Doctor of Philosophy in Natural, Mathematical, and Computational Sciences

Handbook

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Introduction

Doctor of Philosophy in Natural, Mathematical, and Computational Sciences

The course is suited for those who intend to conduct original research in the pursuit, discovery, or creation of new knowledge. It provides training for those seeking advanced study and employment in research-focused fields. The Venture Science PhD track aims to cultivate science-based entrepreneurship, producing graduates with startup-ready projects and the expertise to launch and manage a startup. The goal is to increase the pipeline of talent in cutting-edge science, and to facilitate entrepreneurial talent's entry into academic spaces, and vice versa.

1. A doctorate program has no grades, and no credits – but it does have a three-part structure with checkpoints and a final *viva voce* examination.
2. In addition to the student's supervisor in their field, who must have a PhD, students may also have a secondary advisor so they might benefit from different perspectives and a more extensive professional network.
3. Typically, the PhD can be completed within three years of full-time study. However, a fourth year should be automatically granted on request to the Dean of the student's college.

Key Patterns

1. **Meetings**: In year 1, the student should meet regularly (approximately, 2x/month or more) with the supervisor. In year two, 1x per month should become the norm and continue in year 3.
2. **Learning Methods**: The program integrates asynchronous (recorded lectures, readings, assignments, handouts delivered electronically, digital material) and synchronous (live video calls) components to accommodate diverse student schedules. Students have direct access to their teacher and their peers at all times through direct message and group chat.
3. **Deliverables**: There is a major checkpoint assignment at the end of each year. In years 1 and 3, this assignment features an oral exam. In year 3 the oral exam (viva voce examination) is done with faculty from outside Woolf.
4. **Duration of Courses**: Although courses mention 'years', and the three-year degree is split into three parts, the precise timing by which a student meets each milestone is a guideline rather than a strict requirement.
5. **Overall Structure and Evidence Required for Progression**

Course	ECTS	Hours	Level
Advanced Research Planning and Methodology	0	1500	EQF 8
Advanced Research Progress and Progress Review	0	1500	EQF 8

Thesis Completion and Viva Voce Examination	0	1500	EQF 8

Although these tiers represent similar duration, in practice many students will find that they vary. Their equivalence here represents the importance of the three moments of the degree, rather than prescribing a specific model to a student and their supervisor.

Year One: Advanced Research Planning and Methodology

The course begins with a highly structured Advanced Research Planning and Methodology section, resulting in a detailed programme plan and outline. There are two tracks at the beginning of the programme. The first track focuses on the individual student's research under the direction of their supervisor. The second, cohort-based track (Venture Science) focuses on identifying a research project that is both an original contribution to knowledge and suitable for launching a startup.

Assets to log evidence:

The Research Plan: By the end of the first year, if not earlier, the Research Plan is submitted as a digital portfolio containing six elements:

1. Provisional thesis title
2. Abstract, including proposed methodology
3. Expanded table of contents
4. Literature survey
5. Annotated bibliography
6. Timeline to completion

The 'Research Plan' is submitted to be examined by an academic in the same field, selected by the thesis supervisor with the approval of the college dean. The examining academic must possess a research doctorate.

Year Two: Advanced Research Progress and Progress Review

Upon completion of the first section of the programme, full-time students proceed for one year of research, during which students follow the established timeline for writing sections of the thesis, holding a regular cadence of meetings with their supervisor, and then finally undergo the Progress Review. This research may happen remotely (in computer science, data science, or mathematics, for example) or in labs (in the natural and physical sciences). Several labs at major universities have already agreed to take students from this program as guest researchers.

Assets to log as evidence:

Progress Report: The final assessment is a revision of the thesis proposal developed in year one. The revision should take into account the research of the intervening year, as well as any feedback the student has received from the broader scholarly community.

Year Three: Thesis Completion and Viva Voce

The student should not advance to this course without several substantially completed chapters. This year is about finalising research, preparing the thesis, and defending it.

Assets to log as evidence:

1. Doctoral Thesis (dissertation). The standard scientific doctoral thesis at Woolf is typically 40-60,000 words (not longer than 80,000 words), exclusive of appendices and data sets. The dissertation typically consists of several chapters that include an introduction to the research problem, a literature review, a detailed methodology section, the results of the research, and a discussion of the findings.
2. Viva Voce exam must be recorded and logged.

Woolf also supports an Integrated Thesis option. An Integrated Thesis will typically be 20-40,000 words (not longer than 80,000 words without express permission), exclusive of appendices and data sets. A doctoral thesis on the Integrated Thesis option may be accepted for examination if it consists of a minimum of three papers of publishable quality, framed by an introduction, a literature survey, and a conclusion.

Venture Science Track

Venture Science students' first term includes training that cuts across scientific research, commercialisation, and personal development, including training in scoping a project, connecting with audiences, making complex decisions, and telling compelling stories with data. At the end of the first term, Venture Science students will have produced an equivalent proposal document to the other PhD students, albeit with an additional section on opportunities for commercialisation.

Venture Science students in years two and three may be placed in a research lab at a major university, with all the rights and opportunities associated therein. The doctorate can be completed entirely remotely, however, especially in fields such as mathematics, computer science, or data science.

Module	Level
Introduction to Venture Science	EQF 7
Narrative Design and Storytelling	EQF 7
High Performance Culture	EQF 7
Introduction to Scoping	EQF 7
Scoping 1: Academic Research and Expert Interview	EQF 7
Scoping 2: Customer Development	EQF 7
Scoping 3: Feasibility and Technoeconomics	EQF 7

Complex Decision Making	EQF 7
Sector-Specific Business Model Design	EQF 7
Research: Tests (Theory, Practice, Reflection)	EQF 7
Venture Research	EQF 8

Full Details of PhD

Entry Requirements

1. **Education Requirements**

Candidates who apply for this course must have an EQF 7 level degree. Usually this degree should be in the natural, mathematical, or computational sciences. Applicants with extensive industry experience may be considered with any EQF 7 degree. Candidates applying for the Venture Science track should additionally demonstrate experience in or familiarity with venture creation.

1. **Language Requirements**

Students must have English or Spanish competency at a C1 level. Evidence of this competency that will be accepted includes having completed an EQF 7 level degree in the appropriate language; English language competency scores on IELTS as such: overall, 6.5; Writing: 6; Reading: 6; Listening: 6; Speaking 6; or, for Spanish, a C1 or higher score on the DELE exam.

1. **Transfer of Progress from Other Programmes**

Students who are transferring from another accredited doctoral programme may be eligible to complete the degree in a shorter time frame. This arrangement will be detailed as part of any offer of admission.

1. **Duration of Programme**

Typically, doctoral programs can be completed within three years of full-time study. The following table provides an overview of the duration of PhD with possible extension(s):

Study Mode	Standard Duration	Extension Option 1	Extension Option 1 Procedure	Extension Option 2	Extension Option 2 Procedure
Full-Time	3 Years	4th Year	Automatically granted on request to the Dean	5th Year	Petition to panel (Dean, Academic Board member, QAETAC member)

Part-Time	6 Years	7th Year	Automatically granted on request to the Dean	8th Year	Petition to panel (Dean, Academic Board member, QAETAC member)

Assessment

Within any individual module of the Doctor of Philosophy, assessment is of two kinds:

1. **Regular Assessment** (typically weighted 20% as a whole): Assessment of regular assignments relating to continuous evaluation of student progress, concentrating on the proficiency of submitted assignments, and the ability of the student to respond to issues raised by the instructor about those assignments.
2. **Final Assessment** (typically weighted 80%): Assessment of a final assignment or project. This requires students to deepen and extend the scholarly engagements initiated in their prior work.

The Viva Voce Examination

The *viva voce* examination is a signature moment in a doctoral candidate's career. Examiners from within and without the College ratify the candidate's knowledge of their selected field.

Examination Process:

1. Examiners consist of one faculty member of the College other than the thesis supervisor (who will Chair the meeting) and one external examiner from outside of Woolf.
2. Students may elect whether they wish to allow a public audience to attend the viva voce examination.
3. The examination should be coordinated by the thesis supervisor, and should ordinarily be arranged within one month of receipt of the thesis.
4. The examination should be within two or three months after the thesis has been submitted. Examiners must have a minimum of four weeks to read the thesis before the examination.
5. Before the examination, examiners may write the thesis supervisor indicating any areas of special concern.
6. After the examination, examiners will complete the post-viva form.
7. The post-viva form should give a detailed description of the strengths and weaknesses of the candidate's performance and the thesis itself.
8. Minor corrections should be completed by the student within one month of receiving the list of corrections.

Possible Outcomes:

1. The student will receive the doctorate for the thesis as written.
2. The student will receive the doctorate, subsequent to minor corrections.
3. The student should pursue revision and resubmission.
4. The student can receive a Master's degree in their subject.
5. The student will fail.

Learning Outcomes

1. Create and interpret new knowledge at the most advanced frontier of a field of work or study through original and advanced research of a quality to satisfy peer review, extend the forefront of the discipline and merit publication.
2. Communicate scholarly concepts clearly and unambiguously to specialized and non-specialized audiences.
3. Develop advanced abilities related to research methods and the conventions of appropriate, graduate-level writing.
4. Critically evaluate alternative approaches to solving key scholarly questions on the basis of academic scholarship and case studies, demonstrating reflection on social and ethical responsibilities.
5. Formulate scholarly judgments despite incomplete information by integrating knowledge and approaches from diverse domains including academic scholarly articles, verbal discussions, and original ideation and research.
6. Enquire critically into the theoretical strategies for handling key research questions.
7. Possess the most advanced and specialised skills and techniques to be able to conceptualise, design and implement a project for the generation of new knowledge or to solve critical problems or to refute or redefine existing knowledge.
8. Formulate research-based solutions to scholarly questions in environments of incomplete information.
9. Manage decisions with autonomy in complex and unpredictable environments.
10. Organise projects and people for scholarly discussions in a way that is responsive to the conventions of professional engagements.
11. Demonstrate learning skills needed to maintain continued, self-directed study.
12. Demonstrate authority, innovation, autonomy, integrity and personal responsibility in the production or development of innovative ideas or processes in the context of an academic discipline, field of study or area of professional practice.

Internships policy

Internships must be a genuine extension of the student's academic programme, providing opportunity to apply theoretical knowledge to substantive projects directly related to their field of study. Internships consisting primarily of administrative or routine tasks will not be approved.

Every internship must have a defined start date, end date, and formal learning plan with objectives agreed in advance by the student, the host organisation, and the relevant college. Responsibilities and task complexity should increase over time. Each student must be assigned a named supervisor within the host organisation who holds relevant expertise and is responsible for providing regular guidance and feedback.

Woolf prioritises paid internships to ensure equitable access regardless of socioeconomic background. Unpaid internships may only be approved where they constitute a genuine learning opportunity and do not displace the work of a paid employee.

Programmatic standards

Day-to-day management sits with the relevant college. Each college must have a designated Woolf contact responsible for vetting and approving all host organisations and placements before any internship may proceed. Colleges are responsible for matching students to approved positions.

Students must complete pre-internship preparation before commencing a placement, which may include CV writing, interview support, and other instruction as necessary. Virtual internships are encouraged to widen access beyond geographical constraints; support systems must address the challenges of remote work, including cross-timezone communication and fostering professional belonging.

Programme effectiveness must be evaluated on an ongoing basis. Formal evaluations will be collected from students, host supervisors, and academic advisors, and will inform curriculum design and programme improvement.

Grading Scheme

General Marking Criteria and Classification

Marking of student work keeps in view the scale of work that the student can reasonably be expected to have undertaken in order to complete the task.

The assessment of work for the course is defined according to the following rubric of general criteria:

1. **Engagement:**
    - Directness of engagement with the question or task
    - Range of issues addressed or problems solved
    - Depth, complexity, and sophistication of comprehension of issues and implications of the questions or task
    - Effective and appropriate use of imagination and intellectual curiosity
2. **Argument or solution:**
    - Coherence, mastery, control, and independence of work
    - Conceptual and analytical precision
    - Flexibility, i.e., discussion of a variety of views, ability to navigate through challenges in creative ways
    - Completion leading to a conclusion or outcome
    - Performance and success of the solution, where relevant
3. **Evidence (as relevant):**
    - Depth, precision, detail, range and relevance of evidence cited
    - Accuracy of facts
    - Knowledge of first principles and demonstrated ability to reason from them
    - Understanding of theoretical principles and/or historical debate
    - Critical engagement with primary and/or secondary sources
4. **Organisation & Presentation:**
    - Clarity and coherence of structure
    - Clarity and fluency of writing, code, prose, or presentation (as relevant)
    - Correctness of conformity to conventions (code, grammar, spelling, punctuation, or similar relevant conventions)

Definition of marks

97-100

Work will be so outstanding that it could not be better within the scope of the assignment. These grades will be used for work that shows exceptional excellence in the relevant domain; including (as relevant):

remarkable sophistication and mastery, originality or creativity, persuasive and well-grounded new methods or ideas, or making unexpected connections or solutions to problems.

94-96

Work will excel against each of the General Criteria. In at least one area, the work will be merely highly competent.

90-93

Work will excel in more than one area, and be at least highly competent in other respects. It must be excellent and contain: a combination of sophisticated engagement with the issues; analytical precision and independence of solution; go beyond paraphrasing or boilerplate code techniques; demonstrating quality of awareness and analysis of both first principles or primary evidence and scholarly debate or practical tradeoffs; and clarity and coherence of presentation. Truly outstanding work measured against some of these criteria may compensate for mere high competence against others.

87-89

Work will be at least very highly competent across the board, and excel in at least one group of the General Criteria. Relative weaknesses in some areas may be compensated by conspicuous strengths in others.

84-86

Work will demonstrate considerable competence across the General Criteria. They must exhibit some essential features of addressing the issue directly and relevantly across a good range of aspects; offer a coherent solution or argument involving (where relevant) consideration of alternative approaches; be substantiated with accurate use of resources (including if relevant, primary evidence) and contextualisation in debate (if relevant); and be clearly presented. Nevertheless, additional strengths (for instance, the range of problems addressed, the sophistication of the arguments or solutions, or the use of first principles) may compensate for other weaknesses.

80-83

Work will be competent and should manifest the essential features described above, in that they must offer direct, coherent, substantiated and clear arguments; but they will do so with less range, depth, precision and perhaps clarity. Again, qualities of a higher order may compensate for some weaknesses.

77-79

Work will show solid competence in solving problems or providing analysis. But it will be marred by weakness under one or more criteria: failure to fully solve the problem or discuss the question directly; some irrelevant use of technologies or citing of information; factual error, or error in selection of technologies; narrowness in the scope of solution or range of issues addressed or evidence adduced; shortage of detailed evidence or engagement with the problem; technical performance issues (but not so much as to prevent operation); poor organisation or presentation, including incorrect conformity to convention or written formatting.

74-76

Work will show evidence of some competence in solving problems or providing analysis. It will also be clearly marred by weakness in multiple General Criteria, including: failure to solve the problem or discuss the question directly; irrelevant use of technologies or citing of information; factual errors or multiple errors in selection of technologies; narrowness in the scope of solution or range of issues addressed or evidence adduced; shortage of detailed evidence or engagement with the problem; significant technical performance issues (but not so much as to prevent operation); poor organisation or presentation, including incorrect conformity to convention or written formatting. They may be characterised by unsubstantiated assertion rather than argument, or by unresolved contradictions in the argument or solution.

70-73

Work will show evidence of competence in solving problems or providing analysis, but this evidence will be limited. It will be clearly marred by weakness in multiple General Criteria. It will still make substantive progress in addressing the primary task or question, but the work will lack a full solution or directly address the task; the work will contain irrelevant material; the work will show multiple errors of fact or judgment; and the work may fail to conform to conventions.

67-69

Work will fall down on a number of criteria, but will exhibit some of the qualities required, such as the ability to grasp the purpose of the assignment, to deploy substantive information or solutions in an effort to complete the assignment; or to offer some coherent analysis or work towards the assignment. Such qualities will not be displayed at a high level, and may be marred by irrelevance, incoherence, major technical performance issues, error and poor organisation and presentation.

64-66

Work will fall down on a multiple General Criteria, but will exhibit some vestiges of the qualities required, such as the ability to see the point of the question, to deploy information, or to offer some coherent work. Such qualities will be substantially marred by irrelevance, incoherence, error and poor organisation and presentation.

60-63

Work will display a modicum of knowledge or understanding of some points, but will display almost none of the higher qualities described in the criteria. They will be marred by high levels of factual or technology error and irrelevance, generalisation or boilerplate code and lack of information, and poor organisation and presentation.

0-60

Work will fail to exhibit any of the required qualities. Candidates who fail to observe rubrics and rules beyond what the grading schemes allow for may also be failed.

Indicative equivalence table

US GPA	US Grade	US Percent	UK Mark	UK UG Classification	UK PG Classification	Malta Grade	Malta Mark	Malta Classification	Swiss Grade
4	A+	97 - 100	70+	First	Distinction	A	80-100%	First class honours	6.0
3.9	A	94-96				B	70-79%	Upper-second class honours	
3.7	A-	90-93							5.5
3.3	B+	87-89	65-69	Upper Second	Merit	C	55-69%	Lower-second class honours	
3	B	84-86	60-64						
2.7	B-	80-83	55-59	Lower Second	Pass				5
2.3	C+	77-79	50-54			D	50-54%	Third-class honours	
2	C	74–76	45-49	Third	Pass				
1.7	C-	70–73	40-44						
1.3	D+	67–69	39-	Fail	Fail				
1	D	64–66							
0.7	D-	60–63							
0	F	Below 60				F			

Synchronous Adjustments Template

Synch discussions may affect the mark on submitted assignments: written work is submitted in advance, and a discussion follows. This provides students an opportunity to clarify and explain their written claims, and it also tests whether the work is a product of the student's own research or has been plagiarised.

The synchronous discussion acts to shift the recorded mark on the submitted assignment according to the following rubric:

+3

Up to three points are added for excellent performance; the student displays a high degree of competence across a range of questions, and excels in at least one group of criteria. Relative weaknesses in some areas may be compensated by conspicuous strengths in others.

+/- 0

The marked assignment is unchanged for fair performance. Answers to questions must show evidence of some solid competence in expounding evidence and analysis. But they will be marred by weakness under one or more criteria: failure to discuss the question directly; appeal to irrelevant information; factual error; narrowness in the range of issues addressed or evidence adduced; shortage of detailed evidence; or poor organisation and presentation, including consistently incorrect grammar. Answers may be characterised by unsubstantiated assertion rather than argument, or by unresolved contradictions in the argument.

- 3 (up to three points)

Up to three are subtracted points for an inability to answer multiple basic questions about themes in the written work. Answers to questions will fall down on a number of criteria, but will exhibit some vestiges of the qualities required, such as the ability to see the point of the question, to deploy information, or to

offer some coherent analysis towards an argument. Such qualities will not be displayed at a high level or consistently, and will be marred by irrelevance, incoherence, error and poor organisation and presentation.

0 (fail)

Written work and the oral examination will both be failed if the oral examination clearly demonstrates that the work was plagiarised. The student is unfamiliar with the arguments of the assignment or the sources used for those arguments.

Plagiarism

Plagiarism is the use of someone else's work without correct referencing. The consequence of plagiarism is the presentation of someone else's work as your own work. Plagiarism violates Woolf policy and will result in disciplinary action, but the context and seriousness of plagiarism varies widely. Intentional or reckless plagiarism will result in a penalty grade of zero, and may also entail disciplinary penalties.

Plagiarism can be avoided by citing the works that inform or that are quoted in a written submission. Many students find that it is essential to keep their notes organised in relation to the sources which they summarise or quote. Course instructors will help you to cultivate professional scholarly habits in your academic writing.

Depending on the course, short assignment essays may not require students to submit a bibliography or to use extensive footnotes, and students are encouraged to write their assignments entirely in their own words. However, all essays must acknowledge the sources on which they rely and must provide quotation marks and citation information for verbatim quotes.

There are several forms of plagiarism. They all result in the presentation of someone's prior work as your new creation. Examples include:

- Cutting and pasting (verbatim copying)
- Paraphrasing or rewording
- Unauthorised Collaboration
- Collaboration with other students can result in pervasive similarities – it is important to determine in advance whether group collaboration is allowed, and to acknowledge the contributions or influence of the group members.
- False Authorship (Essay Mills, Friends, and Language Help)
- Paying an essay writing service, or allowing a generous friend to compose your essay, is cheating. Assistance that contributes substantially to the ideas or content of your work must be acknowledged.

Complaints and appeals

Students and faculty should always seek an amicable resolution to matters arising by addressing the issue with the person immediately related to the issue. Students should handle minor misunderstandings or disagreements within a regular teaching session or by direct message, or with their College. If a simple resolution is not possible, or the matter remains unresolved for one party, the steps outlined in this section apply to all groups, colleges, and units of Woolf.

The Red Flag system

An issue with a red flag should be submitted in the case that a member of Woolf seeks to make an allegation of serious misconduct about another member, including matters of cheating, plagiarism, and unfair discrimination or intolerance.

Any member of Woolf, seeking to raise a matter of serious concern, should submit a red flag by emailing redflag@woolf.education. Provide a short, clear description of the issue.

If a student submits an issue with a red flag, or if a faculty member submits an issue about a student, it will trigger a meeting with the student's College Advisor. If the issue is not resolved, the matter will be escalated to the College Dean, or to a committee designated by the College Dean, which will have the power to clear the flag.

If an issue is submitted with a red flag by a faculty member about another faculty member, then the issue is reported directly to the College Dean.

For both students and faculty members, after the Dean's decision, the one who submits the complaint is provided the opportunity to accept or appeal the decision; if the one submitting the issue appeals the decision, it will be assigned to the Quality Assurance, Enhancement, and Technology Alignment Committee, which is a subcommittee of the Faculty Council.

Mitigating circumstances

When serious circumstances ('Mitigating Circumstances'), beyond the control of a student or faculty member, adversely affect academic performance or teaching support, a Mitigating Circumstances report must be submitted using Woolf's red flagging system. Mitigating Circumstances may include but are not limited to serious medical problems, domestic and personal circumstances, major accidents or interruptions of public services, disturbances during examination, or serious administrative or procedural errors with a material effect on outcomes.

Mitigating circumstances do not normally include a member's personal technology problems, including software, hardware, or personal internet connection failures; employment obligations or changes in employment obligations; permanent or sustained medical conditions (unless there is a sudden change of condition); or circumstances where no official evidence has been submitted.

Mitigating circumstances are normally only considered when a red flag has been submitted for the issue before the deadline of an affected written project or assignment, or within one week of a cumulative examination. Proof of mitigating circumstances may result in an extended deadline or examination period, or the possibility to retake an examination; it will not result in any regrading of existing submissions or exams.

Grade appeals

Students who dissent from the grades they have received should follow the normal procedure for submitting a red flag.