Imperial College London

Module Outline

Entrepreneurship for Physicists

Module Code	PHYS97104	FHEQ Level	7
Pre-requisites	None	Co-requisites	None
Primary Department	Physics.		
Module Leader	Dr John Hassard		
Additional Teaching Departments	Enterprise Lab		
Teaching Staff	John Hassard, Dr Mark Richards and others. A range of distinguished guest lecturers including successful entrepreneurs from the Blackett Lab are signed up. The Enterprise Lab and Imperial Hackspace will be fully involved. Several well-known entrepreneurs and financiers have agreed to teach sections.		

Programmes on which the Module is delivered	Core/Elective
All BSc and MSci Physics programmes (F300, F325, F3W3, F303, F309, F390)	Elective

Learning Outcomes

The course will explain the nature – the why, the how – of entrepreneurship with particular reference to Physicists. Students will learn actionable material on the nature of entrepreneurship and the environment we now all face*, Intellectual Property, entrepreneurial finance, and corporate law. In addition, students will gain organisational skills for building an effective (typically cross-disciplinary) team.

Learning outcomes are:

1. How to establish a technology-based enterprise, maximising the utility of your physics education;
2. How to protect its assets- such as Intellectual Property
3. How to structure and incentivise an often cross-disciplinary team
4. Detailed and usable insights into the nature of finance- how to raise it, and how to engage with stakeholders
5. How to structure exit options for yourself and investors.

* HEFCE describes Innovation as being a 'Third Stream' for universities, after research and teaching. 25% of Research Excellence Framework (https://www.ref.ac.uk/) funding for Universities is associated with 'Impact' defined as the contribution of research to the economy and society , with a further 10% hypothecated on environmental issues.

Description of Content

Students will undertake about 20 lectures, and work in teams and as individuals. Individuals will undertake due diligences, technology and IP reviews, and propose enterprises. Individuals will develop detailed technical business models. There will be marked quizzes in order to ensure full engagement.

Lectures will cover:

- Why entrepreneurship is important to universities and the UK economy, endogenous and exogenous growth, innovation and human capital. A 2012 study by the university estimated that all the companies formed by Stanford entrepreneurs generate total global revenue of $2.7 trillion annually. Stanford has about 58 courses like this one – can we learn from them?
- Organisational issues; sector variabilities; the advantages of physics

	• Exploring the gap between high scientific performance on the one hand and industrial competitiveness on the other, in EU, US, Japan, China. Why is university patenting only 3% of total (2007, up from 1% in 1980s)? • The macroeconomic and microeconomic evidence that exists on the contribution of universities to growth and innovation and how Universities are engines of innovative growth and can achieve their full potential, without jeopardizing- indeed, enhancing- their main mission of educating and basic research. The 'triple helix'. REF. TEF. Brexit. • The role, the generation, the management, and protection of and strategies to implement and develop Intellectual properties. • Corporate law for entrepreneurs. • Entrepreneurial finance, Why you need finance. Types of finance: debt, equity, convertibles. Relationship to present and future markets. • Venture capital vs private Equity vs Angels vs Regional Development. vs governments • Components of financial instruments, financial forecasting, sources, harvesting; four factors: Uncertainty, asymmetrical knowledge, assets, market • Profit and loss, balance sheet, cash flow, the many methods of valuation • Case studies. For example: One lecture will illustrate how physics underlies hugely disruptive technologies. • What to look for in good and bad teams. Incentivising, ensuring compliance with agreed goals, examples of good and bad practice. • Development of a Business Model (based on a sophisticated Profit and Loss) • Presentation within a team, and as a 'sole trader' of an entrepreneurial idea, either taken from a distinguished publication* or generated by the student her or himself. • Nature Innovations, http://www.nature.com/nature/efinnovations/ • http://www.sciencemag.org/news/2016/03/average-innovator-not-steve-jobs • http://www.sciencemag.org/news/2016/12/update-surprise-innovation-bill-clears-house-heads-president • http://www.rd100conference.com

Assessment	Assessment Type	Weighting
Weekly individual computer quizzes	Short numerical short factual	20%
Team Presentations	Interview and presentation	20%
Detailed and heavily annotated Profit and Loss statement	Spread sheet, presented individually by each student	20%
Business model document (not a formal business plan, but a 10-15 page document pitching at a hypothetical investor.)	Document assessed according to clearly-defined criteria.	20%
Individual Presentation	On the team project (as above)	20%

Learning & Teaching Hours	Independent Study Hours	Placement Hours	Total Hours
20	130	0	150
ECTS Credit	6	CATS Credit	12
Date of introduction	October 2017	Date of Last Revision	May 2020