# Information Session on Physics Honours at the University of Sydney

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**Today's zoom will run for ≈ an hour. Please enter questions in the Q&A tab.**

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1. Introduction (HC)
2. General introduction to honours (HC)
3. Introduction to individual lecture courses (lecturers)
4. Introduction to research projects (HC)
5. General discussion / Q&A

# (1) Introduction

- Welcome to the School of Physics!
- This is a resource for those thinking of study beyond bachelor's level.
- The assumption is that you are close to completing a bachelor's, with a major in physics.
- We do *not* assume that you're already studying here — we regularly take students from an undergraduate background at other institutions.
- Physics is not for everyone, but physics is special — that part of the natural sciences where the objects of study are big enough, small enough, or simple enough to yield to a mix of experimental tests, mathematical analysis, fundamental inquiry, and physical intuition.
- Physics has open borders with maths and engineering, but also with chemistry, geology, biology, philosophy, IT, environmental science . . . not to mention astronomy, to which physics is joined at the hip (in the US this would be called a department of "Physics and Astronomy")
- in Sydney, the "next step" beyond undergraduate physics is **honours**

# (2) General introduction to honours

- honours is a fourth year of undergraduate work, fully devoted to one subject — physics, in this case
- students take an honours year for a variety of reasons:
  - to extend and "round out" their studies in their favourite subject
  - as the ($\approx$ necessary) next step towards higher academic study
  - to "try [physics] on for size" as a discipline
  - as training and/or enrichment for "unrelated" work
- the mix in honours varies between fields; in physics, it's
  - **50% coursework:** four advanced-level courses (6CP Units of Study)
  - **50% research:** a single, large research project taken over 8–9 months
- honours is probably quite unlike the work you have done up to now:
  - you are dedicated to a single area of study
  - the work is academically more demanding
  - you will be apprenticed to a research group all year
  - tasks with qualitatively different time demands must be balanced
  - you will likely have a relatively close cohort

# (2) General introduction: enrolment

- formal enrolment is in the Bachelor of Advanced Studies * see caveats

https://www.sydney.edu.au/courses/courses/uc/bachelor-of-advanced-studies-honours.html

- by 31st January (for 2021 S1) or 30th June (for 2021 S2)
- the key requirements are:
  - a bachelor of science (or equivalent), including double degrees, parenthetic degrees, and the Bachelor of Medical Science
  - two majors, one of them in physics (a major in nanoscience also counts)
  - a 3000-level physics average of $\geq 65$ and a WAM of $\geq 65$* see caveats
  - an academic willing to supervise you on a research project; they must agree by formal email, `cc:physics.honours@sydney.edu.au`
- the 31-Jan-2021 date is **much later than usual**, reflecting COVID-related disruption, esp. the late (mid-Jan) release of 2020 S2 grades
- I'd encourage you to **apply by 30-Nov-2020, the usual due date;** your offer may need to wait on coursework/fees/admin ...
- there can be a delay between a "provisional offer" and the "final offer"
- I manage the physics end (as honours coordinator), but you must deal directly with admissions; I can help in some circumstances

# (2) General introduction: coursework

- **coursework is worth 50% of your honours mark**
- you take 4 courses, each 30–36 lectures in size;
  3 of which much be from the physics honours programme
- the mix of assignments, projects, presentations, and exams
  varies between the courses; the usual 5%-per-day late penalties apply
- you choose courses by enrolling each semester on Sydney Student * see caveats
- exams are usually in week 14 ("stuvac") & 15 ("exam week 1")
- the one course (optionally) outside our honours programme can be
  - PHYS4036 or PHYS4037 — the option you didn't take in third year
  - PHYS{4015,4016,4017} Physics-hosted 4000-level BAS courses
  - SCIE{4001,4002,4003} Science-Faculty-hosted 4000-level BAS courses
  - MATH4xxx and STAT4xxx courses (a *long* list)
  - HPSC4101 Philosophy of Science
- consultation with your research supervisor is strongly encouraged;
  I am also available for consultation, and you should take other advice

# (2) General introduction: coursework semester 1

- **PHYS4121** Advanced Electrodynamics and Photonics
- **PHYS4122** Astrophysics and Space Science
- **PHYS4125** Quantum Field Theory

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- **PHYS4036** Particle and Condensed Matter Physics
- **PHYS4017** Practitioner Physics
- **SCIE4001** Science Communication
- **SCIE4002** Experimental Design and Data Analysis
- **SCIE4003** Ethics in Science (March Intensive)
- **MATH4XXX** *e.g.* MATH4314 Representation Theory
- **STAT4XXX** *e.g.* STAT4022 Linear and Mixed Models
- **HPSC4101** Philosophy of Science

# (2) General introduction: coursework semester 2

- **PHYS4123** General Relativity and Cosmology
- **PHYS4124** Physics of the Standard Model
- **PHYS4126** Quantum Nanoscience

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- **PHYS4037** Astrophysics and Plasma Physics
- **PHYS4015** Neural Dynamics and Computation (interdisciplinary)
- **PHYS4016** Bayesian Data Inference and Machine Learning
- **SCIE4003** Ethics in Science (August Intensive)
- **MATH4XXX** *e.g.* MATH4077 Lagrangian and Hamiltonian Dynamics
- **STAT4XXX** *e.g.* STAT4027 Advanced Statistical Modelling

# (3) Introduction to individual lecture courses

SEMESTER 1:

- **PHYS4121** Advanced Electrodynamics and Photonics (Zdenka Kuncic +)
- **PHYS4122** Astrophysics and Space Science (Jesse Van De Sande +)
- **PHYS4125** Quantum Field Theory (Archil Kobakhidze)

SEMESTER 2:

- **PHYS4123** General Relativity and Cosmology (Geraint Lewis)
- **PHYS4124** Physics of the Standard Model (Kevin Varvell)
- **PHYS4126** Quantum Nanoscience (John Bartholomew +)

+ : These are multi-lecturer courses;
the staff member who will speak to the course today is shown

# (2 redux) What's all this about "caveats"?

- The degree structure at the university is changing.
- Most students currently doing 3000-level physics are now in the new system; **the answers given in this talk are new-system answers.**
- If you started a BSc here $\leq$ 2017, you *may* end up enrolling in honours via the old system; the key differences are as follows:
  - honours is "appended" to the BSc — you get a BSc (Hons) or similar — rather than "embedded" as an option within the BSc/BAS
  - formal enrolment is with the Faculty of Science, for example

`https://sydney.edu.au/courses/courses/uc/bachelor-of-science-honours.html`

`https://sydney.edu.au/courses/courses/uc/bachelor-of-science-advanced-honours.html`

  - entry requirement will be based on the SciWAM (2000-units with weighting 2, 3000-units with weighting 3), not the WAM
  - you enrol in the four "shell units" PHYS{4011,4012,4013,4014}
  - lecture courses are internal to the School, and you don't enrol in them; if you take an external course then formally you audit the course, and the lecturer sends the mark to `physics.honours@sydney.edu.au`

# (4) Introduction to research projects

- **the research project is likewise worth 50% of your honours mark**
- you are apprenticed to a research group, in particular to your supervisor(s):
  to participate in the life of the group,
  to learn (by doing) the methods of their work,
  to learn (by instruction and osmosis) about the subject area,
  and to carry out research work of your own
- our list of research projects for 2021 is posted on the web:
  - you should discuss projects that interest you *directly* with the staff member listed as contact
  - these projects are an *indicative sample*: treat them as a guide
  - it may be possible to negotiate a project that is *not on the list*
- we recommend project work start *three weeks before* the start of lectures
- assessment is via a formal talk (10%) due by S2 week 9,
  and a 40pp written report (90%) due by S2 week 12, assessed by your group (who also consider your work), and $\geq 2$ external examiners
- enrolment is in PHYS{4103,4104} (S1) and PHYS{4105,4106} (S2);
  you get one single mark overall for your project

# (4) Introduction to research projects: project list

https://canvas.sydney.edu.au/courses/7932/pages/physics-student-portal-homepage
or https://www.sydney.edu.au/science/study/study-areas/physics.html

## Physics Honours Projects: 2021

This document lists a number of potential honours research projects within the School of Physics, together with supervisor contact details and a paragraph describing each of the projects. These are only some of the opportunities available, and *you are welcome to explore other possibilities with potential supervisors*. If you are free, please also join us for the **Honours Information Session at 12:00 on Monday 21st September**.

It is important to choose a project and supervisor to suit your interests and skills. *You are encouraged to have discussions with several possible supervisors before making a decision.* Speaking to honours and postgraduate students will also give you valuable feedback. The Web of Science (accessible from the Library website) will give you information on the research activity of the School's academics. You should also read the School's Research pages (https://sydney.edu.au/science/schools/school-of-physics.html) for more information on areas of active research.

You must arrange a supervisor and project prior to applying for honours. When you have reached agreement with a supervisor, please ask them to send you a formal email agreeing to take you on as a student, with cc to physics.honours@sydney.edu.au. Note that you should aim to start work on your research project *three weeks before the start of lectures*. This will enable you to get your project underway before lectures and assignments compete for your time. You should also make certain that your proposed supervisor will not be absent for protracted periods during semester, unless an associate supervisor is also involved. These issues will need to be formally settled when you submit your Research Plan, two weeks after the start of your first semester as an honours student.

Thank you for your interest in physics honours.

Bruce Yabsley, Honours Coordinator (physics.honours@sydney.edu.au), 14th September 2020

# (4) Introduction to research projects: project list

https://canvas.sydney.edu.au/courses/7932/pages/physics-student-portal-homepage
or https://www.sydney.edu.au/science/study/study-areas/physics.html

**Contents**

# (3) General introduction continued: scholarships

Various scholarships are available in a typical year, including

- **University of Sydney Honours Scholarships**
- **School of Physics Honours Scholarships**
- **The Malcolm Turki Memorial Scholarship**
  (for those suffering financial hardship)
- **Faculty of Science Honours Relocation Scholarships**

and others; note that

- there can be changes year-to-year
- scholarships can be available to domestic students, international students, or both
- some scholarships have special conditions
- you are automatically eligible for some scholarships, but need to actively apply for others

See `https://www.sydney.edu.au/scholarships/` for a full list.

# (3) General intro continued: contacts and dates

**Where to find information and help:**

- `https://sydney.edu.au/science/study/study-areas/physics.html` under "Honours"
- public-facing Honours Canvas is still under construction; will appear under `https://canvas.sydney.edu.au/courses/7932/pages/physics-student-portal-homepage`
- `https://www.sydney.edu.au/courses/courses/uc/bachelor-of-advanced-studies-honours.html` etc. for enrolment
- current and previous honours students
- your (potential) supervisor(s)
- `physics.studentservices@sydney.edu.au`
- `physics.honours@sydney.edu.au`

**Important dates:**

- Friday 30th November 2020 enrolment target (deadline not til Jan 2021)
- Monday 8th February 2021 start project work ("week −2")
- Monday 1st March 2021 start of lectures ("week 1")

# (4) Question and answer . . .