

# PHYS 3008 BIOMEDICAL PHYSICS

**Credit Points** 10

**Legacy Code** 301459

**Coordinator** Timothy Stait-Gardner (<https://directory.westernsydney.edu.au/search/name/Timothy Stait-Gardner/>)

**Description** Students completing this subject will be able to apply the principles and practice of physics to advanced biomedical applications, to critically analyse data regarding, and solve problems involving the physics of living systems, and to work with a range of advanced instrumentation. This subject will provide advanced training in biomedical physics and prepare students for career pathways in medical and biomedical physics. The subject content includes concepts of diffusion and Brownian motion; applications of thermodynamics to biological systems and the origin of life; biomolecular self-assembly; nuclear magnetic resonance and magnetic resonance imaging; atomic force microscopy; molecular dynamics simulations; biophotonics; and nuclear and radiation physics in biomedical sciences.

**School** Science

**Discipline** Physics

**Student Contribution Band** HECS Band 2 10cp

Check your fees via the Fees ([https://www.westernsydney.edu.au/currentstudents/current\\_students/fees/](https://www.westernsydney.edu.au/currentstudents/current_students/fees/)) page.

**Level** Undergraduate Level 3 subject

**Restrictions**

Successful completion of 120 credit points

**Assumed Knowledge**

Knowledge of Mathematics equivalent to Mathematics 1B is recommended, but not required.

## Learning Outcomes

On successful completion of this subject, students should be able to:

1. Articulate and communicate how physics can be used to understand and manipulate biological systems, and the role and impact of biomedical physics in society.
2. Solve complex problems in the physical sciences by applying critical thinking, analytical and problem-solving skills.
3. Propose innovative solutions to problems and challenges in biomedical systems by integrating knowledge of physics, mathematics, chemistry, biology and other areas of science.
4. Conduct investigations in biomedical physics in a collaborative environment.

## Subject Content

1. Diffusion and Thermodynamics of Biological Systems

Brownian motion, dissipation and driving forces, measurement techniques, osmotic pressure, biomolecular self-assembly, the origin and physics of life

2. Bioelectromagnetism

Hodgkin and Huxley nerve conduction model

3. Medical Imaging (MRI)

Sources of contrast, image formation, diffusion-weighted imaging  
 4. Mechanobiology  
 Atomic force microscopy, biological rheology  
 5. Biophotonics  
 Optics/coherent radiation, photodynamic therapy, fluorescence imaging  
 6. Nuclear Physics and Ionising Radiation in Biomedicine  
 PET MRI, MRI linac, radiation

## Assessment

The following table summarises the standard assessment tasks for this subject. Please note this is a guide only. Assessment tasks are regularly updated, where there is a difference your Learning Guide takes precedence.

Type	Length	Percent	Threshold	Individual/ Group	Mandatory Task
Numerical Problem	2 hours	30	N	Individual	N
Solving					
Presentatio	15 minutes	20	N	Group	N
Applied Project	1500 words	20	N	Individual	N
Viva Voce	20 minutes	30	N	Individual	N

Teaching Periods

**Spring (2025)**

**Campbelltown**

**Hybrid**

**Subject Contact** Timothy Stait-Gardner (<https://directory.westernsydney.edu.au/search/name/Timothy Stait-Gardner/>)

View timetable ([https://classregistration.westernsydney.edu.au/odd/timetable/?subject\\_code=PHYS3008\\_25-SPR\\_CA\\_3#subjects](https://classregistration.westernsydney.edu.au/odd/timetable/?subject_code=PHYS3008_25-SPR_CA_3#subjects))