

**PHYSICS**  
POSTGRADUATE HANDBOOK

2017



THE UNIVERSITY OF  
**AUCKLAND**  
Te Whare Wānanga o Tāmaki Makaurau  
NEW ZEALAND

**SCIENCE**

# Welcome to the Department of Physics

Physics opens the door to a vast range of opportunities, and our vibrant research programme illustrates the range of topics tackled by physicists – and physics students.

Students in many fields need a sound understanding of the physical world. We offer a comprehensive range of courses in physics, and potential specialisations in geophysics, medical physics and imaging technologies, and photonics.

A physics degree provides students with the skills they need to succeed, and our graduates work in a host of interesting jobs in New Zealand and around the world.

Our students work in a supportive and stimulating environment and learn from some of New Zealand's leading scientists. Auckland physicists are inventing new kinds of lasers, creating innovative technologies to diagnose illnesses in living tissue, understanding the Earth's changing climate, searching for planets around distant stars, understanding the connections between particle physics and the Big Bang, and much, much more.



We are happy to hear from prospective students – please get in touch if you have any questions about studying Physics at the University of Auckland.

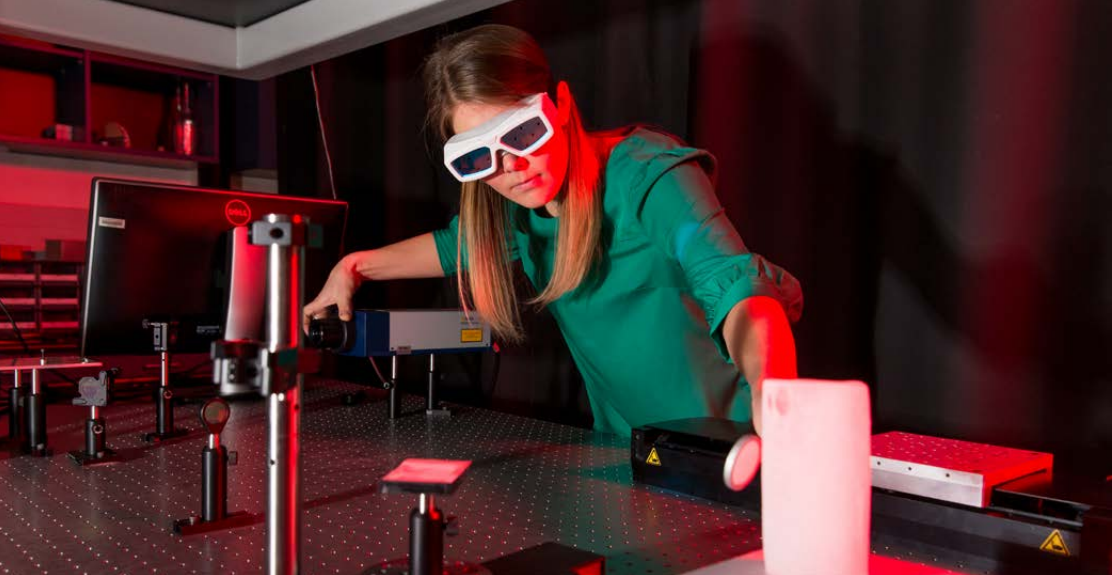
PROFESSOR RICHARD EASTHER  
Head of Department

## Why study with us?

We're the biggest physics department in the country. Our expertise spans the entire world of physics and beyond. And whether your interest lies in pure physics or a multi-disciplinary field, you'll be guided by research-active teaching staff.

The University of Auckland is the highest ranked university in New Zealand by both Times Higher Education and QS rankings.





# Postgraduate study in Physics

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## Postgraduate Diploma in Science (PGDipSci)

### Prerequisite

- A major in Physics, or equivalent as approved by the Head of Department

### Programme structure

- 75 points from PHYSICS 625-681, 691, 701-787, 788

And

- 45 additional points from PHYSICS 625-681, 691, 701-787, 788, MATHS 761-763, GEOPHYS 761-763, 780

Or

- At least 15 additional points from PHYSICS 625-681, 691, 701-787, 788, MATHS 761-763, GEOPHYS 761-763, 780 and up to a further 30 points, subject to the approval of the Head of Department, from approved 600 and 700 level courses in related subjects

## Bachelor of Science (Honours) in Physics

### Prerequisite

- A major in Physics and at least 90 points at Stage III

Students who wish to take a BSc(Hons) in Physics must have attained at least a B average in 45 points above Stage II in the relevant subject major.

### Programme structure

- 30 points: PHYSICS 789 Dissertation
- 45 points from PHYSICS 701-788, 791, 792

And

- 45 additional points from PHYSICS 701-788, 791, 792, MATHS 761-763, GEOPHYS 761-780

Or

- At least 15 additional points from PHYSICS 701-788, 791, 792, GEOPHYS 761-780, MATHS 761-763 and up to 30 points from approved 700 level courses in related subjects as approved by the Head of Department

# BSc(Hons) in Medical Physics and Imaging Technology

Students who complete the BSc in Physics with a B average or higher in 45 points above Stage II are strongly encouraged to enrol in the BSc(Hons) in Medical Physics and Imaging Technology.

## Prerequisites

- A major in Physics and at least 90 points at Stage III

## Recommended

On top of the BSc in Physics core papers, it is recommended to have taken: PHYSICS 280, 340, 325 and 326.

Additionally, students who have done the common year in Science can complement their curriculum with these papers from the FHMS schedule: MEDSCI 205, 206 and 309.

## Programme structure

- 45 points: PHYSICS 787
- 60 points: MEDSCI 703, 737, PHYSICS 701, 780
- 15 points: MEDSCI 701-740, PHYSICS 701-780, 791, 792



# BSc(Hons) in Photonics

Students who complete the BSc in Physics (Photonics theme) with a B average or higher in 45 points above stage II are strongly encouraged to enrol in the Bachelor of Science (Honours) year in Photonics. This additional year of study includes a 45 point research project (usually to be carried out in collaboration with industrial partners) as well as a selection of honours level photonics and communications papers from Physics and Electrical Engineering.

## Prerequisites

- A major in Physics and at least 90 points at Stage III
- Students must have completed two of ELECTENG 209, 210 and 303

## Recommended

In addition to the BSc in physics core papers, it is recommended to have taken: PHYSICS 340, 325 and 326.

## Programme structure

- 45 points: PHYSICS 787
- 30 points: PHYS 726, PHYS 727
- 45 points: PHYS 701, ELECTENG 732, ELECTENG 726, PHYS 731, PHYS 754, PHYS 780

*The MPIT programme has been designed with particular input from the Australasian College of Physical Scientists & Engineers in Medicine (ACPSEM) and local industries most likely to recruit graduates.*

*Several former students have carried out their fourth year projects with Medical Physicists or in the Medical School as well as on industrial projects.*

# Master of Science (MSc) in Physics

## Prerequisite

- A BSc(Hons) or PGDipSci in Physics

## Programme structure

- 120 points: PHYSICS 796 MSc Thesis in Physics

# 1

The average number of years it takes to complete a Master of Science



# Doctor of Philosophy (PhD) in Physics

## Entry to PhD

The normal requirement for admission to the PhD is an honours degree with second class honours (division one or better), either MSc, BSc(Hons), or BTech.

The programme typically takes three to four years of full-time study. The first step towards enrolling in a PhD is to identify a research topic or area and talk to prospective supervisors.

## Selection of a supervisor

Feel free to contact our academic staff directly to discuss your ideas.

[www.physics.auckland.ac.nz/research](http://www.physics.auckland.ac.nz/research)



*"I am interested in the dynamic processes behind water droplet impacts on hard rough surfaces. Use of a high speed camera allows me to record the extremely quick events, and enables me to study the effect of micron scale surface patterns on the spread of water droplets as they impact."*

*"The programme is very diverse in skills and topics. Fluid mechanics, soft lithography, computer coding, image analysis, high speed photography and experimental setup. It is a good chance to broaden my skills into areas I have not previously worked in."*

*"I hope to develop my skills as an experimental physicist. I am keen to use my research in a practical way, collaborating with industry to create functional products. I believe that this qualification will help me to become a flexible and adaptive researcher which will be of benefit in industry."*

*Matheu Broom is studying toward a PhD in Physics having completed a Master of Physics (Honours).*



We are located in the heart of Auckland City, ranked the third best city in the world to live in by the 2016 Mercer Quality of Living Survey.

Postgraduate Physics courses		
Course code	Title	Points
PHYSICS 625	Selected Topics 1	15
PHYSICS 626	Selected Topics 2	15
PHYSICS 681	Experimental Physics	15
PHYSICS 690A	Graduate Diploma Dissertation (Physics)	15
PHYSICS 690B	Graduate Diploma Dissertation (Physics)	15
PHYSICS 691	PG Diploma Dissertation (Physics)	30
PHYSICS 691A	PG Diploma Dissertation (Physics)	15
PHYSICS 691B	PG Diploma Dissertation (Physics)	15
PHYSICS 701	Linear Systems	15
PHYSICS 703	Advanced Quantum Mechanics	15
PHYSICS 705	Advanced Electromagnetism and Special Relativity	15
PHYSICS 706	Quantum Field Theory	15
PHYSICS 707	Inverse Problems	15
PHYSICS 708	Statistical Mechanics and Stochastic Processes	15
PHYSICS 715	Selected Topics 1	15
PHYSICS 726	Optoelectronics	15
PHYSICS 727	Optoelectronics and Communications	15
PHYSICS 731	Wave Propagation	15
PHYSICS 732	Fluid Mechanics and Applications	15
PHYSICS 751	Selected Topics 2	15
PHYSICS 754	Condensed Matter Physics	15
PHYSICS 755	Particle Physics	15
PHYSICS 756	Nuclear Physics	15
PHYSICS 760	Quantum Optics	15
PHYSICS 780	Advanced Imaging Technologies	15
PHYSICS 788	Project in Physics	15
PHYSICS 789	BSc(Hons) Dissertation in Physics	30
PHYSICS 789A	BSc(Hons) Dissertation in Physics	15
PHYSICS 789B	BSc(Hons) Dissertation in Physics	15
PHYSICS 791	Selected Topics 3	15
PHYSICS 792	Selected Topics 4	15
PHYSICS 796A	MSc Thesis in Physics	60
PHYSICS 796B	MSc Thesis in Physics	60

For course descriptions and more information, go to [www.physics.auckland.ac.nz/pg](http://www.physics.auckland.ac.nz/pg)

# Research areas in Physics

## Fundamental Physics, Particle Physics and Astrophysics

When investigating the fundamental properties of the physical universe, we combine strengths in early universe cosmology, LHC-based heavy ion physics, stellar evolution, and searches for extrasolar planets.

## Complex Systems: Biophysics, Condensed Matter and Complexity

Research at the University of Auckland connects condensed matter physics to the physics of complex systems in ecology and the social sciences, and engages with the growing field of data science.

## Physics of Atoms, Molecules and Optics

Our research focuses on interactions between light and matter – from fundamental quantum mechanics to the use of powerful lasers in material processing. Our graduates are equipped for both industrial and academic careers.

## Physics of the Environment

The department's geophysicists tackle questions including seismology to climate science. Support for this crucial research comes from government agencies, industry collaborations and private philanthropy.

## Physics of Measurement and Materials

University of Auckland physicists identify and develop new technologies, techniques, and materials. With a strong record of innovation, the department has provided a spring-board for several successful spinout companies.



### Research profile

*'My principal research area is biophotonics, using light to image and understand physiological and biological processes. Amongst other projects, my team is working on a testing method in which bacteria are tagged with a fluorescent dye. We aim to obtain the exact bacterial concentration by accurately measuring the light coming from the sample – in five minutes, compared with the current three-day plate count.'*

**Dr Frederique Vanholsbeek, Senior Lecturer**

### Disclaimer

Although every reasonable effort is made to ensure accuracy, the information in this document is provided as a general guide only for students and is subject to alteration. All students enrolling at the University of Auckland must consult its official document, the University of Auckland Calendar, to ensure that they are aware of and comply with all regulations, requirements and policies.



# Helpful information

Academic dates	<a href="http://www.auckland.ac.nz/dates">www.auckland.ac.nz/dates</a>
Accommodation	<a href="http://www.accommodation.auckland.ac.nz">www.accommodation.auckland.ac.nz</a>
Apply for postgraduate study	<a href="http://www.auckland.ac.nz/applynow">www.auckland.ac.nz/applynow</a>
Career Development and Employment Services	<a href="http://www.cdes.auckland.ac.nz">www.cdes.auckland.ac.nz</a>
Childcare	<a href="http://www.auckland.ac.nz/childcare">www.auckland.ac.nz/childcare</a>
Degree planning and course advice	<a href="http://www.science.auckland.ac.nz/student-centre">www.science.auckland.ac.nz/student-centre</a>
Disability Services	<a href="http://www.disability.auckland.ac.nz">www.disability.auckland.ac.nz</a>
How to enrol	<a href="http://www.auckland.ac.nz/enrolment">www.auckland.ac.nz/enrolment</a>
Information for postgraduate students	<a href="http://www.postgraduate.ac.nz">www.postgraduate.ac.nz</a>
International students	<a href="http://www.international.auckland.ac.nz">www.international.auckland.ac.nz</a>
Libraries and Learning Services	<a href="http://www.library.auckland.ac.nz">www.library.auckland.ac.nz</a>
Māori and Pacific students	<a href="http://www.science.auckland.ac.nz/tuakana">www.science.auckland.ac.nz/tuakana</a>
Need help?	<a href="http://www.askauckland.ac.nz">www.askauckland.ac.nz</a>
Postgraduate Students' Association	<a href="http://www.pgsa.org.nz">www.pgsa.org.nz</a>
Rainbow Science Network for LGBTI students	<a href="http://www.science.auckland.ac.nz/rainbowsience">www.science.auckland.ac.nz/rainbowsience</a>
Scholarships, awards and fees	<a href="http://www.scholarships.auckland.ac.nz">www.scholarships.auckland.ac.nz</a> <a href="http://www.auckland.ac.nz/fees">www.auckland.ac.nz/fees</a> <a href="http://www.auckland.ac.nz/studentloansandallowances">www.auckland.ac.nz/studentloansandallowances</a>
Support for science students	<a href="http://www.science.auckland.ac.nz/support">www.science.auckland.ac.nz/support</a>

**Questions about Physics? Please email Viji Sarojini ([v.sarojini@auckland.ac.nz](mailto:v.sarojini@auckland.ac.nz)).**



## Connect with us

Faculty of Science, The University of Auckland  
Private Bag 92019, Auckland 1142, New Zealand

Phone: 0800 61 62 63 | Email: [pgscience@auckland.ac.nz](mailto:pgscience@auckland.ac.nz)

Web: [www.physics.auckland.ac.nz](http://www.physics.auckland.ac.nz)



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