Physics Postgraduate Study

The University Of Queensland
AUSTRALIA

Honours

Master of Science (#24)

Acknowledgement of Country

The University of Queensland (UQ) acknowledges the Traditional Owners and their custodianship of the lands on which we meet.

We pay our respects to their Ancestors and their descendants, who continue cultural and spiritual connections to Country.

We recognise their valuable contributions to Australian and global society.

The Brisbane River pattern from *A Guidance Through Time*
by Casey Coolwell and Kyra Mancktelow.

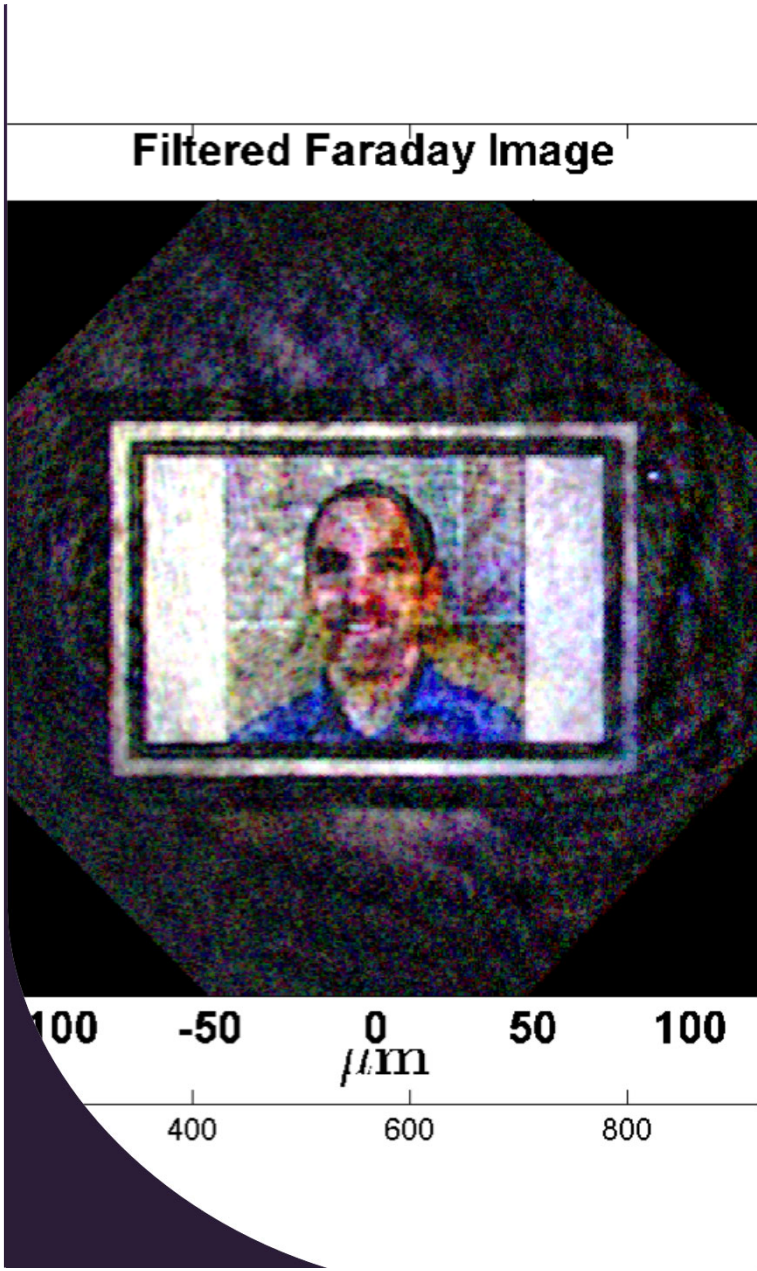
Dr Margaret Wegener (Honours Co-ordinator)

- Teaching-Focused Senior Lecturer

- Research area: Physics Education

Dr Tyler Neely
(Masters Co-ordinator)

- UQ Amplify Associate Professor
- Experimental physics (UQ Bose-Einstein Condensate lab)
- Lecturing and coordinating PHYS7045 Quantum Technologies
- Research interests:
    - Dilute gas superfluids
    - Quantum turbulence
    - Quantum sensing



UQ Physics

> 25 academic staffmembers

> 35 postdoctoral researchers

School of Mathematics and Physics "Wear It Purple" Day, 2023

Why pursue postgraduate education?

THE UNIVERSITY OF QUEENSLAND AUSTRALIA

- Develop analytical and critical thinking skills
- Develop independent research skills
- Research a discipline area in depth; gain breadth & depth through coursework
- **Entry path to a research higher degree (eg: PhD)**
- Take a big step on the journey from student to professional
- Develop career skills that are useful in and beyond science

  eg: public speaking, how to deconstruct complicated ideas

Hard work, but fun too!

Why pursue postgraduate education

THE UNIVERSITY OF QUEENSLAND
AUSTRALIA

at UQ Physics?

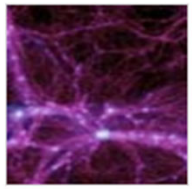
- **Dedicated supervision by world-leading experts**

- **World-class research environment and facilities**

EQUS
Australian Research Council
Centre of Excellence for
Engineered Quantum Systems

CAASTRO
ARC CENTRE OF EXCELLENCE
FOR ALL-SKY ASTROPHYSICS

Research Opportunities in UQ Physics

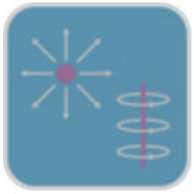


ASTROPHYSICS

SMP groups: T. Davis, Baumgardt, Sweet

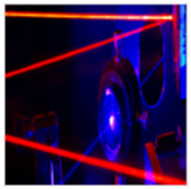
CONDENSED MATTER PHYSICS

SMP groups: Powell, Jacobsen, Namdas, Verdi



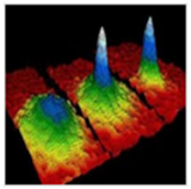
PHYSICS EDUCATION

SMP groups: Wegener, McIntyre



ATOMIC, MOLECULAR, BIOLOGICAL, and OPTICAL PHYSICS

SMP groups: Plakhotnik, Rubinsztein-Dunlop, Ginges, McIntyre, Nieminen



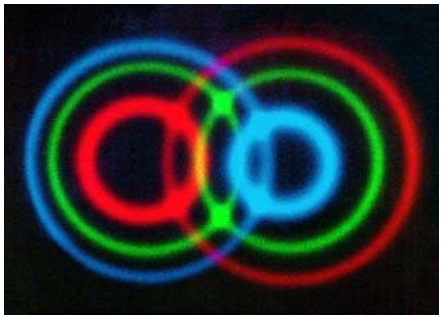
QUANTUM SCIENCE

SMP groups: Stace, Federov, Kheruntsyan, M. Davis, Romero, Ralph, White, Rubinsztein-Dunlop, Neely, Shrapnel, Corney

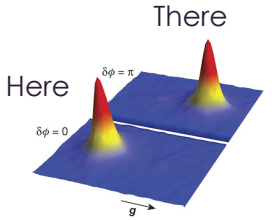
Research Opportunities in Physics

Use *all* the features of quantum mechanics

EQUS

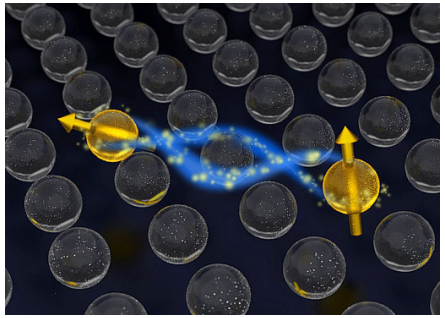


superposition



entanglement

quantum measurement



Research Opportunities in Physics

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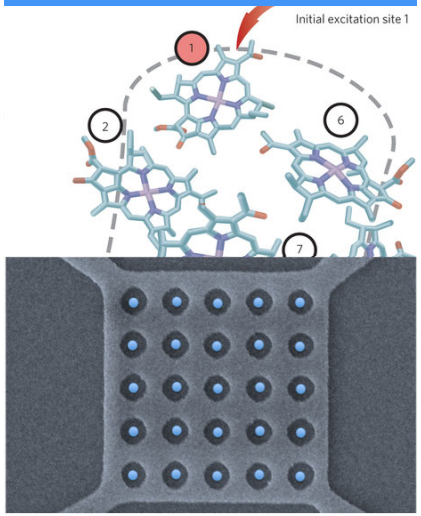
- **Build quantum machines by engineering multi-component quantum systems** with three research programs in

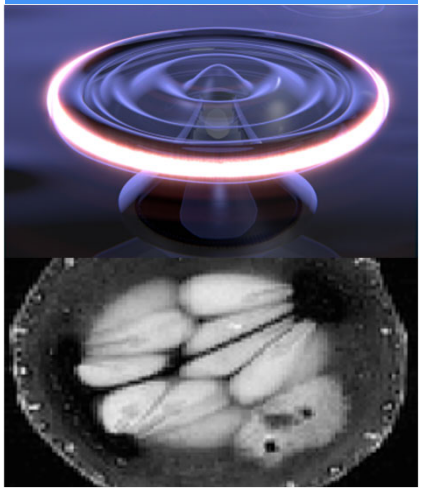
EQUS

1. Designer quantum materials



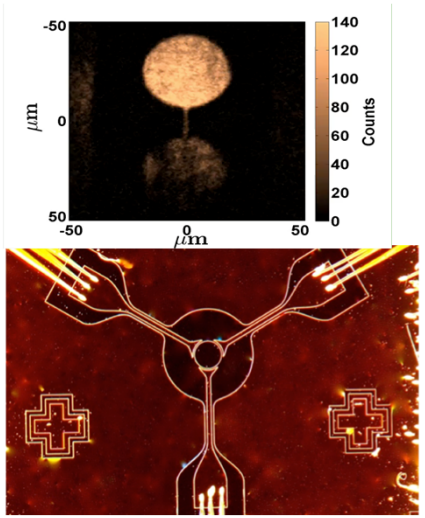
Produce the material building blocks of quantum machines

2. Quantum-enabled diagnostics & imaging



Build the sensors that allow quantum machines to interact with their environment

3. Quantum engines and instruments

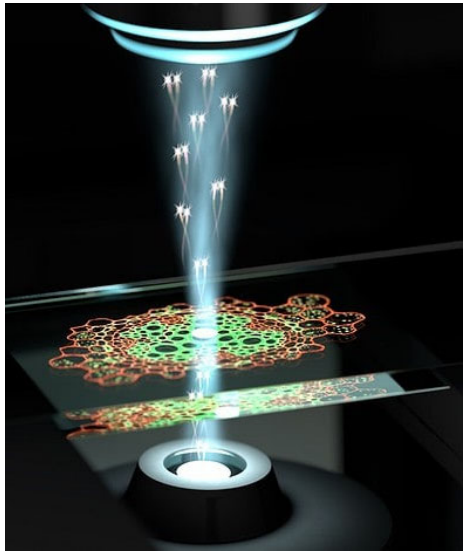


Develop tools and methods to assemble complex quantum machines out of their disparate components

SMP groups: Stace, Federov, Romero, White, Shrapnel, Bowen, Davis, Rubinsztein-Dunlop, Neely

Research Opportunities in Physics

QUBIC
The Australian Research Council Centre of Excellence in Quantum Biotechnology



FNR X

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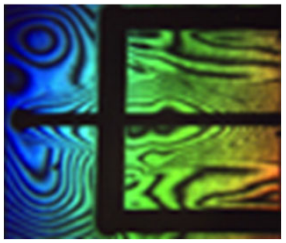
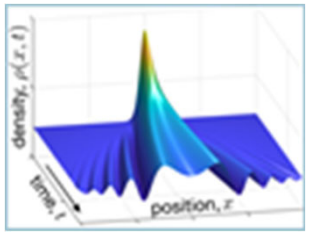
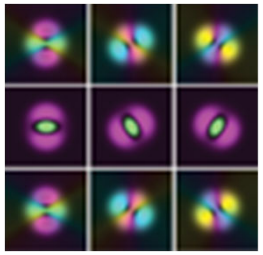
•Iwx{j vzfsyzr grtyjhmstqtl~rsst{fyrts1ufwysjwrsl|nym sfyrtsfqfsi lqtgfqrsizxywnjx

SMP groups: Bowen, Rubinsztein-Dunlop, Neely, Ginges, TBA

Finding a project





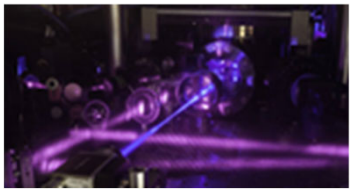


- **Consider established research areas**

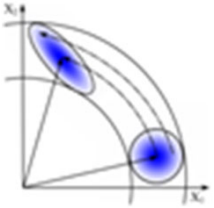
https://smp.uq.edu.au/research

https://about.uq.edu.au/experts

- "Available projects" list is a starting point for discussion



- Could suggest your own topic



- **Approach prospective supervisors for discussion**

- **Choose a supervisor you can work with**

UQ Dictionary

Program: Our degrees are called ‘programs’. They are made up of a prescribed set of requirements/courses.

Course: A subject or class. Can include a combination of lectures, tutorials, workshops and labs.

- Course code = four letters, four numbers. First number indicates level (e.g. PHYS4030 is a Level 4 course).

- Course profile = all the information about your course:
  content outline, assessment dates, grade thresholds, course policies & more!

Unit/s: Most courses are worth 2 units.

A standard full-time study load is 8 units per semester.

Honours

THE UNIVERSITY OF QUEENSLAND
AUSTRALIA

B Adv Sc (Hons)

A single qualification of at least four years (64 units) duration

B Sc (Hons)

An additional one year (16 units) of study following completion of an AQF level 7 Bachelor Degree

Admission prerequisites for BSc(Hons)

- B.Sc. with a relevant major
- GPA of at least 4.0 overall
- GPA of at least 5 over 8 units of late-year courses relevant to the program of study

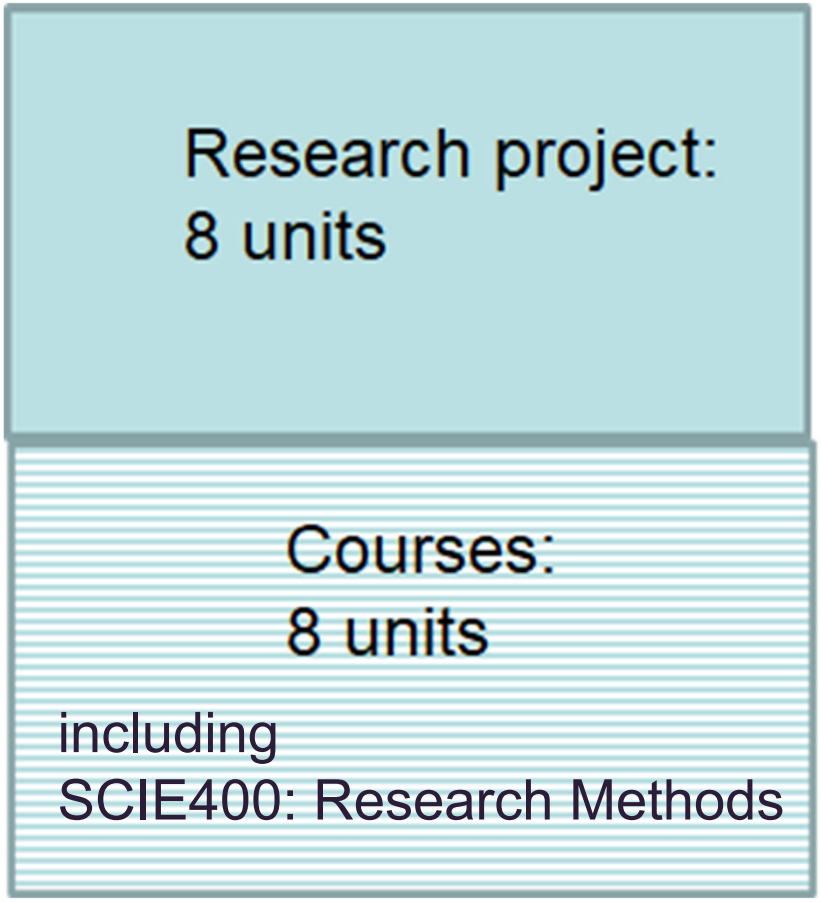
Honours "year" options

* Start Semester I or II

* Full-time or …

Project must be done over 2 consecutive semesters

Program structure (Honours)



Coursework (Honours)

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Semester I choices

- MATH4105:
General Relativity
- PHYS4030:
Condensed Matter Physics
- PHYS4070:
Computational Physics II
- PHYS6500:
Advanced Research Literature Review
- PHYS6004:
Special Topics

Semester II choices

- PHYS4040:
Quantum Field Theory
- PHYS4045:
Quantum Technologies
- PHYS4055:
Atomic Physics & Quantum Optics
- PHYS4080:
Frontiers in Astrophysics
- PHYS6004:
Special Topics

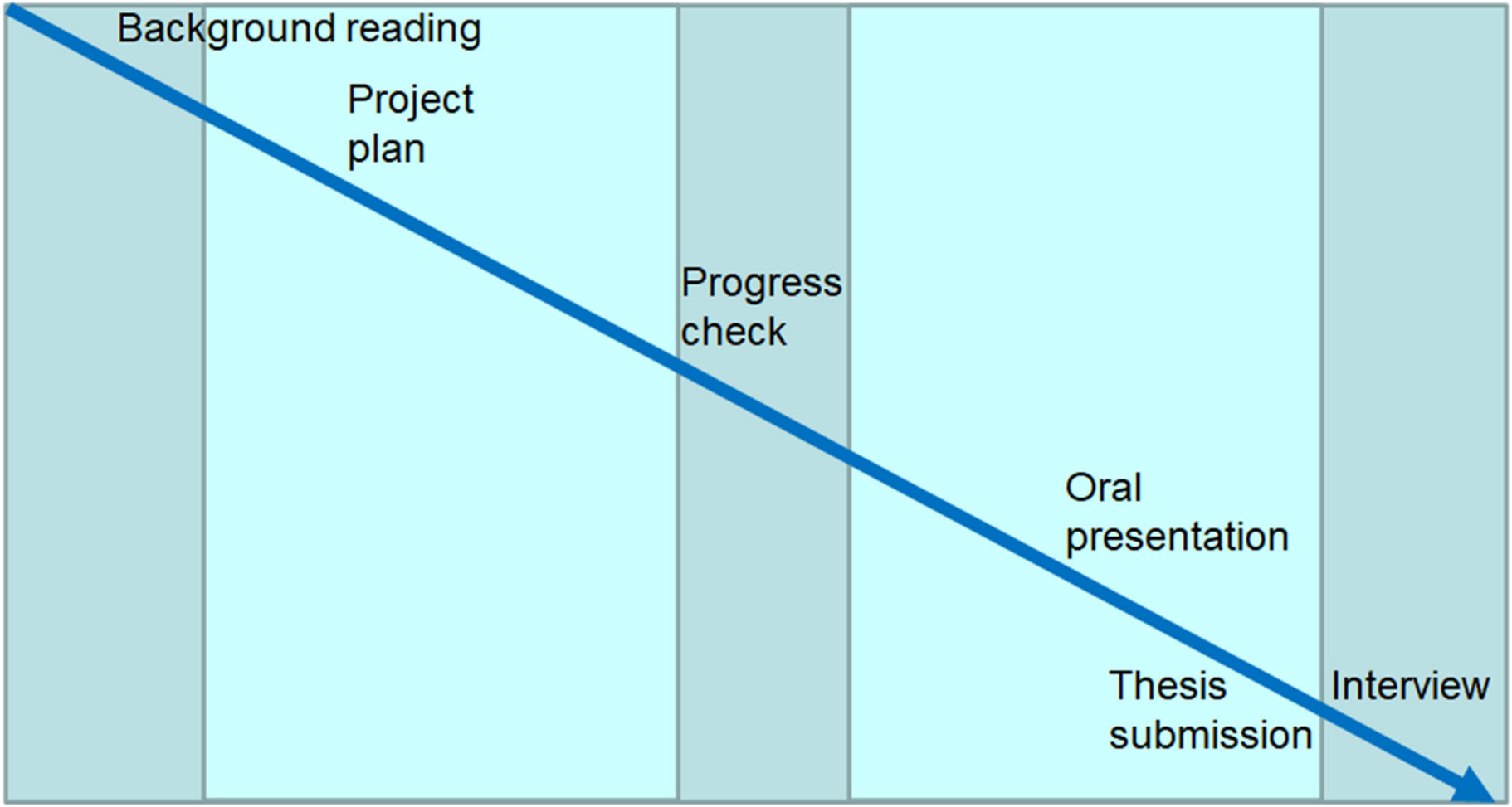
Can include non-standard course, with permission

Honours Course List

#16 unit BSc (Hons)

https://programs-courses.uq.edu.au/requirements/plan/PHYSIX2031/2025

Project timeline



Program structure (MSc)

#24 units (most courses are #2 units) -- assumes you are a physics major and thus able to waive #8 units of Physics Foundational Courses

In the Australian system, the MSc is similar to an Honours degree, but includes an extra semester of coursework.

Admission requirements for MSc

- B.Sc. in relevant major
- GPA of 5.0

Why do this?

Additional coursework study (extra #8 units relative to Honours) – **broaden depth to better prepare for PhD research.**

Potentially more marketable for PhD study abroad.

As of 2024, MSc places are Commonwealth-supported.

Program structure (MSc)

#24 units (most courses are #2 units)

- #16 to #20 units of Physics Core Courses, including at least #4 units of Flexible Core Courses, and can include up to #4 units not on the course list
- Can include any/all of the physics honours courses, but also co-badged undergraduate coursework (2XXX and 3XXX level)
- #4 to #8 units of Research Project(s) -- **usually identical to honours project #8 unit version, but can do less research if desired**

Coursework (Masters)
Physics Core Courses + Electives

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MATH4105	General Relativity	2 units
PHYS4030	Condensed Matter Physics	2 units
PHYS4040	Quantum Field Theory	2 units
PHYS4055	Atomic Physics & Quantum Optics	2 units
PHYS4070	Computational Physics II	2 units
PHYS4080	Frontiers in Astrophysics	2 units
PHYS7045	Quantum Technologies	2 units

PHYS3071	Computational Physics I	2 units
PHYS3080	Extragalactic Astrophysics & Cosmology	2 units
PHYS3830	Physics of Modern Technology	2 units
PHYS7004	Special Topics in Physics	2 units
PHYS7021	Statistical Mechanics	2 units
PHYS7042	Quantum Mechanics II	2 units
PHYS7250	Fields in Physics II	2 units
PHYS7900	Perspectives in Physics Research	2 units

Other courses may be permitted as electives – talk to the Program Coordinator

Masters Course Lists

#24 unit MSc:

https://my.uq.edu.au/programs-courses/requirements/plan/PHYSCX5712

#32 unit MSc includes #8 units of Foundational Courses:

https://my.uq.edu.au/programs-courses/requirements/program/5712

Indicative Annual Fee : FZI)>869 -7579 itr jxyh.1MJHX2MJQU jqlrgqj

Quantum Honours Scholarship

- More than one scholarship to be awarded.
- Available to currently enrolled and commencing students in the first semester of their Honours program.
- $10,000 to commencing students, $5,000 to current students with additional value-add.

THE UNIVERSITY OF QUEENSLAND
AUSTRALIA

CREATE CHANGE

Honours Scholarships

Advanced Semiconductor Materials and Optoelectronics

- $3,000 (separate from any other Schemes)
- Cumulative Grade Point Average
- Interest in organic semiconductor material development (material design, synthesis & characterisation). or optoelectronic devices, or nano- and quantum technologies

Application close: Jul & Feb

s.lo@uq.edu.au or e.namdas@uq.edu.au

Master of Quantum Tech Scholarship

- 50% tuition and fee waiver
- Open to International Students only
- One to two awarded per year on the basis of academic excellence and need

Opportunities during the programs

School of Mathematics and Physics opportunities

Physics Seminars/Colloquia (weekly)

EQUS/QBIO Centre of Excellence events (if involved in EQUS research groups)

Science Undergraduate Research Conference

Tutoring

UQ Science opportunities

Clubs & societies - Sign up on Orientation Day!

UQ Study Skills workshops

UQ Get Involved volunteering

Many more! Keep an eye out for the ‘Science Student Opportunities’ newsletter.

PAST HONOURS STUDENTS

UQ student is Australia-at-Large 2024 Rhodes Scholar

Emerald Gaydon will use her Rhodes Scholarship to study a Doctor of Philosophy in materials at Oxford University.

She will research the application of material science and nanoscale engineering to neuromorphic computing – a field that develops highly energy-efficient computer hardware inspired by the structure and functions of the human brain.

[https://www.uq.edu.au/news/node/135439]

Jesse Woods at the University of Cambridge, where he studied his Master of Advanced Studies in Mathematics (Theoretical Physics)

University of Queensland quantum physicist Jesse Woods has secured a Ramsay Postgraduate Scholarship, allowing him to complete a PhD at Switzerland's University of Bern.

[https://smp.uq.edu.au/article/2024/07/uq-quantum-physicist-heading-bern]

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Questions?

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Instagram.com/uniofqld