Arts and Science Physics

Info Session for ASC1

This Evening's Info Session

- □ Purpose:
 - to provide info for ASC1 students interested in physics degree plans
- □ Why study physics?

- Prof. Bob Gooding: Undergraduate Chair / Honours Physics Advisor
- Prof. Rob Knobel: Head, Department of Physics, Engineering Physics and Astronomy

Physics Degree Plans

Bachelor of Science (Honours) B.Sc.(Honours) 4-year degree

There are 3-year General B.Sc. available too but we won't discuss these.

Physics Minors: Minor (Arts) and Minor (Science)

Honours Degrees in Physics

Concentration – Degree Plan	Degree
Specialization	B.Sc.(Honours) (4 yr)
Major	B.Sc.(Honours) (4 yr)
Major-Minor	B.Sc.(Honours) (4 yr)

Major

- □ 72.0 credits are specified credits in physics and math
- with 48.0 credits electives: allows you some room to pursue other interests (including a Minor in another field)
- □ permitted to take PHYS 590 Research Thesis in 4th Year
- □ possible to go to grad school with this degree

Honours Degrees in Physics

Concentration – Degree Plan	Degree
Specialization	B.Sc.(Honours) (4 yr)
Major	B.Sc.(Honours) (4 yr)
Major-Minor	B.Sc.(Honours) (4 yr)

Specialization

- \square heavy concentration in specified courses \rightarrow best preparation for grad school
 - Physics
 - Astrophysics
 - Mathematical Physics

(99/120 specified credits)

- (102/120 specified credits)
- (105/120 specified credits)

Note: in the Specialization degree plans, you cannot take a minor.

Major or Specialization

2nd Year for Physics and Astrophysics

Fall	Winter
PHYS 206 Dynamics	PHYS 212 Waves and Vibrations
PHYS 213 Computational Methods	PHYS 239 Electromagnetism
in Physics	
PHYS 242 Relativity and Quanta	PHYS 250 Foundations of Experimental
	Physics (lab)
MATH 280 or 221 Advanced	
(Vector) Calculus	
MATH 231 Differential Equations or	MATH 225 Differential Equations
	PHYS 216 Introduction to Astrophysics

Specialization

2nd Year for Mathematical Physics

Fall	Winter
PHYS 206 Dynamics	PHYS 212 Waves and Vibrations
PHYS 213 Computational Methods	PHYS 239 Electromagnetism
in Physics	
PHYS 242 Relativity and Quanta	PHYS 250 Foundations of Experimental
	Physics (lab)
MATH 280 Advanced Calculus	MATH 281 Introduction to Real Analysis
MATH 231 Differential Equations	MATH 210 Rings and Fields
some MAPH students squeeze in (or take in 3	3 rd year)

some MAPH students squeeze in (or take in 3rd year)STAT 268 Statistics and Probability ISTAT 269 Statistics and Probability II

2nd Year MATH Courses

 you really need to complete vector calculus (MATH 280 or MATH 221) and differential equations (MATH 231 or MATH 225) in your 2nd year

very important for 3rd year PHYS courses that follow

Major or Specialization

3rd Year for Physics and Astrophysics

Major, Specialization Physics and Specialization Astrophysics

- PHYS 316 and 317 Mathematical Methods in Physics (full-year)
- PHYS 344 and 345 Quantum Mechanics (full-year)
- PHYS 350 3rd year Lab: full-year course, includes project in Winter term
- PHYS 372 Thermodynamics

Specialization Physics and Specialization Astrophysics take in addition

PHYS 321 Advanced Mechanics

Specialization Astrophysics takes

PHYS 315 Physical Processes in Astrophysics

available course: PHYS 334 Electronics for Physicists

4th Year for Physics and Astrophysics

Major, Specialization Physics and Specialization Astrophysics

PHYS 432 EM Theory

Specialization Physics and Specialization Astrophysics take in addition

- PHYS 453 Advanced Lab (term-length)
- PHYS 590 Honours Research Thesis (also Specialization Mathematical Physics takes)
- 6.0 credits choice of physics at the 400 level

Major takes

 6.0 credits choice of physics at the 400 level or above (allowed to count PHYS 315 Astrophysics to satistfy)

Specialization Physics also required to take

- PHYS 444 Advanced Quantum or PHYS 472 Statistical Mechanics
- PHYS 480 Solid State Physics
- PHYS 490 Intro Nuclear and Particle Physics

Specialization Astrophysics also required to take

- PHYS 414 General Relativity
- PHYS 435 Stellar Structure and Evolution

4th Year Physics Courses

to choose from, include:

- □ General Relativity
- □ Stellar Structure and Evolution
- □ Advanced Lab
- Advanced Physics Design Project
- □ Laser Optics
- □ Solid State Physics
- □ Nanoscience and Nanotechnology
- □ Intro Nuclear and Particle Physics
- □ Advanced Quantum Theory
- Statistical Mechanics
- Intro Medical Physics
- □ 4th year Honours Physics Thesis

Physics Minor

- "Science Minor" is a bit of a misnomer Science students can complete a Physics Minor (Arts)
- □ Minor (Arts) 24.0 units beyond 1st year
 - an count ASTR 101, ASTR 102, PHYS P20 or P22
- □ Minor (Science) 36.0 units beyond 1st year
 - specific PHYS and MATH courses
- Students who have completed PHYS 117 (and done well) may be approved to take 200-level PHYS courses and can be accepted into a Physics Minor

Accelerated Master's in Physics

- □ get an M.Sc. degree after you complete your B.Sc. (Honours) degree, with an extra year "4+1"
 - full M.Sc. degree with research thesis
 - apply in your 3rd year; start in the summer after 3rd year in a paid(!), research position
 - continue your PHYS 590 thesis in that same research group
 - able to take 1-2 graduate PHYS courses in your 4th year that "double count" towards your BScH and MSc
 - become a Master's student in the summer after 4th year, continue research
 - complete MSc research, thesis and requirements in your 5th year

- □ What if I don't have linear algebra (MATH 110 or MATH 111)?
 - MATH 110 or 111 is required for all Honours Physics degree plans
 - you can still choose Physics and will be admitted (normal plan admission thresholds apply)
 - this summer, try to take an approved, transferable course somewhere (at least 3.0 units worth)
 - if you don't, then absolutely must take linear algebra in your 2nd year along with the other 200-level MATH courses
 - and talk to me (Physics Advisor)

- □ I'm taking PHYS 117 and I really like physics. Can I get into a physics degree plan?
 - yes, it's possible if you have an A+ or A in both PHYS
 117 and MATH 121
 - *need* to talk to me (Physics Advisor)
 - entry into a Physics degree plan will require manual intervention

- Is Study Abroad possible for Physics students?
 - yes, each year ~1-2 students go on study abroad for one term or the full-year, in their 3rd year
 - England and Australia are "popular"; recent students have also gone to Ireland, the Netherlands, France, Hong Kong

- Are QUIP Internships available for Arts and Science Physics students?
 - yes, although QUIP is fairly new and not so many students have done it (2 students this year)
 - in recent years we are seeing more and more internship postings for physics, e.g.
 - National Research Council
 - Ontario Power Generation (nuclear)
 - Defense Research and Development Canada

After Graduation?

- □ about 50% of Canadian physics graduates go on to graduate school
 - in physics, astronomy, but also in math, engineering, chemistry, medicine, MBA, law...
- □ top students from Queen's have been admitted to the top physics graduate schools in Canada, USA, UK and abroad
 - e.g. Princeton, MIT, Harvard, Caltech, Stanford
- □ careers after graduation, with or without more school include
 - e.g. education, research in government labs or industry, technologyrelated industry, medical physics, software and computing, finance and management consulting
- a physics education and degree give you: problem-solving skills, abstract and critical thinking ability and quantitative capabilities (incl. math and computing) at the highest level potential employers know: a physics degree isn't easy!

Why Study Physics?



Because Physics is Cool, that's why!



How Much Food?

does a goose need to eat to prepare for migrating 3,000 km?

