B1: Show a clear understanding of the basic concepts of nuclear forces, Schrodinger's wave equation of duetron.


B3: Apply the laws governing the reactors.
| c) Professional skills | C1: Examine the Production of neutrons- Neutron reactions and detection.  
C2: Dissect the difference between Fission reactions and Fussion reactions  
C3: conduct the physical knowledge to analyze a suitable technique to solve problems.  
C4: Examine some physical problems helping in understanding the course parts. |
|------------------------|----------------------------------------------------------------------------------------------------------------------------------|
| d) General skills      | D1: use of technology tools like the internet/electronic resources to obtain subject specific information,. - use a number of computer packages to present information.  
D2: The ability to work in groups: work with other as a part of a team to collect data and/or to produce reports and presentations.  
D3: The ability to communicate improving Self-learning: - study independently, set realistic targets and plan work and time to met targets within deadlines.  
D4: Write reports and Problem solving: - Regular problem exercises and example will give students the chance to develop their theoretical understanding and problem.  
D5: The ability to communicate: Students will have write reports and give oral presentation. |
### 4. course content

- Electric and Magnetic properties of the nucleus.
- The quantum numbers of the nucleon inside the nucleus.
- The nuclear energy levels.
- The Vector coupling.
- The magnetic moment of the nucleus and the parity
- The nuclear forces.
- Schrodinger's wave equation of duetron.
- Theories and mechanisms of Alpha, Beta and Gamma decay.
- Nuclear structure and nuclear models
- Liquid drop model and the shell model as examples.
- Production of neutrons
- Neutron and reactor physics
- Neutron reactions and detection
- Fission reactions-
- Principles of reactors: (Types- Fuels- moderators- coolants).
- Infinite amplification coefficients

Critical volume- Examples- Fussion reactions.
Accelerators: Importance- Types- Uses.

### 5. Teaching and learning methods

5.1. Teaching will be by lectures, exercises.

5.2. All learning outcomes are delivered through lectures.

5.3. All lectures and worked examples are given from the lecturer private notes.

Instructional Methods include:

- Direct Instruction: lecture, reading, in class research, problem sets, presentations, and guest speakers
- Instructional Materials: textbook; primary and secondary materials, experts from the field, and electronic media
| Quality Assurance Project  
Damanhour University  
Faculty of Science |
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<td>6. teaching and learning methods for students with special needs</td>
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</tbody>
</table>
| • Team Teaching which will include business, university, and community based partners  
• Community based applied concept projects  
• Self-directed, cooperative, and collaborative learning projects  
• Student oral presentations |
| 7. Student Assessment |
| 7.1. Semester Work.  
7.2. Mid-Term Examination .  
7.3. Practical Examination  
7.4. Final Term Examination |
| a) Procedures used: |
| 7.1. Research and presentation to assess skills of presenting data and discussion.  
7.2. Mid-Term Examination To accesses ability to continue in course  
7.3. practical exam. To access professional and practical skills.  
7.4. written exam. To accesses ability to remember & understand scientific background. &.understand scientific background. |
b) Schedule:

<table>
<thead>
<tr>
<th>Assessment</th>
<th>Week</th>
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<tbody>
<tr>
<td>1: Semesterwork</td>
<td>4-8</td>
</tr>
<tr>
<td>2: Mid-term</td>
<td>10</td>
</tr>
<tr>
<td>3: Practical final</td>
<td>12</td>
</tr>
<tr>
<td>4: Written final</td>
<td>14</td>
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c) Weighing of Assessment:

<table>
<thead>
<tr>
<th>Examination</th>
<th>Weight</th>
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<tbody>
<tr>
<td>Mid-Term Examination</td>
<td>10</td>
</tr>
<tr>
<td>Final-Term Examination</td>
<td>150</td>
</tr>
<tr>
<td>Practical Examination</td>
<td>30</td>
</tr>
<tr>
<td>Semester Work</td>
<td>10</td>
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Total: 200

8. List of Textbooks and References:

a) Course Notes
Lecturer private notes

b) Required Books (Textbooks)
1. Nuclear physics by I. Kaplan (Addison Wesley).
2. Nuclear physics and Nuclear reactors by A. Klimov (Mir publishers).
3. α, β, and ray spectroscopey (Vol I) by K. Sigban (North Holland publishing)

c) Recommended Book

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d) Periodicals, web sites, etc

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Course Instructor: Dr / shaker Ibrahim
Head of Department: Prof. Dr. El. M. Elmaghry

Date: -----/-----/-----