Course Specifications
Valid as from the academic year 2015-2016

Course size
(nominal values; actual values may depend on programme)

<table>
<thead>
<tr>
<th>Credits</th>
<th>Study time</th>
<th>Contact hrs</th>
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<tbody>
<tr>
<td>3.0</td>
<td>90 h</td>
<td>30.0 h</td>
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</tbody>
</table>

Course offerings and teaching methods in academic year 2016-2017
A (semester 2) lecture

Contact hrs

Study time 90 h
Contact hrs 30.0 h

Lecturers in academic year 2016-2017
Bacher, Klaus GE05 lecturer-in-charge
Buls, Nico VUB co-lecturer

Offered in the following programmes in 2016-2017

<table>
<thead>
<tr>
<th>Programme</th>
<th>crdts</th>
<th>offering</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bridging Programme Master of Science in Biomedical Engineering</td>
<td>3</td>
<td>A</td>
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<tr>
<td>Bridging Programme Master of Science in Biomedical Engineering</td>
<td>3</td>
<td>A</td>
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<tr>
<td>Master of Science in Biomedical Engineering</td>
<td>3</td>
<td>A</td>
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<tr>
<td>International Master of Science in Biomedical Engineering</td>
<td>3</td>
<td>A</td>
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<tr>
<td>Master of Science in Biomedical Engineering</td>
<td>3</td>
<td>A</td>
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</tbody>
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Teaching languages
Dutch, English

Keywords
interaction of radiation, dosimetry, image quality, medical imaging, radionuclide therapy, MRI, lasers

Position of the course
The student learns how a variety of physical principles and laws are applied in medical diagnostics and therapy. The student gets in contact with this research field of sciences in medicine.

Contents
Part I (K. Bacher, UGent)
- Interaction ionizing radiation with matter and tissues
- Applications of ionizing radiation in imaging and therapy
- Basic concepts of radiation dosimetry and radiation protection
- Image quality analysis in X-ray imaging
- Patient dosimetry in X-ray imaging
- Patient dosimetry in nuclear medicine, radionuclide therapy

Part II (N. Buls, VUB):
- MRI Basic physics and imaging
  - Nuclear Magnetic Resonance
  - Image contrast
  - Image encoding and MR sequences
  - Image quality
  - MRI Fast scanning, hardware and image artifacts
  - MRI Flow imaging and spectroscopy
  - MRI safety and siteplanning
  - Lasers in medicine: safety and applications

Initial competences
Basic physics

Final competences
1. Understanding the physical concepts used in medicine for imaging and therapy
2. Applying the principles of radiation dosimetry in different clinical disciplines

(Approved)
3. Understanding the concepts of image quality analysis
4. Being aware of the need for a medical physicist in a hospital environment

**Conditions for credit contract**
Access to this course unit via a credit contract is determined after successful competences assessment

**Conditions for exam contract**
This course unit cannot be taken via an exam contract

**Teaching methods**
Lecture

**Learning materials and price**
Syllabus, slides

**References**
- Medical Physics and Biomedical Engineering- B.H. Brown, R.H. Smallwood, D.C. Barber, P.V. Lawford and D.R. Hose (1999)
- http://www.mark-fox.staff.shef.ac.uk/PHY332/laser_notes.pdf

**Course content-related study coaching**
appointment with the lecturers

**Evaluation methods**
end-of-term evaluation

**Examination methods in case of periodic evaluation during the first examination period**
Written examination with open questions, oral examination

**Examination methods in case of periodic evaluation during the second examination period**
Written examination with open questions, oral examination

**Examination methods in case of permanent evaluation**

**Possibilities of retake in case of permanent evaluation**
not applicable

**Extra information on the examination methods**

**Calculation of the examination mark**
Part VUB: 40%
Part UGent: 60%
If students score less than 10/20 for one of the components, they can no longer pass the entire course unit. If the total score is a mark of ten or more out of twenty, then this is reduced to the highest failing mark.