Programme Specification

MSc Data Science and Computational Intelligence

ECT104

From Academic Year: 2017/18

Faculty of Engineering, Environment and Computing
September 2017

Please note: This specification provides a concise summary of the main features of the course and the learning outcomes that a typical student might reasonably be expected to achieve and demonstrate if s/he takes full advantage of the learning opportunities that are provided.

We regularly review our course content, to make it relevant and current for the benefit of our students. For these reasons, course modules may be updated.

More detailed information on the learning outcomes, content, and teaching, learning and assessment methods of each module can be found in the Module Information Directory (MID), student module guide(s) and the course handbook.

The accuracy of the information contained in this document is reviewed by the University and may be verified by the Quality Assurance Agency for Higher Education.
Contents

Introduction ........................................................................................................................................... 4

Part 1: Programme Specification for .............................................................. 5

MSc Data Science and Computational Intelligence ................................................. 5

1 Available Award(s) and Modes of Study .............................................................. 5

12 Intended Learning Outcomes* .............................................................................. 7

12.1 Knowledge and Understanding* ..................................................................... 7

12.2 Cognitive (thinking) Skills* ............................................................................. 8

12.3 Practical Skills* ............................................................................................... 9

12.4 Transferable Skills* ....................................................................................... 9

16 Method for Evaluating and Enhancing the Quality and Standards of Teaching and Learning ........ 14

17 Regulation of Assessment .................................................................................. 14

18 Indicators of Quality and Standards ................................................................. 1

19 Additional Information ....................................................................................... 1

20 Mandatory and Option Modules ..................................................................... 2

21 Curriculum Map .................................................................................................. 1

22 Capabilities (Skills) Map ................................................................................... 2
**Introduction**

Data science refers to understanding, processing, extracting value from and representing very large amounts of data. It requires multidisciplinary skills including traditional computer science, mathematics, statistics combined with business aptitude, curiosity and entrepreneurship.

Computational Intelligence (CI) is a branch of computer science studying problems for which there are no effective computational algorithms. Computational Intelligence approaches mimic human information processing and reasoning mechanisms as well as other biologically inspired processes such as evolution and collective intelligence found in many natural systems. The main areas of Computational Intelligence are Neural Networks, Evolutionary Computation and Fuzzy Systems.

The focus of the proposed MSc Data Science and Computational Intelligence Programme is on applications of data science methods and tools combined with Computational intelligence techniques to the analysis, interpretation and visualisation of complex data.

The School of Computing has considerable expertise in the above areas as evident by the research projects and the numerous research publications. The proposed MSc programme is expected to attract around 20 students per year which hold 2.1 or 1st BSc Computer Science or related degree. The programme will provide students with the knowledge and understanding of the underlining theory of data science and CI methodologies and practical experience in applying these to real life problems in business, finance, security and bioinformatics. The unique selling point of the programme will be the delivery through activity and problem based led learning in the context of current real research or industry consultancy projects conducted by the academics teaching on the course. The best students will be invited to apply for PhD study or research projects taking place in the School.

The programme will equip students with strong analytical and problem solving skills, ability to apply computational intelligence methods, algorithms and techniques to real data applications. There have been many publications predicting that the demand for specialists capable of analysing data to help businesses to make decisions will reach more than a million by 2018 (e.g. Report by McKinsey Global Institute, 2011). It is also emphasised that data science, computational intelligence and machine learning will drive a new wave of innovation. Successful data and computational intelligence applications require specialist knowledge and skills not readily available on the market. The course will provide the opportunity to individuals with the right background to acquire such skills and meet the demand for experts in these areas.
## 1 Available Award(s) and Modes of Study

<table>
<thead>
<tr>
<th>Title of Award *</th>
<th>Mode of attendance*</th>
<th>UCAS Code</th>
<th>FHEQ Level*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Master of Science (MSc) Data Science and Computational Intelligence</td>
<td>F/T – 1 year, P/T day release – 2 years</td>
<td>N/A</td>
<td>7</td>
</tr>
<tr>
<td>Fallback awards:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Postgraduate Diploma Data Science and Computational Intelligence (Pg Dip)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Postgraduate Certificate Data Science and Computational Intelligence (Pg Cert)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Computational Intelligence</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## 2 Awarding Institution/Body *

Coventry University

## 3 Collaboration

Not Applicable

## 4 Teaching Institution and Location of delivery*

Coventry University

## 5 Internal Approval/Review Dates

Date of approval*/latest review*: Feb/2013

Date for next review: 2019/20

## 6 Programme Accredited by*

Not Applicable

## 7 Accreditation Date and Duration

Not Applicable

## 8 QAA Subject Benchmark Statement(s) and/or other external factors *

Relevant Subject Benchmark statement(s):


- QAA for Higher Education statement on Masters programmes

  “Much of the study undertaken at Masters level will have been at, or informed by, the forefront of an academic or professional discipline. Students will have shown originality in the application of knowledge, and they will understand how the boundaries of knowledge are advanced through research. They will be able to deal with complex
issues both systematically and creatively, and they will show originality in tackling and solving problems. They will have qualities needed for employment in circumstances requiring sound judgement, personal responsibility and initiative, in complex and unpredictable professional environments.”


<table>
<thead>
<tr>
<th>9 Date of Programme Specification *</th>
<th>March 2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 Programme Manager/Course Tutor *</td>
<td>Dr Abdulrahman Altahhan</td>
</tr>
</tbody>
</table>

11 Educational Aims of the Programme *

The aims of the programme are to:

- Provide industry relevant programme that meets the needs of individuals wishing to pursue a career in research and development focused in data science and computational intelligence;
- To enable students to enhance their analytical, problem solving, critical communication and presentation skills in the context of their taught modules and develop the ability to analyse, evaluate and model complex problems involving large amounts of data;
- To advance the skills and knowledge acquired through previous study and experience into cutting edge research and technologies and to enhance students' transferable and professional skills and, thereby, their employment prospects;
- To provide in depth knowledge and understanding of the computational intelligence area including specialist knowledge in neural networks, fuzzy logic, evolutionary computing, data and web mining, information retrieval and data science technologies and tools;
- To enable students to analyse and critique the central and current research problems in data science and computational intelligence;
- To enable students to operate as effective independent researchers and/or consultants in their chosen specialised aspect of the course;
- To provide relevant and topical subject content for personal professional development that promotes good ethical practice in the workplace, particularly relating to the application of data analysis and computational intelligent techniques to real world applications and projects including in business, finance, industry control, engineering, natural language processing, information retrieval and bioinformatics;
- To enable students to adapt to future changes in technology in relation to data science and computational intelligence areas.
12 Intended Learning Outcomes*

12.1 Knowledge and Understanding*
On successful completion of the programme a student should be able to demonstrate knowledge and understanding of

KU1 The fundamental principles and techniques of data science and computational intelligence
KU2 Analysing complex, high-volume, high-dimensional, structured/unstructured data from varying sources
KU3 The combination of theory and practical application of data science and computational intelligence methods and techniques
KU4 Professional, legal, social, cultural and ethical issues related to data science, computational intelligence and an awareness of societal and environmental impact
KU5 Critically evaluate current research problems and apply cutting edge developments of data science and to computational intelligence areas
KU6 A specialised advanced area related to computational intelligence developed through a substantial individual project
KU7 Appropriately identify, analyse and critically review relevant literature

The principal teaching, learning and assessment methods normally used to enable outcomes to be achieved and demonstrated are identified below.

<table>
<thead>
<tr>
<th>Teaching and Learning</th>
<th>Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>KU1 Lectures, computer laboratory sessions, Web-based learning, problems and activity led classes, seminars discussions and tutorials, guided independent study, project work</td>
<td>Examinations, Individual written</td>
</tr>
<tr>
<td>KU2 problems and activity led classes, seminars discussions and tutorials, guided independent study, project work</td>
<td>coursework, Practical assignments, in class tests, portfolios of activities</td>
</tr>
<tr>
<td>KU3 problems and activity led classes, seminars discussions and tutorials, guided independent study, project work</td>
<td>coursework, Practical assignments, in class tests, portfolios of activities</td>
</tr>
<tr>
<td>KU4 problems and activity led classes, seminars discussions and tutorials, guided independent study, project work</td>
<td>coursework, Practical assignments, in class tests, portfolios of activities</td>
</tr>
<tr>
<td>KU5 guided independent study, personal supervision and support</td>
<td>Dissertation</td>
</tr>
<tr>
<td>KU6 guided independent study, personal supervision and support</td>
<td>Dissertation</td>
</tr>
<tr>
<td>KU7 guided independent study, personal supervision and support</td>
<td>Dissertation</td>
</tr>
</tbody>
</table>
### 12.2 Cognitive (thinking) Skills*

On successful completion of the programme a student should be able to

| CS1 | Engage in a peer review process that involves the critical review of papers, proposals and IT solutions related to data science and computational intelligence areas and make sound recommendations |
| CS2 | Critically evaluate a range of possible options solutions or architectures to address a sizeable data application and present a soundly reasoned justification for the final recommendation |
| CS3 | Demonstrate competence, creativity and innovation in solving unfamiliar problems |
| CS4 | Communicate effectively outcomes from major projects to technical and non-technical audiences |

The principal teaching, learning and assessment methods normally used to enable outcomes to be achieved and demonstrated are identified below.

<table>
<thead>
<tr>
<th>Teaching and Learning</th>
<th>Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS1 Group discussions either seminar or Web based, problem led classes and tutorials.</td>
<td>Presentations, poster display, seminar papers, written projects, examinations, problem solving exercises</td>
</tr>
<tr>
<td>CS2 Group discussions either seminar or Web based, problem led classes and tutorials.</td>
<td>Presentations, poster display, seminar papers, written projects, examinations, problem solving exercises</td>
</tr>
<tr>
<td>CS3 Group discussions either seminar or Web based, problem led classes and tutorials.</td>
<td>Presentations, poster display, seminar papers, written projects, examinations, problem solving exercises</td>
</tr>
<tr>
<td>CS3 Guided independent study, personal supervision and support</td>
<td>Written reports, Dissertation, Presentations</td>
</tr>
<tr>
<td>CS4 Guided independent study, personal supervision and support</td>
<td>Written reports, Dissertation, Presentations</td>
</tr>
</tbody>
</table>
12.3 Practical Skills*
On successful completion of the programme a student should be able to

PS1 Select and apply relevant knowledge and skills in big data applications using relevant tools and technologies

PS2 Identify and make effective and systematic use of a range of suitable techniques for developing solutions to complex data and analytical problems

PS3 Plan and conduct an independent project or dissertation either to solve a real practical problem applying best practice or to pursue research in a specific specialised aspect

PS4 Create relevant software solutions for data science and computational intelligence methods applicable to real world problems demonstrating business aptitude, curiosity and entrepreneurship

The principal teaching, learning and assessment methods normally used to enable outcomes to be achieved and demonstrated are identified below.

<table>
<thead>
<tr>
<th>Teaching and Learning</th>
<th>Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>PS1 Lectures, laboratory sessions, Web-based learning, problem led classes and tutorials, workshops, research design tutorials, dissertation supervision and guided and self-directed study</td>
<td>Practical and written assessments, presentations and production of a research plan and report</td>
</tr>
<tr>
<td>PS2 Lectures, seminars, problem led classes, and tutorials.</td>
<td>Written papers, exercises and presentations</td>
</tr>
<tr>
<td>PS3 Supervised Project or dissertation, Library searches, web-based learning,</td>
<td>Formal project report, presentation</td>
</tr>
<tr>
<td>PS4 learning, class discussions</td>
<td>or viva, demonstration of software product</td>
</tr>
</tbody>
</table>

12.4 Transferable Skills *
On successful completion of the programme you should be able to

TS1 retrieve and manipulate information

TS2 communicate complex quantitative analysis, idea and results clearly and effectively

TS3 solve problems and create software

TS4 exercise initiative and personal responsibility

TS5 make decisions in complex and unpredictable situations

TS6 demonstrate the independent learning ability required for continuing professional development

TS7 operate effectively in a variety of team roles and take leadership roles where appropriate
Transferable/key skills are generally incorporated within modules and related to relevant assessments as appropriate. Self-directed learning forms an element of all modules and the necessity to work within tight deadlines is an essential requirement across the curriculum. The ability to communicate orally and in writing will be developed across the range of modules. The wide range of assessment techniques will ensure that students are given every opportunity to demonstrate their skills in these areas.

13 Programme Structure and Requirements, Levels, Modules, Credits and Awards

'The below tables show a typical delivery pattern for this course depending upon the Teach-Teach-Project cycle on alternate academic years being used during the entry year. Personalised timetables will be issued to students prior to their course start date.'

Mandatory Modules Credits

<table>
<thead>
<tr>
<th>Module Code</th>
<th>Module name</th>
<th>Credits</th>
<th>Indicative Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>M23COM</td>
<td>Artificial Neural Networks</td>
<td>15</td>
<td>B</td>
</tr>
<tr>
<td>M24COM</td>
<td>Machine Learning</td>
<td>15</td>
<td>A</td>
</tr>
<tr>
<td>M28COM</td>
<td>Evolutionary and Fuzzy Systems</td>
<td>15</td>
<td>B</td>
</tr>
<tr>
<td>M26COM</td>
<td>Intelligent Information Retrieval</td>
<td>15</td>
<td>A</td>
</tr>
<tr>
<td>M27COM</td>
<td>Business Intelligence and Big Data Processing</td>
<td>15</td>
<td>B</td>
</tr>
<tr>
<td>M25COM</td>
<td>Cloud Computing and Distributed Technologies</td>
<td>15</td>
<td>A</td>
</tr>
<tr>
<td>M26CDE</td>
<td>Advanced Database Systems</td>
<td>15</td>
<td>A</td>
</tr>
<tr>
<td>M37COM</td>
<td>Research Methods in Computing</td>
<td>15</td>
<td>A or B</td>
</tr>
<tr>
<td>M08CDE</td>
<td>Project dissertation</td>
<td>60</td>
<td>B and C</td>
</tr>
</tbody>
</table>

Awards:

MSc Data Science and Computational Intelligence: The full curriculum (180 credits).

Pg Dip Data Science and Computational Intelligence: 120 credits comprising of the taught modules described in the programme of study.

Pg Cert Data Science and Computational Intelligence: 60 credits comprising at least three mandatory taught modules described in the programme of study.
A comprehensive support and guidance system exists for all postgraduate students in the Faculty of Engineering, Environment and Computing. Support is via a network of University and Faculty provision.

The Course Director is available to advise students on academic and pastoral issues. They may refer students to many other Faculty or central support services of the University where necessary. The Faculty Registry have offices located close to the main Receptions. You can drop by the Registry support desk which is next to reception in the ECB; Monday – Friday from 1000 – 1600. Or you can contact Registry staff via the Reception desks in the main EC building or the John Laing building; Monday – Friday from 0830 – 1700. This team can also be emailed CEM.FacultyRegistry.eec@coventry.ac.uk at any time and this will be passed to each student’s dedicated course support team to respond to.

The Student Experience Enhancement Team within the Faculty aims to take a pro-active student-centred approach to identify scope for innovation and improvements to any part of the educational process. The Team is also available to help resolve problems affecting students’ progress, including financial problems, and to advise students and staff on student-centred matters.

Additional postgraduate student support is provided by the Graduate and CPD Centre, based in the Jaguar Building and open until 20:00 weekdays. Support is provided for both full-time and part-time students during the daytime and in the evening. The Graduate Centre facilities include the Barclay Lounge and Snack bar. Many events are organised for postgraduate students through the Graduate Centre, including careers workshops, prestigious guest lectures and social events.

Overseas students may take advantage of services and guidance offered by the International Office and EU students are supported by a team of academic advisers comprising the Faculty’s External Relations Team. Other University agencies including Careers Guidance Services, Centre for Academic Writing and Disabilities Office are able to provide specialist advice as required by the Course Director and students.

The Faculty of Engineering, Environment and Computing has a dedicated employability unit and provides regular talks from industry speakers as well as career advice to students. The School of Computing organises yearly Computing show, which gives the opportunity to students to present their work to industry professionals. There are also regular research seminars in the Faculty, which are open to all postgraduate students.

Students who are studying modules managed by other faculties within the University have access to appropriate teaching and learning resources available within those faculties. In such cases Course Directors liaise with their counterparts in the faculties concerned so that they can provide advice to their students about operational requirements and procedures for the other faculty.

Each student receives a Student Handbook containing information about the Faculty, as well as specific information about the programme and modules. There is a scheduled induction period at the start of each semester at which new students are briefed on regulatory matters, processes and procedures relevant to their studies. The aim is to familiarise new students with the structure and
operation of their programme and the wider facilities of the University. Essential briefings are provided into aspects such as Health and Safety.

As soon as possible after enrolling, students are assigned an academic Personal Tutor, who invites a small group of tutees to an introductory meeting to discuss any problems arising from the arrival and induction process. Where possible the personal tutors are assigned from the team of teaching staff delivering postgraduate modules. Academic staff assigned as personal tutors receive regular guidance covering pastoral and academic support requirements.

Module Leaders and associated Module Teams support student learning at module level. The assessment mode varies according to subject content and the nature of the intended learning outcomes. Formative assessment styles and feedback mechanisms are designed to develop skills and support student achievement. All module assessment is carried out in compliance with the University Assessment Strategy which has been developed to ensure assessment is fair and equitable for students.

Prior to the commencement of the master’s project, individual supervisors, ideally with appropriate expertise or research experience, are assigned to help the students develop their project specifications. The Project Supervisor then normally assumes the role of Personal Tutor. For students who are undertaking projects in conjunction with external companies, the project supervisor normally facilitates meetings and liaises closely with the company and the student during the project period. For all types of project, the student and Supervisor agree regular contact times during the project in order to monitor progress and provide guidance. Additional support is provided to cover project supervision during the summer, to allow for academic staff absences for annual leave. This takes the form of a “hotline” for support and a postgraduate duty rota of academic staff from each School.

The University places a high priority on providing equal opportunities for all students and has received national recognition for its work in assisting disabled students. Individual staff have been briefed and trained on their responsibilities in these areas and provide the basic assistance required in the academic work of a study module. A Faculty Learning Support Co-ordinator and a central University-wide Disabilities Office provide more specialised support. Reasonable adjustments can be made to the teaching, learning, assessment and support of the course(s) to maximise accessibility to students with disabilities.

The University has an excellent record on widening access and welcomes students from all backgrounds on to its courses.
15 Criteria for Admission

Applicants for this programme will normally be expected to possess a minimum of upper second class honours degree in Computer science, Mathematics or other relevant area.

Students whose first language is not English should have achieved a minimum English language standard of IELTS 6.5. Alternatively, students may be admitted with IELTS 6.0 subject to successfully completing a compulsory five week pre-sessional English course, operated by Coventry University, before joining their master’s programme.

Admission of disabled students

The University and the Faculty have always adopted a very positive approach to applications from students with disabilities.

- If possible students with disabilities are identified on application to the Faculty. All letters inviting students to interview or open days include a sentence asking disabled students to contact the admissions team to discuss any special needs they may have in advance of their visit.
- On receipt of an application from a disabled student, the Admissions Officer liaises with the student and the University Disabilities Office to arrange meetings to discuss requirements and to ensure an assessment of needs is undertaken.
- Where required the Course Director is involved at the earliest opportunity to ensure that all special operational requirements can be identified and satisfied in advance of arrival.
- Disabled students with special educational needs are encouraged to select their core options in the earliest opportunity to allow academic staff sufficient time to prepare any bespoke teaching methods and materials.
- Disabilities Officer contacts all students who indicate on their enrolment form that they have a disability to offer support and guidance.
- The Faculty Learning Support Co-ordinator and the Course Directors monitor and liaise about issues affecting enrolled students with disabilities.
- The Faculty Learning Support Co-ordinator liaises with the University Disabilities Office and provides guidance to staff and students on matters relating to study support.

Accreditation for prior learning (APL) is in accordance with University regulations as set out in paragraph 7.3.1 of the regulations for taught postgraduate courses.

The accreditation for Prior Experiential learning (APEL) will only be awarded for achievements equivalent to masters’ level.

Module exemptions can be given for prerequisites that have been achieved through previous study or experience. Normally alternative modules will be chosen from those available in the core options list. However appropriate alternative modules may be substituted, subject to the approval of the Course Director, who must ensure that the aims and learning outcomes of the named award are achieved by any variations in the programme of study.
16 Method for Evaluating and Enhancing the Quality and Standards of Teaching and Learning

The Programme is managed by the Computing Board of Study of the School of Computing Electronics and Math.

The Programme Assessment Board (PAB) for CEM is responsible for considering the progress of all students and making awards in accordance with both the University and course-specific regulations.

The assurance of the quality of modules is the responsibility of the Boards of Study which contribute modules to the programme.

External Examiners report annually on the programme and their views are considered as part of the annual quality enhancement monitoring process (CQEM). Details of the CQEM process can be found on the Registry’s web site.

Students are represented on the Student Forum, Board of Study and Faculty/School Board, all of which normally meet two or three times per year.

Student views are also sought through module evaluation questionnaires and student forums.

All programmes are subject to a major review involving subject experts external to the University, normally on a six year cycle. At these reviews the views of employers and current and former students are sought where appropriate.

17 Regulation of Assessment

University policy requires the internal moderation of all assessments.

External Examiners are appointed for all named University awards. The role of the External Examiner at module level is to ensure that academic standards are in line with national norms for the subject. External Examiners undertake the moderation of examination papers and assessment tasks, and view representative samples of work for the modules for which they have responsibility. At programme level, External Examiners help to ensure fairness in the consideration of student progression and awards. They have the right to comment on all aspects of the assessment system and participate as full members of the assessment boards.

The Pass mark for all modules is 40%. This overall module mark may comprise more than one component (e.g. coursework and exam). The individual module descriptors give the precise pass criteria and the weighting of the component marks that contribute to the overall module mark.

Awards for Taught Master programmes may be made with Distinction or Merit (i.e. achievement of an average mark of at least 70% or 60% respectively).
The following are key indicators of quality and standards:

- The programme has been designed in accordance with the QAA benchmark statements for Master's degrees in computing, 2011, [http://www.qaa.ac.uk/Publications/InformationAndGuidance/Documents/QAA386_Computing.pdf](http://www.qaa.ac.uk/Publications/InformationAndGuidance/Documents/QAA386_Computing.pdf) and QAA for Higher Education statement on Masters programmes.

- The programme has been designed in accordance with the benchmarking standards for taught master degrees in Computing, CPHC and BCS, 2008 [http://www.cphc.ac.uk/docs/cphc_masters_april_final.pdf](http://www.cphc.ac.uk/docs/cphc_masters_april_final.pdf).

- This programme satisfies the requirements of the Quality Assurance Agency for Higher Education as stated above and also complies with the University’s Code of Practice for Academic and Professional Skills Development.

- The School has strong links with employers, enabling visits, guest lectures and joint projects with local companies;

The last Research Excellence Framework (REF 2014) resulted in the following ratings for Computer Science & Informatics (5% World-leading, 37% Internationally Excellent, 55% International Recognition, 3% National Recognition):

- The course has strong links with academics who research interests lie within data driven innovation e.g. Machine Learning, Artificial Neural Networks, Big Data platforms, Computational Intelligence, Analytics and Information Retrieval which informs our teaching.

The report of QAA’s Institutional Audit undertaken in 2015 confirmed that:

- The maintenance of the threshold academic standards of awards offered on behalf of degree-awarding bodies and/or other awarding organisations meets UK expectations.
- The quality of student learning opportunities at the provider meets UK expectations.
- The quality of the information produced by the provider about its provision meets UK expectations.
- The enhancement of student learning opportunities at the provider meets UK expectations.
19 Additional Information
Key sources of information about the course and student support can be found in

- Student Handbook
- Module Guides
- Module Information Directory
- CU Online
- Module Webs
- Postgraduate Programme Webs
- EC Faculty Postgraduate Web

CU Portal

- Study Support information is accessible from student services home page
- Generic Faculty information is available on the EC Faculty Web

Please note: This specification provides a concise summary of the main features of the programme and the learning outcomes that a typical student might reasonably be expected to achieve and demonstrate if s/he takes full advantage of the learning opportunities that are provided.

More detailed information on the learning outcomes, content, and teaching, learning and assessment methods of each module can be found in the Module Information Directory (MID), student module guide(s) and the course handbook.

The accuracy of the information contained in this document is reviewed by the University and may be verified by the Quality Assurance Agency for Higher Education.
### 20 Mandatory and Option Modules

<table>
<thead>
<tr>
<th>Module code</th>
<th>Module title</th>
<th>Credit</th>
<th>Pre/Co requisite</th>
<th>MSc Data Science and Computational Intelligence</th>
</tr>
</thead>
<tbody>
<tr>
<td>M23COM</td>
<td>Artificial Neural Networks</td>
<td>15</td>
<td>None</td>
<td>M</td>
</tr>
<tr>
<td>M24COM</td>
<td>Machine Learning</td>
<td>15</td>
<td>None</td>
<td>M</td>
</tr>
<tr>
<td>M28COM</td>
<td>Evolutionary and Fuzzy Systems</td>
<td>15</td>
<td>None</td>
<td>M</td>
</tr>
<tr>
<td>M26COM</td>
<td>Intelligent Information Retrieval</td>
<td>15</td>
<td>None</td>
<td>M</td>
</tr>
<tr>
<td>M27COM</td>
<td>Business Intelligence and Big Data Processing</td>
<td>15</td>
<td>None</td>
<td>M</td>
</tr>
<tr>
<td>M25COM</td>
<td>Cloud Computing and Distributed Technologies</td>
<td>15</td>
<td>None</td>
<td>M</td>
</tr>
<tr>
<td>M08CDE</td>
<td>Project dissertation</td>
<td>60</td>
<td>None</td>
<td>M</td>
</tr>
<tr>
<td>M26CDE</td>
<td>Advanced Database Systems</td>
<td>15</td>
<td>None</td>
<td>M</td>
</tr>
<tr>
<td>M37COM</td>
<td>Research Methods in Computing</td>
<td>15</td>
<td>None</td>
<td>M</td>
</tr>
</tbody>
</table>

**Key**

M = Mandatory (i.e. must be studied and passed for the named award)

O = Option
21 Curriculum Map

This diagram is used to map the intended learning outcomes against the mandatory and option modules. It is used to check that the students will have the opportunity to achieve the intended learning outcomes shown in section 12, regardless of which options are chosen.

<table>
<thead>
<tr>
<th>Module codes</th>
<th>Knowledge and Understanding</th>
<th>Cognitive (Thinking) Skills</th>
<th>Practical Skills</th>
<th>Transferable Skills</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>KU1</td>
<td>KU2</td>
<td>KU3</td>
<td>KU4</td>
</tr>
<tr>
<td>M23COM</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M24COM</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M28COM</td>
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### 22 Capabilities (Skills) Map

In the grid below, the box where the module listed offers a significant opportunity to demonstrate the capability is annotated.

It includes taught (T), practised (P) and assessed (A) information regarding the stated intended outcomes and how they will be experienced/demonstrated by the student.

<table>
<thead>
<tr>
<th>Module codes</th>
<th>Learning to Learn</th>
<th>Working with others</th>
<th>Problem Solving and Innovation</th>
<th>Numeracy</th>
<th>IT and Online Learning</th>
<th>Communication</th>
<th>Career Management</th>
<th>Information Management</th>
<th>Personal Development Planning</th>
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Key: T=Taught, P=Practiced, A=Assessed

The Code of Practice for Academic and Professional Skills Development requires that each of the capabilities be demonstrated at least once during the programme.
Capability Outlines (from the Code of Practice for Academic and Skills Development)

Learning to Learn – Students should be ready to accept responsibility for their own independent learning. They should also be able to reflect on their learning and appraise their capabilities and achievements. Students should also be able to identify their individual needs for effective learning.

Working with Others – Students should be able to work effectively as part of a group, and respect the dignity, rights and needs of others.

Problem Solving and Innovation – Students should be able to use problem-solving skills in a variety of practical situations. They should be able to demonstrate creativity, flexibility, perception, decisiveness, confidence and an awareness of values.

Numeracy – Students should be able to interpret, analyse and present numerical data.

IT and Online Learning – Students should be able to use computer-based systems for learning, communicating, collaborating with peers and tutors, and working with data.

Communication – Students should be able to communicate effectively in appropriate forms in a wide variety of situations.

Career Management – Students should appreciate the values, culture, structure and process of work organisations relevant to their area of study. Students should also appropriately match their experience and academic achievements to employer expectations.

Information Management – Students should be able to carry out research relevant to their field of study by retrieving and using information drawn from a variety of resources.

Personal Development Planning – Students should be able to demonstrate self-awareness, set personal goals and record achievement.

Capabilities developed through the Add+vantage Scheme

In all full-time UK based undergraduate courses (with the exception of those that lead to a licence to practice), students will undertake at least one 10 credit Add+vantage module in each of the three years of their course. Theses Add+vantage modules will develop the following generic capabilities:

- Problem Solving Skills
  - Action Planning and Organising
  - Written and Oral Communication
  - Questioning and Listening

Employability competencies and career management skills will be introduced in each Add+vantage module. The following personal qualities related to employability will be addressed in each of the Add+vantage modules:

- Achievement orientation
- Initiative (Creativity)
- Self Confidence
- Decisiveness
- Reflectiveness
- Adaptability/Flexibility
- Influencing
- Career Management Skills