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. Welcome / Introduction (HC)
2. General introduction to honours (HC)
3. Introduction to individual lecture courses (lecturers)
4. Introduction to research projects (HC)
5. Administrative and other details (HC & postgrad coordinator)
6. 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 that is fully devoted to a single 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: application/enrolment

- there are various formal application paths: * see details later

  `Sydney Student ⟶ "Course details" ⟶ "Apply for Advanced Studies honours"`
  `https://sydney.edu.au/courses/courses/uc/bachelor-of-advanced-studies-honours.html`
  `https://sydney.edu.au/courses/courses/uc/bachelor-of-science-honours.html`
  `https://sydney.edu.au/courses/courses/uc/bachelor-of-liberal-arts-and-science-honours.html`
  `https://sydney.edu.au/courses/courses/uc/bachelor-of-medical-science-honours.html`

- deadlines: 31st January (for 2022 S1) or 30th June (for 2022 S2)
- the key requirements are:
  - a **bachelor of science**, including "equivalent degrees" and variants: the BLAS, the BMedSc, double degrees, parenthetic degrees ...
  - a **major in physics**:
    a major in nanoscience, or UTS' Applied Physics also count
  - a **credit average** overall, and in senior physics * see details later
  - 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-2022 date is very late relative to the start of semester;
  I'd encourage you to apply by the old-style due date, **30-Nov-2021**
- it's **normal** to apply while you're still finishing 3rd-year coursework ...

(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
- exams are mostly in weeks 15 & 16 ("exam weeks 1 & 2") as usual
- 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

- **PHYS4036** Particle and Condensed Matter Physics
- **PHYS4017** Practitioner Physics
- **SCIE4001** Science Communication
- **SCIE4002** Experimental Design and Data Analysis (Intensive March)
- **SCIE4003** Ethics in Science (Intensive March)
- **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

- **PHYS4037** Astrophysics and Plasma Physics
- **PHYS4015** Neural Dynamics and Computation (interdisciplinary)
- **PHYS4016** Bayesian Data Inference and Machine Learning
- **SCIE4003** Ethics in Science (Intensive August)
- **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

(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 2022 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 ≥ 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/

Physics Honours Projects: 2022

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 6th 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), 1st September 2021

(4) Introduction to research projects: project list

https://canvas.sydney.edu.au/courses/7932/

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(5) Administrative and other details: application (i)

USyd has a distinctive "Bachelor of Advanced Studies",
and *most* science students here are in a combined BSc/BAS degree.
This runs for four years, and honours is a specialisation of that fourth year.

- such students apply in Sydney Student:
  "Course Details" and then "Apply for Advanced Studies honours"
- students in other degrees, or students from other universities,
  can instead apply for a one-year "standalone BAS":

  `https://sydney.edu.au/courses/courses/uc/bachelor-of-advanced-studies-honours.html`
- one of the features of the BAS is that it requres **two majors**,
  rather than (say) a major and a minor
- if you have just the major in physics, other enrolment paths are open:

  `https://sydney.edu.au/courses/courses/uc/bachelor-of-science-honours.html`
  `https://sydney.edu.au/courses/courses/uc/bachelor-of-liberal-arts-and-science-honours.html`
  `https://sydney.edu.au/courses/courses/uc/bachelor-of-medical-science-honours.html`
- once you are accepted into honours,
  the difference between these cases will be $\approx$ invisible to you:
  unit enrolment etc. works the same way in all cases

(5) Administrative and other details: application (ii)

- there can be a delay between a "provisional offer" and the "final offer" . . . which won't be issued until your bachelor's degree is fully graded
- your offer may also need to wait on any outstanding fees/fines/. . .
- if there are problems/delays with your application, please contact me
- you can enrol in honours after a gap: *e.g.* if you finished your bachelor's a semester ago, or two years ago, this is still OK

Most enrolments (BAS, BSc (Hons), . . .) rely on the **WAM** (Weighted Average Mark), counting 6CP units weighted $\times 6$, 2CP units $\times 2$, . . .

some heritage enrolments use the **SciWAM**, which is restricted to 2000-units (weighted $\times 2 \times$ CP value), and 3000-units ($\times 3 \times$ CP value)

Note that the WAM, SciWAM, and senior physics average **count all course attempts, including fails:** *e.g.* your senior physics grades at Fictitious University are 68 (PHY301), 44 (PHY302), 71 (PHY303), & 64 (PHY304), and you re-take PHY302 receiving 73 — in this case, the senior physics average is 64.

(5) Administrative and other details: enrolment

Five examples of course enrolments in physics honours:

(1) PHYS412X courses only; starting first semester

2022 S1	PHYS4122	Astrophysics and Space Science
2022 S1	PHYS4125	Quantum Field Theory
2022 S1	PHYS4103	Physics Honours Project A
2022 S1	PHYS4104	Physics Honours Project B
2022 S2	PHYS4123	General Relativity and Cosmology
2022 S2	PHYS4124	Physics of the Standard Model
2022 S2	PHYS4105	Physics Honours Project C
2022 S2	PHYS4106	Physics Honours Project D
2022 S2	SCIE4999	Final Honours Mark [special 0CP "unit"]

(This looks the same for BSc/BAS, Standalone BAS, and BSc (Hons) students.)

(5) Administrative and other details: enrolment

Five examples of course enrolments in physics honours:

(2) including an external course; starting first semester

2022 S1	PHYS4125	Quantum Field Theory
2022 S1	MATH4314	Representation Theory
2022 S1	PHYS4103	Physics Honours Project A
2022 S1	PHYS4104	Physics Honours Project B
2022 S2	PHYS4123	General Relativity and Cosmology
2022 S2	PHYS4126	Quantum Nanoscience
2022 S2	PHYS4105	Physics Honours Project C
2022 S2	PHYS4106	Physics Honours Project D
2022 S2	SCIE4999	Final Honours Mark [special 0CP "unit"]

(This looks the same for BSc/BAS, Standalone BAS, and BSc (Hons) students.)

(5) Administrative and other details: enrolment

Five examples of course enrolments in physics honours:

(3) including an external course; starting first semester

2022 S1	PHYS4121	Advanced Electrodynamics and Photonics
2022 S1	PHYS4125	Quantum Field Theory
2022 S1	PHYS4103	Physics Honours Project A
2022 S1	PHYS4104	Physics Honours Project B
2022 S2	PHYS4123	General Relativity and Cosmology
2022 S1	MATH4077	Lagrangian and Hamiltonian Dynamics
2022 S2	PHYS4105	Physics Honours Project C
2022 S2	PHYS4106	Physics Honours Project D
2022 S2	SCIE4999	Final Honours Mark [special 0CP "unit"]

(This looks the same for BSc/BAS, Standalone BAS, and BSc (Hons) students.)

(5) Administrative and other details: enrolment

Five examples of course enrolments in physics honours:

(4) with another physics course, starting second semester

2022 S2	PHYS4124	Physics of the Standard Model
2022 S2	PHYS4016	Bayesian Data Inference and Machine Learning
2022 S2	PHYS4103	Physics Honours Project A
2022 S2	PHYS4104	Physics Honours Project B
2023 S1	PHYS4121	Advanced Electrodynamics and Photonics
2023 S1	PHYS4122	Astrophysics and Space Science
2023 S1	PHYS4105	Physics Honours Project C
2023 S1	PHYS4106	Physics Honours Project D
2023 S1	SCIE4999	Final Honours Mark [special 0CP "unit"]

(This looks the same for BSc/BAS, Standalone BAS, and BSc (Hons) students.)

(5) Administrative and other details: enrolment

Five examples of course enrolments in physics honours:

(5) with frontloading, starting second semester

2022 S2	PHYS4123	General Relativity and Cosmology
2022 S2	PHYS4124	Physics of the Standard Model
2022 S2	PHYS4126	Quantum Nanoscience
2022 S2	PHYS4103	Physics Honours Project A
2023 S1	PHYS4125	Quantum Field Theory
2023 S1	PHYS4104	Physics Honours Project B
2023 S1	PHYS4105	Physics Honours Project C
2023 S1	PHYS4106	Physics Honours Project D
2023 S1	SCIE4999	Final Honours Mark [special 0CP "unit"]

(This looks the same for BSc/BAS, Standalone BAS, and BSc (Hons) students.)

(5) Administrative and other details: 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.

(5) Administrative & other details: postgraduate

How does honours relate to / prepare you for postgraduate study?

$\longrightarrow$ presentation by Sveta Postnova,
Postgraduate Coordinator for Admissions

(5) Administrative & other details: contacts & dates

Where to find information and help:

- `https://sydney.edu.au/science/study/undergraduate-courses/honours-in-science.html`
- public-facing Honours Canvas is still under construction; will appear under Student Portal: `https://canvas.sydney.edu.au/courses/7932/`
- `Sydney Student` → `"Course details"` → `"Apply for Advanced Studies honours"` within BSc/BAS; or `https://sydney.edu.au/courses/courses/uc/bachelor-of-advanced-studies-honours.html` etc. as appropriate
- current and previous honours students, your (potential) supervisor(s) ...
- `physics.studentservices@sydney.edu.au`
- `physics.honours@sydney.edu.au`

Important dates:

- end-Nov/early-Dec-2021 application target (deadline not til Jan 2022)
- Monday 31st January 2022 start project work ("week −2")
- Monday 21st February 2022 start of lectures ("week 1")

(6) Question and answer . . .