Programme Specification ARO 034a

This specification provides a concise summary of the main features of the programme and of the learning outcomes that a typical student might reasonably be expected to achieve if they take full advantage of the learning opportunities provided. This document is published on the University website and will be a publicly available record of the named programme.

Section 1 Key Facts

<table>
<thead>
<tr>
<th>Awarding Body</th>
<th>University of Stirling</th>
</tr>
</thead>
<tbody>
<tr>
<td>Partner Institution</td>
<td></td>
</tr>
<tr>
<td>Programme Name</td>
<td>Big Data</td>
</tr>
<tr>
<td>Award e.g. BSc (Hons), MA etc.</td>
<td>MSc</td>
</tr>
<tr>
<td>Faculty</td>
<td>Natural Sciences</td>
</tr>
<tr>
<td>Division (if applicable)</td>
<td>Computing Science and Mathematics</td>
</tr>
<tr>
<td>UCAS Code (UG only)</td>
<td></td>
</tr>
<tr>
<td>Programme Code</td>
<td>TXX44-BIG</td>
</tr>
<tr>
<td>Mode of Study</td>
<td>Full Time ✔ Part Time □ (if both please provide two Degree Programme Tables in the Outline Programme Structure)</td>
</tr>
<tr>
<td>Location/Method of Study</td>
<td>On Campus – UK ✔ On Campus – International □ Muscat College (Oman) Amity (Singapore) Core International Education (UAE)</td>
</tr>
<tr>
<td>Blended</td>
<td></td>
</tr>
<tr>
<td>Admission Points</td>
<td>September ✔ January ✔ Other</td>
</tr>
<tr>
<td></td>
<td>January Entry at Amity only.</td>
</tr>
<tr>
<td></td>
<td>(if more than one entry point please provide a Degree Programme Table for each in the Outline Programme Structure)</td>
</tr>
<tr>
<td>Length of Programme</td>
<td>12 months</td>
</tr>
<tr>
<td>SCQF Level</td>
<td>11</td>
</tr>
<tr>
<td>Total Credit Value</td>
<td>180 credits</td>
</tr>
<tr>
<td>ECTS Credit Value</td>
<td>60</td>
</tr>
<tr>
<td>Relevant QAA Subject Benchmark</td>
<td>Masters Degree in Computing</td>
</tr>
<tr>
<td>Professional Body Accreditation (all relevant accreditations to be listed)</td>
<td>Name of accrediting body: British Computer Society (BCS) (for Stirling Campus delivery only) Required for programme: Not required, but awarded Date of Accreditation: 28 / 09 / 2017</td>
</tr>
</tbody>
</table>
Section 2 Overview

PROGRAMME SUMMARY
This is a one year, full time taught MSc. designed to lead to a job in data science or analytics.

Big Data skills are in high demand and they attract high salaries. The MSc Big Data at the University of Stirling is a taught advanced Master's degree covering the technology of Big Data and the science of data analytics.

The course covers Big Data technology, advanced analytics and industrial and scientific applications. The syllabus includes:

- Mathematics and Statistics for Big Data
- **Python** scripting
- Business and scientific applications of Big Data
- Big databases and NoSQL including **MongoDB**, **Cassandra** and **Neo4J**
- Analytics, machine learning and data visualisation using **Weka**, **R** and **ScikitLearn**
- Cluster computing with **Hadoop**, **Spark**, **Hive** and **MapReduce**
- Student projects including possible **paid internships**

The course is also proudly part of the **DataLab MSc**, which supports our students with funding, networking and routes into employment.

PROGRAMME LEARNING OUTCOMES
On successful completion of this programme, you should be able to demonstrate:

1. An understanding of the issues of scalability of databases, data analysis, and search
2. The ability to choose the right solution for a commercial task involving big data, including databases, architectures and cloud services
3. An understanding of the analysis of big data including methods to visualise and automatically learn from vast quantities of data
4. The programming skills to build simple solutions using big data technologies such as MapReduce and scripting for NoSQL, and the ability to write parallel algorithms for multi processor execution.

WHAT WILL I BE EXPECTED TO ACHIEVE?
**Detailed Learning Outcomes**
On successful completion of this programme, you should be able to demonstrate:

1. an ability to develop technical solutions using a range of modern computing technologies including
   a. SQL and NoSQL Databases
   b. Machine learning and data analytics tools
   c. Coding using Python and Java
   d. Large scale computing over a cluster with Hadoop and Spark
2. an international perspective to understand the global data science field.
3. creative problem solving skills to find the best applications for the technology and skills they have.
4. an ability to communicate complex technical ideas from both computing and data science to audiences with varied backgrounds. You will need to be able to tell stories about customers, systems, data and business in a coherent way.
5. confidence working with new technologies and in challenging business environments.
6. an appreciation of the sensitivities and security requirements around the use of personal data in the with particular emphasis on the implications of new technology being introduced in those sectors.
7. a willingness to embrace new ideas and win over people whose views are different.
8. a strong ethical grasp of the issues around privacy, security and automated decision making.

HOW WILL I LEARN?
This is a highly practical course and is delivered through a combination of lectures, tutorials and practical laboratory sessions.

WHAT TYPES OF ASSESSMENT AND FEEDBACK CAN I EXPECT?

Assessment and Assessment Criteria
The programme will use the standard assessment methods of assignments and exams. Assignments will vary from module to module, with several technical assignments, some essay writing and some presentations. The dissertation project will be assessed by dissertation.

All assessment will be suitable for the common marking scheme and will be set to reflect both the learning outcomes of the module and the attainment descriptors of the CMS.

Feedback on Assessment
Feedback will be provided as appropriate to the type of assignment. There will be no single model for feedback from assessment, but the emphasis will be on the skills required to perform well in assessment (and the real world domain that the subject covers).

Assessment Regulations
There are no exceptions to the assessment regulations for this programme.

If you would like to know more about the way in which assessment works at the University of Stirling, please see the full version of the assessment regulations at: Postgraduate – Taught

WHAT WILL I STUDY?

Outline Programme Structure
The list below shows compulsory and option modules for this programme. Option modules are revised over time and, in some cases, will be dependent upon pre-requisite and/or co-requisites being taken (none in October 2017). More information about these requirements can be found in the relevant Module Descriptors. The options available each year can be subject to change due to student demand and availability of teaching staff.

- Where an “Option list” is specified, you have a choice of which module to take at this point in the degree programme and these choices are listed below

Year 1

Total year 1 credit value = 180
Compulsory credits = 120
Option credits = 60

Compulsory Modules – Note that new modules are highlighted in **bold**

<table>
<thead>
<tr>
<th>Module Title</th>
<th>Module Code</th>
<th>Credit</th>
<th>Semester</th>
<th>SCQF Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Statistics for Data Science</td>
<td>MATPMD1</td>
<td>10</td>
<td>Autumn</td>
<td>11</td>
</tr>
<tr>
<td>Representing and Manipulating Data</td>
<td>ITNPBD2</td>
<td>20</td>
<td>Autumn</td>
<td>11</td>
</tr>
<tr>
<td>Commercial and Scientific applications</td>
<td>ITNPBD4</td>
<td>20</td>
<td>Autumn</td>
<td>11</td>
</tr>
<tr>
<td>Relational and non-relational databases</td>
<td>ITNPBD3</td>
<td>20</td>
<td>Spring</td>
<td>11</td>
</tr>
<tr>
<td>Data Analytics</td>
<td>ITNPBD6</td>
<td>20</td>
<td>Spring</td>
<td>11</td>
</tr>
<tr>
<td>Cluster Computing</td>
<td>ITNPBD7</td>
<td>20</td>
<td>Spring</td>
<td>11</td>
</tr>
</tbody>
</table>

Option Modules – you may choose one of the following modules to take

<table>
<thead>
<tr>
<th>Module Title</th>
<th>Module Code</th>
<th>Credit</th>
<th>Semester</th>
<th>SCQF Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematical Foundations</td>
<td>ITNPBD1</td>
<td>10</td>
<td>Autumn</td>
<td>11</td>
</tr>
<tr>
<td>Networks &amp; Graph Theory</td>
<td>MATPMD2</td>
<td>10</td>
<td>Autumn</td>
<td>11</td>
</tr>
<tr>
<td>Dissertation project</td>
<td>ITNPBD5</td>
<td>60</td>
<td>Summer</td>
<td>11</td>
</tr>
<tr>
<td>Research Dissertation project</td>
<td>ITNPMR9*</td>
<td>60</td>
<td>Summer</td>
<td>12</td>
</tr>
</tbody>
</table>

*Module is not available at international partners: Muscat College, Core Education, Amity.

Part Time

You may study the programme part time over two years. There are no pre-requisites, so you may choose any modules each semester subject to the following constraints: you must study a minimum of 30 and a maximum of 40 credits per semester (Spring and Autumn). By the end of the second year you must have completed 60 credits in Autumn modules and 60 credits in Spring modules. The dissertation project must be completed over one summer period, in the summer of year two.

Key Features of the Programme

If you want to become a data scientist, this is the course for you. Around 88% of data scientists have an MSc, making it a passport to jobs in this field. Get the skills in Python, R, Hadoop, NoSQL, Spark, and machine learning you need to land your dream job. All you need to join us is a degree in a numerate subject. We will teach you the coding skills and give you a firm basis in the maths and statistics you need.

Stirling is a member of The Data Lab, which is an Innovation Centre with the aim of developing the data science talent and skills required by industry in Scotland. The data lab with facilitate industry involvement and collaboration and provide funding and resources for students. You can find out more about the Data Lab from their web site: [www.thedatalab.com](http://www.thedatalab.com)

The Stirling MSc in Big Data has been developed in partnership with global and local companies who employ data scientists. HSBC have a development centre in Stirling and have provided some very interesting Big Data projects to our students. Amazon’s development centre in Scotland is close by in Edinburgh. The course features a long summer project, generally in partnership with a company or technology provider, that provides students with a showcase of their skills to take to employers or launch online.

The Stirling MSc in Big Data has a programme of invited speakers from industry who give you a chance to ask questions of people who are doing data science every day. Recent companies have included MongoDB, SkyScanner and HSBC.
READING LIST

- SIGKDD Explorations, a magazine of the SIGKDD, the ACM (Association of Computing Machineries) data miners professional group (http://www.kdd.org/explorations)
- Analytics magazine from INFORMS (http://analytics-magazine.org/)

More detailed reading will be given by the lectures on each specific module

Section 3 Student Support

SUPPORT FOR STUDENT LEARNING

Induction

There is an induction lecture on the first day of Autumn semester, which is recorded for those who miss it. Students are also provided with a detailed student handbook that covers everything they need to know about the procedures and regulations of taking a degree at Stirling. Each student is assigned a personal tutor who is available throughout their studies to offer help, support and advice.

Study Skills Support

Student Learning Services are committed to providing comprehensive guidance on all aspects of effective and efficient learning. The ultimate aim of the service is to enable you to make the most of your academic studies at the University and for you to become an independent, successful learner during your time at the University of Stirling. This is facilitated through collaborative work with experienced tutors and by offering a variety of courses, workshops and tutorials.

All students, whatever stage of their academic studies, are welcome to use Student Learning Services. However the service may be particularly beneficial:

- In your first two years of study.
- If you are making the transition from college to Higher Education.
- If you have been out of education for some time.

What SLS are able to do:

- Advise you on academic skills relevant to your studies at University.
- Help you consolidate your previous learning and develop new learning strategies.
- Advise on action-plans to potentially improve grades.
- Suggest practical solutions if you feel overwhelmed by assignment work.
- Help you gain confidence in the transition to Higher Education.

More information can be found here: http://www.stir.ac.uk/campus-life/learning-support/student-learning-services/

STEER is a University-wide Student Peer Support Scheme providing Mentors or Buddies for any Undergraduate or Taught Postgraduate student in their first year at the University of Stirling. The scheme aims to help you make the most of your time at the University and enable you to settle in as quickly as possible. More information can be found here: http://www.steer.stir.ac.uk/index.php

Academic and Pastoral Support

Adviser of Studies: Advisers have an important role to play in enhancing your academic and personal
development and are essential to ensuring you make the most of your time at university. Advisers provide a personalised point of contact for you to discuss academic concerns or queries within the academic community. The general purpose of the role is to provide more in-depth advice on the academic options available to you and on the academic policies and regulations within the University. More information can be found here: http://www.stir.ac.uk/registry/advisers/

**Personal Tutor:** The role of a personal tutor is to help you feel part of the University community. They are a specific and consistent source of guidance, information and support for you throughout your studies. The tutor should be your first formal point of contact for general academic guidance and pastoral support. More information can be found here: http://www.stir.ac.uk/tse/personal-tutor/

**Support and Wellbeing:** At university you may face non-academic issues where you need some expert help or guidance. There are lots of ways we can help you in your day-to-day life at University. Student Support Services provide a range of high-quality services to assist you during the course of your studies, help prepare you for life after graduation. We aim to enhance the student experience and help you to get the most out of your time at University. More information can be found here: http://www.stir.ac.uk/campus-life/support-and-wellbeing/

**Student Union:** you can also access support through the Students’ Union, more information can be found here: https://www.stirlingstudentsunion.com/representation/studentsupport/

**Accessibility and Inclusion**
SLS are committed to offering a service which is welcoming and supportive of the needs of all students. Our service takes into account the full range of needs you may have, in a wide variety of circumstances including - physical and mobility difficulties, sensory impairments, specific learning difficulties including dyslexia and autistic spectrum disorder as well as medical conditions and mental health difficulties. We can also support you if you have short-term, temporary impairments or other difficulties as a result of an accident, injury, illness or surgery. More information can be found here: http://www.stir.ac.uk/student-support/accessibility-&-inclusion-service/

**Learning Resources**
You can find out more about the resources available to support your learning here: http://www.stir.ac.uk/campus-life/learning-support/

---

**Section 4 Programme Evaluation and Enhancement**

**METHODS FOR EVALUATING AND IMPROVING THE QUALITY AND STANDARDS OF TEACHING AND LEARNING**

**Module Evaluation**
Module evaluations are carried out each year and are an important way of getting student feedback on the modules we teach. The University introduced a new programme of module evaluations in 2015 using the EvaSys system. We aim to evaluate every module we teach in every semester. You can find out more here: http://www.stir.ac.uk/registry/studentinformation/moduleevaluation/

**Programme Review**
Programmes are reviewed annually and on a 5 yearly cycle. You can get involved in a variety of different ways; by completing module evaluations, becoming a course representative and attending Student Staff Consultative Committees, or participating in the review process itself. You can find out more here: http://www.stir.ac.uk/academicpolicy/handbook/review-and-monitoring/

**External Examiner(s)**
Name of External Examiner: Dr Dharini Balasubramaniam
Institution: University of St Andrews
## Section 5 My Future

### WHAT KIND OF CAREER MIGHT I GO ON TO?

**What career avenues does this qualification open up to the student?**
The MSc in Big Data opens up a career as a data scientist across many different application areas. Graduates of the course have gone on to work in health, in finance, in marketing, and in sport.

### WHAT STUDY ABROAD OPPORTUNITIES ARE AVAILABLE?

There are no study abroad opportunities.

### WHAT PLACEMENT OPPORTUNITIES ARE AVAILABLE?

The three month summer dissertation project may be carried out as a placement with a company. The division of Computing Science and Mathematics have had a good level of success placing students in placements in the current Big Data programme, and we expect this to continue.

### WHAT FURTHER STUDY OPTIONS ARE AVAILABLE TO ME?

Professional Doctorate in Big Data Science

### WHAT OTHER INFORMATION DO I NEED TO KNOW?

Contact the programme director if you have any questions. They will also be able to direct you to specific preparatory reading for the course, based on your previous experience.

## Section 6 Admissions

### HOW DO I ENTER THE PROGRAMME?

**Admissions Criteria**

A minimum of a second class Honours degree or equivalent in a numerate subject such as maths, computing, engineering or an analytic science. Applicants without these formal qualifications but with significant appropriate work experience are encouraged to apply.