PHYS388

Advanced Physics III

FY1 Day 2018

Dept of Physics and Astronomy

Contents

General Information

Unit convenor and teaching staff
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Credit points
3

Prerequisites
(PHYS188 and PHYS201(D) and PHYS202(D))

Corequisites
MATH235

Co-badged status
This unit is co-badged with phys246

Unit description
This unit offers extended insight into unifying core principles of physics. Alternate years will focus on two key concepts that permeate nearly all of physics - probability (even years) and symmetry (odd years). These two key concepts affect much of modern physics including quantum mechanics, astronomy and astrophysics, lasers and photonics, and biophysics. Students are expected to engage in a research-related activity and produce a report in scientific format on their findings.

Important Academic Dates

Information about important academic dates including deadlines for withdrawing from units are available at https://www.mq.edu.au/study/calendar-of-dates

Learning Outcomes

On successful completion of this unit, you will be able to:

Be able to identify how symmetry/probability is used in many sub areas of physics, in sometimes vastly different contexts

Be able to explain how symmetry/probability unifies many sub areas of physics and provides a common structure

Be able to apply symmetry/probability to solve problems from particular sub areas of physics

Assessment Tasks

Name	Weighting	Hurdle	Due
S1 Assignments	15%	No	continuous
S1 Exam	30%	No	End of Semester 1
S1 Problem sets	5%	No	Continuous
S2 Assignments	20%	No	Continuous
S2 Project	30%	No	End of S2

S1 Assignments

Due: **continuous**
Weighting: **15%**

As for all physics units, problem solving is an essential aid to understanding the physical concepts involved. There will be 2 assignments in semester 1.

On successful completion you will be able to:

- Be able to identify how symmetry/probability is used in many sub areas of physics, in sometimes vastly different contexts
- Be able to explain how symmetry/probability unifies many sub areas of physics and provides a common structure
- Be able to apply symmetry/probability to solve problems from particular sub areas of physics

S1 Exam

Due: **End of Semester 1**
Weighting: **30%**

A one and a half hour written closed book exam will be set at the end of semester 1.

On successful completion you will be able to:

- Be able to identify how symmetry/probability is used in many sub areas of physics, in sometimes vastly different contexts
- Be able to explain how symmetry/probability unifies many sub areas of physics and provides a common structure
- Be able to apply symmetry/probability to solve problems from particular sub areas of physics

S1 Problem sets

Due: **Continuous**
Weighting: **5%**

Each student supplies five solved problems for the material taught in the semester, to be used as a learning resource for the rest of the class.

On successful completion you will be able to:

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- Be able to apply symmetry/probability to solve problems from particular sub areas of physics

S2 Assignments

Due: **Continuous**
Weighting: **20%**

As for all physics units, problem solving is an essential aid to understanding the physical concepts involved. There will be 3 assignments in semester 2.

On successful completion you will be able to:

- Be able to identify how symmetry/probability is used in many sub areas of physics, in sometimes vastly different contexts
- Be able to explain how symmetry/probability unifies many sub areas of physics and provides a common structure
- Be able to apply symmetry/probability to solve problems from particular sub areas of physics

S2 Project

Due: **End of S2**
Weighting: **30%**

At the end of the semester the students will complete a research project on a topic that fits the theme focus of the unit (either symmetry or probabilities in physics) and is negotiated with the lecturer. The lecturer will provide a list of suggested topics and starting points for reading, but students are free to pick their own topics and in any case, will need to read more broadly than the suggestions provided.

Each research project will have two components: a report to be handed in and an in-class presentation by the student. The report will be in the style of a 10 page international refereed journal article. Students will also provide a short (15 minutes + 5 minutes for questions) presentation on the project. Students are expected to ask questions during presentations.

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Delivery and Resources

Course notes will be available for download on ilearn. There is no textbook for this course though suggested readings will be given on ilearn.

Unit Schedule

This is a full-year 3 cpt unit, offering extended insight into unifying core principles of physics. Alternate years will focus on two key concepts that permeate nearly all of physics - probability (even years) and symmetry (odd years). These two key concepts affect much of modern physics including quantum mechanics, astronomy and astrophysics, lasers and photonics, and biophysics. Students are expected to engage in a research-related activity and produce a report in scientific format on their findings.

Learning and Teaching Activities

Lecture tutorials

There will be two informal lectures per week where the students are actively encouraged to participate

Policies and Procedures

Macquarie University policies and procedures are accessible from Policy Central (https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central). Students should be aware of the following policies in particular with regard to Learning and Teaching:

- Academic Appeals Policy
- Academic Integrity Policy
- Academic Progression Policy
- Assessment Policy
- Fitness to Practice Procedure
- Grade Appeal Policy
- Complaint Management Procedure for Students and Members of the Public
- Special Consideration Policy *(**Note:** The Special Consideration Policy is effective from 4 December 2017 and replaces the Disruption to Studies Policy.)*

Undergraduate students seeking more policy resources can visit the Student Policy Gateway (https://students.mq.edu.au/support/study/student-policy-gateway). It is your one-stop-shop for the key policies you need to know about throughout your undergraduate student journey.

If you would like to see all the policies relevant to Learning and Teaching visit Policy Central (https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central).

Student Code of Conduct

Macquarie University students have a responsibility to be familiar with the Student Code of Conduct: https://students.mq.edu.au/study/getting-started/student-conduct

Results

Results shown in *iLearn*, or released directly by your Unit Convenor, are not confirmed as they are subject to final approval by the University. Once approved, final results will be sent to your student email address and will be made available in eStudent. For more information visit ask.mq.edu.au.

If you apply for Disruption to Study for your final examination, you must make yourself available for the week of July 24 – 28, 2017. If you are not available at that time, there is no guarantee an additional examination time will be offered. Specific examination dates and times will be determined at a later date.

Student Support

Macquarie University provides a range of support services for students. For details, visit http://students.mq.edu.au/support/

Learning Skills

Learning Skills (mq.edu.au/learningskills) provides academic writing resources and study strategies to improve your marks and take control of your study.

- Workshops
- StudyWise
- Academic Integrity Module for Students
- Ask a Learning Adviser

Student Services and Support

Students with a disability are encouraged to contact the Disability Service who can provide appropriate help with any issues that arise during their studies.

Student Enquiries

For all student enquiries, visit Student Connect at ask.mq.edu.au

IT Help

For help with University computer systems and technology, visit http://www.mq.edu.au/about_us/offices_and_units/information_technology/help/.

When using the University's IT, you must adhere to the Acceptable Use of IT Resources Policy. The policy applies to all who connect to the MQ network including students.

Graduate Capabilities

Creative and Innovative

Our graduates will also be capable of creative thinking and of creating knowledge. They will be imaginative and open to experience and capable of innovation at work and in the community. We want them to be engaged in applying their critical, creative thinking.

This graduate capability is supported by:

Learning outcomes

- Be able to identify how symmetry/probability is used in many sub areas of physics, in sometimes vastly different contexts
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- Be able to apply symmetry/probability to solve problems from particular sub areas of physics

Assessment tasks

- S1 Assignments

- S1 Exam
- S1 Problem sets
- S2 Assignments
- S2 Project

Commitment to Continuous Learning

Our graduates will have enquiring minds and a literate curiosity which will lead them to pursue knowledge for its own sake. They will continue to pursue learning in their careers and as they participate in the world. They will be capable of reflecting on their experiences and relationships with others and the environment, learning from them, and growing - personally, professionally and socially.

This graduate capability is supported by:

Learning outcomes

- Be able to identify how symmetry/probability is used in many sub areas of physics, in sometimes vastly different contexts
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Assessment tasks

- S1 Problem sets
- S2 Project

Discipline Specific Knowledge and Skills

Our graduates will take with them the intellectual development, depth and breadth of knowledge, scholarly understanding, and specific subject content in their chosen fields to make them competent and confident in their subject or profession. They will be able to demonstrate, where relevant, professional technical competence and meet professional standards. They will be able to articulate the structure of knowledge of their discipline, be able to adapt discipline-specific knowledge to novel situations, and be able to contribute from their discipline to inter-disciplinary solutions to problems.

This graduate capability is supported by:

Learning outcomes

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Assessment tasks

- S1 Assignments
- S1 Exam
- S1 Problem sets
- S2 Assignments
- S2 Project

Critical, Analytical and Integrative Thinking

We want our graduates to be capable of reasoning, questioning and analysing, and to integrate and synthesise learning and knowledge from a range of sources and environments; to be able to critique constraints, assumptions and limitations; to be able to think independently and systemically in relation to scholarly activity, in the workplace, and in the world. We want them to have a level of scientific and information technology literacy.

This graduate capability is supported by:

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Problem Solving and Research Capability

Our graduates should be capable of researching; of analysing, and interpreting and assessing data and information in various forms; of drawing connections across fields of knowledge; and they should be able to relate their knowledge to complex situations at work or in the world, in order to diagnose and solve problems. We want them to have the confidence to take the initiative in doing so, within an awareness of their own limitations.

This graduate capability is supported by:

Learning outcomes

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Assessment tasks

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- S1 Exam
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- S2 Project

Effective Communication

We want to develop in our students the ability to communicate and convey their views in forms effective with different audiences. We want our graduates to take with them the capability to read, listen, question, gather and evaluate information resources in a variety of formats, assess, write clearly, speak effectively, and to use visual communication and communication technologies as appropriate.

This graduate capability is supported by:

Learning outcome

- Be able to explain how symmetry/probability unifies many sub areas of physics and provides a common structure

Assessment tasks

- S1 Assignments
- S1 Exam
- S1 Problem sets
- S2 Assignments
- S2 Project

Engaged and Ethical Local and Global citizens

As local citizens our graduates will be aware of indigenous perspectives and of the nation's historical context. They will be engaged with the challenges of contemporary society and with knowledge and ideas. We want our graduates to have respect for diversity, to be open-minded,

sensitive to others and inclusive, and to be open to other cultures and perspectives: they should have a level of cultural literacy. Our graduates should be aware of disadvantage and social justice, and be willing to participate to help create a wiser and better society.

This graduate capability is supported by:

Assessment task

- S1 Problem sets