REPORT ON PROGRAMME VALIDATION/REVIEW **Q 3 report template**

Part 1 Programme details

Proposed title/Existing title and code	BSc (Hons) Physics with Data Science
Mode and duration of programme	4 years full-time
ECTS	240
DIT award(s) sought	BSc in Physics with Data Science BSc (Ord) in Physics Higher Certificate in Physics
Classifications of award(s)	BSc: First Class Honours, Second Class Honours, First Division, Second Class Honours, Second Division, Pass BSc (Ord) and Higher Certificate: Unclassified
School responsible	Physics & Clinical & Optometric Sciences
Professional body accreditation and relevant dates (where applicable)	N/A
External provider type (where applicable)	N/A
Delivery location	City Campus – Kevin Street (moving to Grangegorman in September 2020)

Part 2 Programme approval information

Date of initial approval (of Q1A) by SLT's Academic and Research Committee/SLT	4th December 2018
Date of validation/review event	10th May 2019
Date of approval by Academic Council and Governing Body	
Proposed date of commencement	September 2019

Part 3 Programme background/structure

Background

This programme is oriented towards developing graduates with key skills in the Data Science Industry, in which Ireland is a key international player, while also giving graduates options in more traditional areas of science and technology. The School has engaged with industry stakeholders to ascertain the demand for staff with a laboratory science background coupled to data science and data analytics. The Physics with Data Science programme will extend opportunities for education in this vibrant sector at undergraduate level, whilst also offering the potential for students to obtain qualifications allowing enter to more traditional physics roles.

Stated aims and learning outcomes of the programme

The aim of this programme is to equip graduate students with scientific and analytical skills as well as practical problem-solving ability. Strong emphasis is placed on developing transferable skills and qualities sought by the data analytics and data science industries, such as strong IT and computing skills, ability to work in teams, interpersonal skills and adaptability. Practical and project work is given special consideration in recognition of their central role in developing these skills.

Programme Learning Outcomes

On completion of this programme the graduate will:

- Have detailed knowledge and understanding of a wide range of core topics in physics, including mechanics, optics, electromagnetism, modern and nuclear physics, quantum physics, thermal physics and physics of materials

- Have a particular knowledge and understanding of the relevance of physics to key areas of application such as computational physics and data science, with some of this knowledge at the current boundaries of these fields.

- Have a detailed knowledge of the mathematics and statistical theory underpinning data science methodologies used with physical and scientific data.

- Have a detailed knowledge and understanding of the application of computational methods and data science within the physical sciences and related sectors.

- Have a detailed knowledge and understanding of the applications of physics in modern technology.

- Have knowledge of mathematics and computing appropriate for a physical scientist and appreciation of the interdisciplinary nature of modern science and technology.

- Have demonstrated confidence and skill in conducting a wide range of scientific experiments, involving a wide range of instrumentation and apparatus, computational tools, recording, data analysis and critical interpretation of data.

- Have demonstrated the ability to design a scientific experiment to achieve specific objectives, and to apply scientific and computational knowledge and skills to solve a non routine problem in the field of physics.

- Have strong mathematics, IT and computing skills, including interfacing and programming specifically directed towards data science and computational physics.

- Have demonstrated the ability to carry out an individual scientific research project under supervision, involving the description of the problem, the formulation and implementation of solutions, an appreciation of the significance of the project outcomes and the communication of the outcomes.

- Have demonstrated the ability to participate as a member of a team in the solution of a problem, both as a team-leader and as a team member, to identify the knowledge required to solve the problem, and to critically evaluate their own contribution to the work of the team.

- Have developed a view of the relevance of their field of study to industry and society at large, including exposure to the key topics of innovation and entrepreneurship and the skills associated with intellectual property.

Programme structure The programme consists of 4 years (stage). Stages 1 and 2 are designed to provide a strong foundation in physics and associated subjects with a view to developing more advanced knowledge at Stages 3 and 4. Stage 1 consists of 1 core 15ECTS module, 2 core 10 ECTS modules and 5 core 5 ECTS modules. Stage 2 consists of 1 core 15ECTS module, 3 core 10 ECTS modules and 3 core 5 ECTS modules. Stage 3 consists of 3 core modules of 10 ECTS in semester 1 and a 30 ECTS work placement in Semester 2. Stage 4 consists of consists of 2 core 10 ECTS modules and 5 core 5 ECTS modules and a 15 ECTS final year project.

Entry Requirements The minimum entry requirements to the programme are a Leaving certificate with a minimum of 6 subjects that must include 2 honours (≤H5), at least a O3/H7 in Mathematics and at least a O6/H7 in English or Irish and at least a H4 in a Science subject (Applied Mathematics, Physics, Chemistry, Physics and Chemistry, Biology, Computer Science, Agricultural Science, Engineering, Technical drawing, Technology or Design & Communication Graphics) or equivalent.

Student assessment
In accordance with TU Dublin City Campus General Assessment Regulations

A student who fails the laboratory element of any module, the work placement or final year project will normally be required to repeat the practical element in a subsequent academic year.

No compensation will apply to or from PHYS4813 Final Year Project.

Derogations from the General Assessment Regulations, including rationale for derogation and view of the Panel:

Part 4 Validation Details and Membership of Panel

Schedule of meetings: Friday, 10th May 2019

Venue: *Boardroom, Kevin Street*

9.15 hrs	Refreshments (tea/coffee) served. Introductory meeting between Panel and Director of College, Head of School, Programme Chair Brief presentation regarding proposed programme.
10.00 hrs	Private meeting of Panel to discuss agenda.
10.45.hrs	Meeting of Panel with Programme Management Team to discuss programme learning outcomes, programme learning teaching and assessment strategy and programme governance.
11.45 hrs	Tea / Coffee Break
12.00 hrs	Meeting of panel with learner representatives
12.30 hrs	Lunch and private meeting of the panel
13.30 hrs	Meeting of Panel with the lecturing staff to discuss module learning outcomes, content, learning, teaching and assessment issues
15.00 hrs	Refreshments (Tea /Coffee) Private meeting of Panel to consider draft report.
16.00 hrs	Final meeting of Panel with Director, Head of School and appropriate staff

Panel Membership

External Panel Members

Prof Emma Sokell	Associate Professor and Deputy Head of School of Physics, University College Dublin
Dr Barry Haycock	Data Analyst, KBC Bank Ireland Plc.

Internal Panel Members

Dr Patrick Prendergast	School of Surveying and Construction Management, TU Dublin City Campus
Dr Fiona McSweeney	School of Languages, Law and Social Sciences, TU Dublin City Campus
Dr Aine Whelan	School of Chemical and Pharmaceutical Sciences, TU Dublin City Campus

Officer

Nicole O'Neill	Quality Assurance Officer, TU Dublin City Campus

Documentation submitted: Programme Document, Background Information, Student Handbooks, Work Placement Handbook and Staff Profiles.

Part 5 Summary of Panel findings against key questions

Note: the Panel's findings (ie yes/no) and any additional comments against each of the key questions should be recorded below. Where a 'no' is recorded, an associated condition or recommendation should be included in Part 6, Findings of the Panel.

Is the market demand and need for the programme clear and articulated?	Yes
Are the aims, objectives and learning outcomes of the programme well-founded and clearly formulated?	Yes for aims and objectives. See conditions re Learning Outcomes
Are the entry requirements clear and appropriate?	Yes
Are the arrangements for access, transfer and progression in accordance with Institute policy and NFQ?	Yes
Are the programme learning outcomes at the appropriate level as set out by the NFQ requirements?	See condition
Do the individual modules 'add up' to a coherent programme?	Yes, however there is a panel recommendation in relation to reviewing the overlap between elements to ensure complementarity.
Are Graduate Attributes embedded within the programme?	See Condition
Will the accumulation of the module learning outcomes result in the attainment of the programme learning outcomes?	Yes but there is a panel condition that will improve this further.
Is there appropriate use of student-centred learning, teaching and assessment strategies, including the First Year Framework for Success checklist, which recognise the needs of diverse student groups?	Yes
Do the curricula and teaching schemes in each module descriptor give realisable substance to the module's aims, objectives and learning outcomes?	Yes
Are the assessment methods and criteria aligned to the learning outcomes in each module?	Yes
Are facilities and resources, including staff, in place to support the delivery of the programme at the standard proposed?	Yes
Is there parity between off-campus/on-campus delivery (if applicable)?	N/A
Are the roles and responsibilities of each partner clearly specified (if applicable)?	N/A

Part 6 Recommendations of the Panel

- **Overall recommendations of the Panel**

The panel recommends approval of the programme with the following awards:

- Higher Certificate in Physics at level 6 of the NFQ
- BSc (Ord) in Physics at level 7 at the NFQ
- BSc (Hons) in Physics with Data Science at level 8 at the NFQ

Subject to the implementation of the following conditions and consideration of the following recommendations.

- **Conditions**
  - Rewrite the programme learning outcomes using active and measureable terminology and ensure that they link with the NFQ. Some of the module learning outcomes could be migrated to programme learning outcomes.

  - Module Learning Outcomes should be reviewed to ensure that all are written with active and measurable verbs, to consolidate learning outcomes where appropriate and to consider the appropriateness of any duplication. Particular attention should be paid to how the learning outcomes are written for the attainment of competencies.

  - Review the assessment schedule to ensure that the workload is balanced at a programmatic level.

  - The Quantum Mechanics text should be on the required reading list for Phys3001.

  - Articulate the Graduate Attributes for the programme and indicate where these are achieved on the programme.

  - Remove the NFQ level from the module descriptors. Should the School wish at a future date to provide modules as standalone CPD modules, at this stage appropriate levels can be assigned to the modules to be offered.

- **Recommendations**
  - Consider introducing a short preparatory workshop for Problem Based Learning which will make the students aware of the group work skills that they may already have from working in groups elsewhere that they can utilise for Problem Based Learning.

  - Make more explicit where Scientific Integrity and Ethics is covered on the programme, broaden to include data analytics and data protection and incorporate into the Programme Learning Outcomes.

  - Incorporate Academic Writing Skills and Data Story Telling into the programme learning outcomes.

  - Reading lists should be written using a standardised referencing style. Similar to the Physics programme a core introductory textbook should be adopted for the Data Analytics components in the early stages of the programme.

  - The panel notes that the School has introduced this year a number of initiatives, to support student retention, including Staff Mentoring, the panel advises that the School review the impact of these initiatives and keep under active review the retention rates for the programmes.

- Clarify the regulations and requirements in relation to the missed continuous assessment and the late submission policy.

- Consider applying for accreditation from the Irish Data Analytics Institute.

- The circumstances by which students are not eligible to go on external Work Placement could be made clearer in the student handbook and the assessment strategy and repeat arrangements clarified.

- The Student Handbook should be corrected to clarify that continuous assessment can be both formative and summative.

- Consider if Phys4815 should be spilt into two separate 5 ECTS modules: Electromagnetism and Statistical Mechanics.

- Consider putting the career development elements including, CV and e-portfolio requirements in core modules in years 1 and 2.

- Consider building on the e-portfolio and how students can be supported to develop publically available profiles e.g Github or Kaggle

- Edit all documents to remove editorial inconsistencies and ensure that Student Handbooks given to students are consistent and coherent across years.

- **Observations**
  The Work Placement experience, including the preparation for and the Work Placement Handbook and alternative arrangements are exemplary.

  The panel was impressed in relation to the feedback received from learner representatives, that issues raised in relation to programme delivery were addressed and changes made to the curriculum based on feedback from students, and the students made aware that changes had been made.