



Date of Meeting: 20th June 2017

Named Award: Master of Science
Programme Title: Master of Science in Data Science and Analytics
Award Type: Master of Science
Award Class: Major Award
NFQ Level: 9
Intakes Commencing: September 2017
ECTS/ACCS Credits: 90

PANEL MEMBERS

Name
Dr. SORCHA HEALY, Data Scientist, McAfee Labs Data Science Team (Chairperson)
Professor Eamonn Murphy, Professor Emeritus, Department of Mathematics, University of Limerick
Dr. Kieran Murphy, Lecturer, Department of Computing & Mathematics, Waterford Institute of Technology
Dr. Eoin Murphy, Senior Data Scientist, Research & Innovation, AIB
Dr. Stephen Cassidy, Dean of Academic Quality Enhancement & Acting Dean of Graduate Studies Cork Institute of Technology

PROPOSING TEAM MEMBERS

Name
Mr Michael Loftus, Head of Faculty, Faculty of Engineering & Science
Dr Áine Ní Shé, Head of Department, Department of Mathematics
Dr Clodagh Carroll, Department of Mathematics
Dr Robert Heffernan, Department of Mathematics
Dr Noreen Quinn, Department of Mathematics
Dr Catherine Palmer, Department of Mathematics
Mr Aengus Daly, Department of Mathematics
Mr Adrian O'Connor, Department of Mathematics
Dr Ted Scully, Department of Computer Science
Dr Ruairí O'Reilly, Department of Computer Science
Dr Ignacio Castiñeiras, Department of Computer Science



BACKGROUND TO THE PROPOSED PROGRAMME

The need for both data scientists and “data savvy” practitioners has been well-articulated in government policy documents, going back at least as far as the Action Plan for Jobs in 2012. At that point, CIT Department of Mathematics was successful in applying for HEA funding (under the *ICT Skills* initiative) to run a conversion Higher Diploma in Science in Data Science & Analytics. Our fourth successive cohort of HEA funded students is about to graduate, and we have also recruited two cohorts of part-time students into the programme, most of whom are sponsored by their employers. In addition, we have successfully applied for funding to admit a fifth cohort for 2017/18. On foot of demand from our graduates and interest from industry, we have been working towards the development of a Level 9 programme for the past year. In March 2017, Ministers Bruton and Halligan announced a call for proposals for MSc conversion courses. Following our successful application, the HEA has now awarded funding for 20 places on this new programme, for which we now seek approval.

The proposed full-time MSc in Data Science & Analytics will run over three semesters, i.e. fifteen months. Each semester accrues 30 ECTS credits. Of the total of 90 ECTS, 60 are at expert level, and the remaining 30 ECTS are at advanced level, in line with similar Masters programmes within the Institute which draw from a diverse entry cohort.

The Semester 1 schedule (30 ECTS, all at advanced level) consists of six 5-credit modules which provide the learner with the necessary foundation in Mathematics, Statistics and Computer Science. The Semester 2 schedule consists of six 5-credit modules, all at expert level. From Semester 2, the specialisation into the “Big Data” space takes effect, and the learning experience is geared specifically for the realisation of Level 9 programme outcomes.

In Semester 3, the learner undertakes a 30 credit capstone project module, in which they apply the knowledge, skills and competences acquired in the taught modules to the research and development of a Data Science problem, and successfully complete the project in accordance with a project plan. Following on the success of the link of many Higher Diploma in Science projects to industry, it is proposed to actively seek collaboration with industry for this project. Giving the student the opportunity to work on an authentic “Big Data” problem will maximise employment potential on graduation. However, it is also possible, at Masters level, that the 30-credit project could be a more theoretical piece, and so the descriptor has been designed accordingly so as to facilitate the necessary flexibility.

FINDINGS OF THE PANEL

*NOTE: In this report, the term “**Requirement**” is used to indicate an action or amendment which in the view of the Panel **must** be undertaken prior to commencement of the Programme. The term “**Recommendation**” indicates an item to which the Institute/Academic Council/Course Board should give serious consideration for implementation at an early stage and which should be the subject of ongoing monitoring.*

The Panel would like to **commend** the programme development team for the quality of the proposal. The enthusiasm of the proposers for the programme was clearly evident on the day of the validation panel itself.

The Panel has considered the documentation provided and has discussed the programme with the proposers. Based on this, the Panel has arrived at a number of Findings, Requirements and Recommendations as follows.

1. Programme-Level Findings

1.1 NEED FOR THE PROGRAMME

Validation Criterion: Is there a convincing need for the programme(s) with a viable level of applications?

Overall Finding: Yes

1.2 AWARD

Validation Criterion: Are the level and type of the proposed awards appropriate?

Overall Finding: Yes.

1.2.1 The programme designation as a Master of Science in Data Science and Analytics is appropriate. The programme will take in students from a number of cognate disciplines and through the initial semester develop their skills in mathematics, statistics and computer science via a range of relevant advanced level modules. Subsequently the learners will undertake 60 ECTS credits at expert level allowing them to gain the necessary knowledge, skills and competences expected of a Level 9 graduate in Data Science.

1.3 LEARNING EXPERIENCE

Validation Criterion: Is the learning experience of an appropriate level, standard and quality overall?

Overall Finding: Yes

The panel believes that the learners on this programme will receive a learning experience of an appropriate level and standard. In the first instance, the programme will be delivered in full-time mode supported through the Springboard funding programme. The programme and module documents submitted also describe part-time delivery modalities as the Department envisages offering this programme in part-time mode in the future. The panel also sees merit in offering this programme via online delivery which has the potential to broaden the potential pool of applicants.

1.4 PROGRAMME STRUCTURE

Validation Criterion: Is the programme structure logical and well designed (including procedures for access, transfer and progression)?

Overall Finding: Yes, subject to certain Requirements and Recommendations.

1.4.1 Recommendation: The proposers have detailed the standard entry requirement as being a 2H1 in a Level 8 Honours degree. Alternatively, graduates with a 2H2 Honours degree will be considered, subject to having three years relevant experience. The panel are happy to **recommend** this entry requirement for the initial delivery of the programme. Once the programme has been running for a period of time, the proposers may wish to re-visit this entry requirement to see if lowering the standard entry requirement to 2H2, in line with other Masters programmes within the Institute, may be appropriate.

1.4.2 Requirement: The Panel **requires** that the proposers review and ameliorate the duplication of module content in the modules **Machine Learning** and **Data Mining & Knowledge Discovery**. Whilst not being prescriptive on how this may be done, the panel feel that removing material from **Data Mining & Knowledge Discovery** may allow the inclusion of material such as additional Data Visualisation, natural language processing and command line Linux capability into the programme which would be welcomed.

1.4.3 Recommendation: The panel notes that for financial considerations the proposers are seeking a derogation from free choice and have not included any elective choice on the proposed programme. The panel are of the view that the addition of elective choice would allow the learners to take ownership of their learning and develop their specialised knowledge in areas that match their particular interests. The panel **support** the initial derogation from free choice. However, the panel **recommends** that the proposers would introduce elective choice into the programme as soon as it is financially feasible.

1.4.4 Recommendation: The panel notes that it is proposed to offer the three semesters of the programme over 15 months. In this delivery model, the learners are formally not engaged with their studies over the summer period of June-September before commencing formally their project in September. The panel **recommends** that the proposers consider the introduction of an elective work placement/internship module into the programme to cover this period. Learners would have the opportunity to be placed in partner companies where they could continue to develop their data and computer science skills. Additional learning gained through this placement period could be assessed via a standard portfolio and/or presentation and credit awarded. Whilst on placement, learners could also begin to undertake background research for their thesis.

1.5 PROGRAMME MANAGEMENT

Validation Criterion: Are the programme management structures adequate?

Overall Finding: Yes, subject to certain Requirements.

1.5.1 Recommendation: The panel **recommend** that the proposers commence the development of a framework for managing their relationship with industrial partners in respect to industry-based projects. This may take the form of a tri-partite learning agreement between the learner, the Institute and the Industry Partner. The agreement would describe the various roles and responsibilities of the various actors to the agreement. Additional items such as IP, protocols regarding data storage and dissemination of project outcomes should also be considered. Furthermore, a project/thesis handbook should be developed to include, inter alia, project guidelines, indicative project milestones, research and report writing guidelines.

1.5.2 Recommendation: The panel recommends that the panel form an industry liaison panel for the data science suite of programmes. This panel which would meet from time to time would provide support and guidance in relation to programme content to maintain the currency and relevance of the programmes.

1.6 RESOURCE REQUIREMENTS

Validation Criterion: Are the resource requirements reasonable?

Overall Finding: Yes.

1.7 IMPACT ON THE INSTITUTE

Validation Criterion: Will the impact of the programme on the Institute be positive?

Overall Finding: Yes

2. Module-Level Findings

The Panel notes that 7 modules on the proposed programme as presented to the panel are new modules. The panel was informed that these draft modules have not been subject to internal scrutiny by the CIT module moderator.

In exercising its brief to consider the overall standard and appropriateness of modules, the Panel wishes to add the following findings, requirements and recommendations.

2.1 ALL MODULES

2.1.1 Requirement: Any revisions to Module Descriptors or Semester Schedules made to address the recommendations and requirements in this require sign-off from the CIT Module Moderator and the Registrar's Office prior to approval by the CIT Academic Council.

2.1.2 Requirement: Reading lists including journals and texts should be updated to ensure currency of content. Websites should be appropriately referenced.

2.1.3 Requirement: The coursework breakdown across the module descriptors should be reviewed to ensure the suitability, weighting, spacing and timing of assessments are appropriate.

2.1.4 Requirement: Duplication across the modules to be removed.

2.2. MODULES

2.2.1 MATH8009 Maths Methods and Modelling

Requirement: The learning outcomes are quite generic and should be reviewed and aligned closer to the indicative content of the module.

2.2.2 DATA8003 Unstructured Data and Visualisation

Requirement: The number of learning outcomes should be reviewed and a number consolidated.

Requirement: Websites should be added to support the software used on the module (R, RapidMiner, Shiny).

Recommendation: Consideration could be given to using alternative industry-standard software such as Tableau and ClickView.

2.2.3 DATA8002 Data Management Systems

Recommendation: Review whether the use of a terminal examination is aligned with measuring the achievement of the stated learning outcomes.

2.2.4 DATA8001 Data Science and Analytics

Requirement: The number of learning outcomes should be reviewed and consolidated.

2.2.5 Time Series & Factor Analysis

Requirement: Review Learning Outcome 3 which appears to incorporate a number of learning outcomes.

2.2.6 Research Methods

Requirement: The assessment description for the presentation states that the learner is required to present and their research question and initial literature review both orally and in report format. This would indicate that there are two assessments: presentation and report which should be reflect as separate assessment items with associated assessment weightings.

2.2.7 Research Project – Data Science

Requirement: The number of learning outcomes should be reviewed and consolidated.

Requirement: The presentation assessment should be split into two assessments, namely, poster and presentation with their associated weightings.

Requirement: The mark associated with student initiative should be substantially reduced and these marks re-assigned to the thesis mark.

3. Conclusion

Based on the above findings, the Panel has arrived at the following Conclusions:

- The Master of Science in Data Science and Analytics meet the required standards for an award in the Science field of study at Level 9 of the National Framework of Qualifications.
- The Programmes meet the criteria for validation of new programmes adopted by the Academic Council of Cork Institute of Technology.

The Panel therefore recommends that the Programme be validated for five academic years, or until the next programmatic review, whichever is soonest, subject to implementation of the Requirements above, and with due regard to the Recommendations made.

Implementation of Requirements and Recommendations
Requiring Registrar's Office Sign-Off:
<p>1.4.1 Recommendation: The proposers have detailed the standard entry requirement as being a 2H1 in a Level 8 Honours degree. Alternatively, graduates with a 2H2 Honours degree will be considered, subject to having three years relevant experience. The panel are happy to recommend this entry requirement for the initial delivery of the programme. Once the programme has been running for a period of time, the proposers may wish to re-visit this entry requirement to see if lowering the standard entry requirement to 2H2, in line with other Masters programmes within the Institute, may be appropriate.</p>
<p>Proposers' Response: We note the recommendation of the panel. The Department of Mathematics shall compile and maintain a list of students' prior qualifications and experience, to include level, field of study and award classification of all degrees. When the programme has run for a period of time, the Department can then carry out a correlation analysis of entry standard versus final award classification. The aim of this analysis shall be to determine if a 2H2 Honours degree graduate without relevant work experience is likely to complete the MSc successfully, assuming that s/he invests the average weekly learner workload of 7 hours per 5 ECTS into the programme.</p>
<p>1.4.2 Requirement: The Panel requires that the proposers review and ameliorate the duplication of module content in the modules Applied Machine Learning and Data Mining & Knowledge Discovery. Whilst not being prescriptive on how this may be done, the panel feel that removing material from Data Mining & Knowledge Discovery may allow the inclusion of material such as additional Data Visualisation, natural language processing and command line Linux capability into the programme which would be welcomed.</p>
<p>Proposers' Response: Firstly, the proposers wish to thank the members of the panel for their advice and contributions on this matter. In addressing this requirement, we have proceeded as follows:</p> <ol style="list-style-type: none"> a) The expert level module Applied Machine Learning remains unchanged. b) The expert level module Data Mining & Knowledge Discovery is now renamed Data Visualisation & Analytics. The overlap has been ameliorated through the introduction of content both on visualisation and on the overarching themes in Data Science & Analytics, whereby the various statistical and computer science approaches are compared and contrasted. c) This has also provided the opportunity to alleviate learner workload in the Semester 1 module DATA8003 Unstructured Data and Visualisation. A revised version of this module is now tabled for approval. d) As the Semester 1 module DATA8003 Unstructured Data and Visualisation is shared with the HDipSc in Data Science & Analytics programme, it was therefore necessary to review and revise the advanced level module DATA8004 Data Mining & Knowledge Discovery. The changes proposed are similar to those for the corresponding expert level module, albeit at advanced level. The nature and extent of the changes to this module are such that a retitling and recoding of the module is necessary. e) Accordingly, a programme change for the HDipSc is now proposed, with the proposal to replace DATA8004 Data Mining & Knowledge Discovery with DATA8007 Data Visualisation & Analytics. f) The proposers thank the panel for its suggestions re natural language processing and command line Linux capability. The Department of Mathematics has engaged subsequently with the Department of Computer Science in relation to these. Feedback in relation to natural language processing indicates that this is a very substantial area which is difficult to treat in a "light touch" manner. As the programme develops, it may be possible to introduce an elective module if circumstances allow the introduction of elective choice. Notwithstanding that Linux is another substantial area, we will introduce this to students in the initial delivery of the programme. Pending the programmatic review of the HDipSc., the best way to do this in the coming year is to provide a one-two day seminar for students in January, after the Semester 1 examinations have concluded. The Head of Department of Mathematics and the Head of Computer Science shall progress this. g) The proposers shall monitor and review developments in these areas. Through regular programme board meetings, consultation with lecturers, and student feedback, care shall be taken to avoid overlap between modules, while also ensuring a cohesive and integrated learning experience.
<p>1.4.3 Recommendation: The panel notes that for financial considerations the proposers are seeking a derogation from free choice and have not included any elective choice on the proposed programme. The panel are of the view that the addition of elective choice would allow the learners to take ownership of their learning and develop their specialised</p>

<p>knowledge in areas that match their particular interests. The panel support the initial derogation from free choice. However, the panel recommends that the proposers would introduce elective choice into the programme as soon as it is financially feasible.</p>
<p>Response: The proposers thank the members of the panel for their careful consideration of the issues involved in the introduction of free choice at this point. As discussed at the panel meeting, this is the first phase of the development of the suite of L9 Data Science & Analytics Masters offerings in CIT, with a part-time delivery model (including blended learning and online modality) possible in subsequent phases. The proposers will investigate the introduction of elective choice into the programme when it is financially feasible.</p>
<p>1.4.4 Recommendation: The panel notes that it is proposed to offer the three semesters of the programme over 15 months. In this delivery model, the learners are formally not engaged with their studies over the summer period of June-September before commencing formally their project in September. The panel recommends that the proposers consider the introduction of an elective work placement/internship module into the programme to cover this period. Learners would have the opportunity to be placed in partner companies where they could continue to develop their data and computer science skills. Additional learning gained through this placement period could be assessed via a standard portfolio and/or presentation and credit awarded. Whilst on placement, learners could also begin to undertake background research for their thesis.</p>
<p>Response: The proposers note and welcome this recommendation, and are already looking into it for the next phase of programme development. To this end, a meeting has been set up between the Head of Mathematics and the Head of CIT Extended Campus for the purposes of scoping the issues involved.</p>
<p>1.5.1 Recommendation: The panel recommend that the proposers commence the development of a framework for managing their relationship with industrial partners in respect to industry-based projects. This may take the form of a tri-partite learning agreement between the learner, the Institute and the Industry Partner. The agreement would describe the various roles and responsibilities of the various actors to the agreement. Additional items such as IP, protocols regarding data storage and dissemination of project outcomes should also be considered. Furthermore, a project/thesis handbook should be developed to include, inter alia, project guidelines, indicative project milestones, research and report writing guidelines.</p>
<p>Response: The proposers wish to progress this recommendation in advance of the commencement of the programme. The programme team has already developed some documentation and procedures for the 10 ECTS HDipSc project module DATA8006, but it is clear that the issues are more substantial and complex with the escalation of level and the additional volume of credits. The Head of Mathematics will initially discuss with the Head of CIT Extended Campus, which has already developed some very useful resources and best practice in this space. The Department will continue to nominate member/s of the programme team as project coordinator/s for the purposes of ensuring fairness and consistency across all projects, and ensuring smooth running of industry based projects.</p> <p>The programme team has already drawn on the experience and expertise of its members from the Department of Computer Science, which already has a suite of project and placement modules for Level 8 and Level 9 programmes. This engagement will be continued in order to inform procedures in relation to the research project.</p> <p>The programme team has also previously consulted with the programme team of the BEng(Hons) in Chemical & Biopharmaceutical Engineering, which now has linked placement and project modules (15 ECTS each) in the first semester of final year. This team has also developed some very useful resources such as guidelines for industry mentors, student handbooks, etc.</p>
<p>1.5.2 Recommendation: The panel recommends that the panel form an industry liaison panel for the data science suite of programmes. This panel which would meet from time to time would provide support and guidance in relation to programme content to maintain the currency and relevance of the programmes.</p>
<p>Response: The proposers have commenced working on this recommendation, and invitations have been sent to ten industry experts, ranging across public and private sectors, and expertise in Statistics/Computer Science. All of the invitees have already engaged with the HDipSc programme. The majority of invitees have already agreed to participate.</p>
<p>2.1.1 Requirement: Any revisions to Module Descriptors or Semester Schedules made to address the recommendations and requirements in this require sign-off from the CIT Module Moderator and the Registrar's Office prior to approval by the CIT Academic Council.</p>
<p>Response:</p>

<p>2.1.2 Requirement: Reading lists including journals and texts should be updated to ensure currency of content. Websites should be appropriately referenced.</p>
<p>Response: Resource lists have all been rechecked and are up to date and appropriately referenced.</p>
<p>2.1.3 Requirement: The coursework breakdown across the module descriptors should be reviewed to ensure the suitability, weighting, spacing and timing of assessments are appropriate.</p>
<p>Response: The proposers acknowledge that there is a heavy concentration of assessments at the end of the first semester. As noted in the panel discussion, the reality is that the assessment of the two 100% CA modules is complete by the end of Week 13. This has been formally documented in the update of DATA8003. The proposers note the comments of the panel in relation to module DATA8002, and the Department of Computer Science will consider this further as part of the programmatic review in Autumn 2017. The assessment matrix for Semester 2 was reviewed and checked during the module development phase prior to the panel visit.</p>
<p>2.1.4 Requirement: Duplication across the modules to be removed.</p>
<p>Response: The response to Requirement 1.4.2 refers. Given the particular challenges which arise in relation to interdisciplinary programmes such as this, the proposers undertake to carefully monitor these issues and to keep them under ongoing review.</p>
<p>Additional Information</p>
<p>2.2 Requirements in relation to specific modules: All requirements and recommendations in relation to modules MATH8009 <i>Maths Methods and Modelling</i>, DATA8003 <i>Unstructured Data & Visualisation</i>, DATA8001 <i>Data Science & Analytics, Time Series & Factor Analysis, Research Methods</i>, and <i>Research Project – Data Science</i> have been addressed. The proposers note the recommendation of the panel in relation to the need to review the suitability of the terminal examination for <i>DATA8002 Data Management Systems</i>. The Department of Computer Science shall consider this matter in the forthcoming programmatic review of the HDipSc in Data Science & Analytics, to which programme this module is also attached.</p>

APPENDIX 1 – Proposed Programme Outcomes Master of Science in Data Science and Analytics

Programme CR_1stJune2017 - Master of Science in Data Science and Analytics - 17 July 2017

Programme Outcomes

Upon successful completion of this programme the graduate will be able to demonstrate... :

PO1	Knowledge - Breadth
(a)	Demonstrate comprehensive and systematic understanding of the facts, principles, theories and methods from the fields of Mathematics, Statistics, Computer Science and Business Intelligence which are relevant to the Data Analyst.
(b)	Identify and articulate the key considerations of a "Big Data" problem; draw complex information together; critically comment on the technical, social, economic, environmental and political implications of own work and the work of others in Data Science, including an appreciation of the philosophical and ethical issues involved.
PO2	Knowledge - Kind
(a)	Demonstrate comprehensive knowledge and detailed understanding of: the theories, paradigms, defining concepts and underlying principles of the rapidly evolving Data Science and Analytics field; demonstrate knowledge and experience of advanced and new methods and technologies for acquiring, interpreting and analysing big data, with a critical awareness of the appropriate contexts for their use through the study of original papers, reports, journals, and data sets; demonstrate comprehensive knowledge and understanding of: the identification, definition and resolution of novel, complex research problems; relevant legal and regulatory frameworks; aspects of the defining elements and the inter-relationships of Data Science & Analytics as a result of in-depth study and research; demonstrate comprehensive knowledge and appreciation of the current limits of theoretical and applied knowledge in interdisciplinary field of Data Science and Analytics.
PO3	Skill - Range
(a)	Demonstrate mastery of standard and specialised research tools in Statistics, Mathematics, Computer Science and Business Intelligence; use these to proactively model, troubleshoot and solve original technical problems in the "Big Data" space; source relevant information, critically interpret and apply appropriate referenced literature from a wide range of information sources; maintain detailed records of activities; present and defend scientific research findings in a variety of forms to data scientists, "data savvy" practitioners, and non-specialists; formulate a hypothesis and design a relevant programme of investigation; work independently within defined time and resource boundaries; write accurately and in a manner consistent with scientific publications in Data Science or related disciplines.
PO4	Skill - Selectivity
(a)	Design, develop and test novel hypotheses; design experiments; select from a range of scientific skills, in particular those which draw from Mathematics/Statistics and Computer Science, so as to apply the most appropriate in a range of situations; think independently and make informed effective decisions; make decisions in the Data Science work setting; develop new skills either independently or with minimal mentoring.
PO5	Competence - Context
(a)	Apply advanced research skills and Big Data technologies; act autonomously and think independently; constructively criticise, draw conclusions and offer recommendations in a wide range of contexts, including unpredictable situations; formulate and communicate judgements, with incomplete or limited information.
PO6	Competence - Role
(a)	Act effectively, demonstrate initiative, lead and take responsibility in a complex interdisciplinary team environment with data scientists and qualified practitioners of other disciplines; develop and implement novel technical solutions for "Big Data" problems; reflect on own practices.
PO7	Competence - Learning to Learn
(a)	Learn to act in variable and unfamiliar learning contexts; identify knowledge gaps through effective self-evaluation; source and undertake self-learning as necessary for continued academic and professional self-development as a Data Scientist.
PO8	Competence - Insight
(a)	Identify and articulate the key considerations of a "Big Data" problem; draw complex information together; critically comment on the technical, social, economic, environmental and political implications of own work and the work of others in Data Science, including an appreciation of the philosophical and ethical issues involved.

Appendix 2 – Proposed Semester Schedules: Master of Science in Data Science and Analytics

Programme CR_1stJune2017 - Master of Science in Data Science and Analytics - 17 July 2017

Semester Schedules

Stage 1 / Semester 1

Mandatory								
Mod Code	Module Title	Co-ordinator	Level	Credits	PT Contact Hours	PT Contact Hours	Course Work	Formal Exam
DATA8001	Data Science and Analytics (Draft)	AINE NI SHE	Advanced	5.0	4.00	3.00	40.0	60.0
STAT8006	Applied Stats & Probability (Approved)	AINE NI SHE	Advanced	5.0	4.00	3.00	50.0	50.0
MATH8009	Maths Methods and Modelling (Draft)	AINE NI SHE	Advanced	5.0	4.00	4.00	50.0	50.0
COMP8042	Analytical and Scientific Prog (Approved)	TIM HORGAN	Advanced	5.0	4.00	4.00	100.0	0.0
DATA8002	Data Management Systems (Approved)	TIM HORGAN	Advanced	5.0	4.00	4.00	50.0	50.0
DATA8003	Unstructured Data & Visualis'n (Draft)	AINE NI SHE	Advanced	5.0	4.00	3.00	100.0	0.0

Stage 1 / Semester 2

Mandatory								
Mod Code	Module Title	Co-ordinator	Level	Credits	PT Contact Hours	PT Contact Hours	Course Work	Formal Exam
No Code Yet	Statistical Data Analysis (Draft)	AINE NI SHE	Expert	5.0	4.00	3.00	50.0	50.0
No Code Yet	Time Series & Factor Analysis (Draft)	AINE NI SHE	Expert	5.0	4.00	3.00	100.0	0.0
No Code Yet	Data Visualisation & Analytics (Draft)	AINE NI SHE	Expert	5.0	4.00	4.00	100.0	0.0
No Code Yet	Applied Machine Learning (Draft)	TIM HORGAN	Expert	5.0	4.00	4.00	100.0	0.0
No Code Yet	Distributed Data Management (Draft)	TIM HORGAN	Expert	5.0	4.00	4.00	100.0	0.0
No Code Yet	Research Methods (Draft)	AINE NI SHE	Expert	5.0	3.00	3.00	100.0	0.0

Stage 1 / Semester 3

Mandatory								
Mod Code	Module Title	Co-ordinator	Level	Credits	PT Contact Hours	PT Contact Hours	Course Work	Formal Exam
No Code Yet	Research Project -Data Science (Draft)	AINE NI SHE	Expert	30.0	1.00	1.00	100.0	0.0

Appendix 3 – Proposed Revised Semester Schedules: Higher Diploma of Science in Data Science and Analytics

Programme CR_SDAAN_8 - Higher Diploma in Science in Data Science & Analytics - 17 July 2017

Semester Schedules

Stage 1 / Semester 1

Mandatory									
Mod Code	Module Title	Co-ordinator	Level	Credits	PT Contact Hours	PT Contact Hours	Course Work	Formal Exam	
DATA8001	Data Science and Analytics (Draft)	AINE NI SHE	Advanced	5.0	4.00	3.00	40.0	60.0	
STAT8006	Applied Stats & Probability (Approved)	AINE NI SHE	Advanced	5.0	4.00	3.00	50.0	50.0	
MATH8009	Maths Methods and Modelling (Draft)	AINE NI SHE	Advanced	5.0	4.00	4.00	50.0	50.0	
COMP8042	Analytical and Scientific Prog (Approved)	TIM HORGAN	Advanced	5.0	4.00	4.00	100.0	0.0	
DATA8002	Data Management Systems (Approved)	TIM HORGAN	Advanced	5.0	4.00	4.00	50.0	50.0	
DATA8003	Unstructured Data & Visualis'n (Draft)	AINE NI SHE	Advanced	5.0	4.00	3.00	100.0	0.0	

Stage 1 / Semester 2

Mandatory									
Mod Code	Module Title	Co-ordinator	Level	Credits	PT Contact Hours	PT Contact Hours	Course Work	Formal Exam	
STAT8007	Statistical Meth for Big Data (Approved)	AINE NI SHE	Advanced	5.0	4.00	3.00	100.0	0.0	
DATA8007	Data Visualisation & Analytics (Draft)	AINE NI SHE	Advanced	5.0	4.00	3.00	50.0	50.0	
DATA8005	Distributed Data Management (Approved)	TIM HORGAN	Advanced	5.0	4.00	4.00	100.0	0.0	
DATA8006	Data Science Analytics Project (Approved)	AINE NI SHE	Advanced	10.0	0.50	0.50	100.0	0.0	
Elective									
Mod Code	Module Title	Co-ordinator	Level	Credits	PT Contact Hours	PT Contact Hours	Course Work	Formal Exam	
COMP8043	Machine Learning (Approved)	TIM HORGAN	Advanced	5.0	4.00	4.00	100.0	0.0	
STAT8008	Time Series & M-V Analysis (Approved)	AINE NI SHE	Advanced	5.0	4.00	3.00	100.0	0.0	