**COURSE SPECIFICATION:
Core Award Data**

ROBERT GORDON UNIVERSITY ABERDEEN

Master of Science [MSc] Big Data Analytics (Session 2025-26)

VALIDATION DATE

10 May 2016

AWARDING INSTITUTION

Robert Gordon University

INSTITUTION OF DELIVERY

Informatics Institute of Technology, Sri Lanka

COURSE ACCREDITED /RECOGNISED/ APPROVED BY

BCS, The Chartered Institute for IT

(https://www.bcs.org/)

COURSE ACCREDITATION / RECOGNITION /APPROVAL

Accredited by BCS, The Chartered Institute for IT for the purposes of partially meeting the academic requirement for registration as a Chartered IT Professional and partially meeting the academic requirement for a Chartered Engineer.

AWARDS

Stage 1
Students are awarded:

- Postgraduate Certificate Big Data Analytics on successful completion of four modules (60 SCQF11 credits)
- Postgraduate Diploma Big Data Analytics on successful completion of eight modules (120 SCQF11 credits)
- Master of Science Big Data Analytics on successful completion of eight modules and the MSc project (180 SCQF11 credits)

Students have the option of graduating in Sri Lanka at the IIT convocation or at RGU's graduation ceremony.

AWARD TYPE

Postgraduate - Masters

MODES OF STUDY

Part-time on-campus learning

Part-time online learning

DURATION OF COURSE

The course will normally be delivered and assessed over the following duration(s). Please note the period from enrolment to final assessment will depend on the point of intake and scheduled University breaks.

18-24 months (depending on how many modules students take each Semester) with intakes in September, January and May.

LANGUAGE OF STUDY

English

LANGUAGE OF ASSESSMENT

English

UCAS CODE

None.

JACS CODE

I100

RELEVANT QAA SUBJECT GROUP

Computing

DATE OF PRODUCTION / REVISION

1 April 2024 (Version 8)

INTRODUCTION TO THE COURSE

The MSc/PgD/PgC Big Data Analytics is a specialist Masters course, designed for practising industry professionals such as Software Engineers and Business Analysts who have an Honours degree in Information Technology (IT), Computing or related areas. The course consists of 8 core modules and an MSc Project module designed to equip students with specialist computing skills which focus on knowledge discovery from structured and unstructured data stores, cloud computing techniques, programming for distributed architectures, relational and NoSQL database management systems. The course will provide research and technical skills necessary for the student to develop sophisticated data analysis and retrieval systems applied to Big Data and work as an independent researcher.

The MSc project module will provide an opportunity for students to demonstrate originality and creativity in solving a relatively complex real-world problem and applying state-of-the art research methods and techniques producing well-documented high-quality work of a professional standard. It will give students a strong foundation and self-confidence to introduce and implement Big Data Analytics projects in their workplace. This will, in turn, benefit the local IT industry in Sri Lanka.

The course content and delivery will be complemented by practical and research work intended not only to reinforce the learning process but also to enhance the vocational relevance of the course of study. The syllabus content incorporates modules intended to develop the technical and professional skills required to produce, manage and execute

state-of-the-art Big Data Analytics processing systems.

EDUCATIONAL AIMS OF THE COURSE

The specific aims for each stage of the course are:

Postgraduate Certificate
To produce practitioners who will be able to:

- Demonstrate an extensive, detailed and critical knowledge and understanding of big data management principles and technology practices.
- Create and extend models and trends to support decision making with a view to explaining, interpreting and synthesising knowledge from big data.
- Enhance and develop transferable skills needed to create and architect big data systems.

Postgraduate Diploma
To produce practitioners who, in addition to the aims above, will be able to:

- Critically review, consolidate and extend the concepts from data analysis and natural language processing to create innovative text analytics systems for big data.
- Undertake independent research in a rapidly evolving technological discipline with awareness of the legal, ethical, social, and professional framework in which they operate.
- Plan complex big data system deployments and make informed judgments based on comprehensive in-depth knowledge of specialised cloud-based solutions.
- Programming for distributed and parallel architectures, data warehousing offerings, state-of-the-art data storage and mining systems; and critically appraise the state-of-the-art techniques in big data with insights and conclusions drawn from related research works.

Master of Science
In addition to the above, MSc graduates will be able to:

- Plan, manage and deliver a significant Big Data Analytics project of research, investigation and development within the confines of the legal, ethical, social and professional context of big data.
- Critically appraise different design approaches and technical solutions for a Big Data Analytics project requiring a comprehensive understanding of the latest research developments and scientific risk.
- Create innovative solutions through the integration of a range of standard and specialised big data technologies at the forefront of big data research.
- Effectively test, evaluate, document, and present a complex big data solution.

LEARNING OUTCOMES

This Masters course offers extensive training in big data technology and methods, providing the opportunity to upgrade existing skills to the state-of-the-art in areas such as Data Mining, Programming for Distributed Processing Systems, NoSQL Databases, Text Analytics techniques and leveraging Cloud Computing platforms for Big Data Analytics. A strong research focus will equip students either to move on to a PhD programme, or industry-based research position or be an industry consultant in Big Data Analytics solutions.

Course Learning Outcomes

Knowledge and Understanding

The student is expected to demonstrate a systematic, in-depth knowledge and understanding of:

- Modern NoSQL and relational database systems, and advanced data mining methods.
- Tools and techniques which aid the specification, design and implementation of a Big Data Analytics project; machine leaning techniques, which can be applied to analyse and extract useful information from complex data stores.
- Selecting and establishing a project management framework and lay down effective procedures for monitoring progress of any large-scale research / development project.
- Accessing information resources and managing these to obtain state-of-the-art knowledge of big data and its technologies.
- Comprehensive, detailed, state-of-the-art knowledge of the specialist area(s) in Big Data Analytics; research methods appropriate to their Masters independent study project, together with detailed knowledge of the particular area or sub-area in which the project is carried out.
- The theoretical and empirical limits and boundaries of big data, and the range of methods of study and types of judgments employed by advanced practitioners in the field informed by legal, social, ethical and professional issues.

Practice: Applied Knowledge and Understanding

The student is expected to demonstrate the skills required to:

- Apply statistical methods to assess and evaluate research or experimental test results.
- Use a wide range of big data tools, techniques and programming skills.
- Make effective use of available IT tools and packages to undertake the practical work of the PgC/PgD modules, to produce high quality coursework.
- Make effective use of available IT infrastructure and software packages to undertake a big data project and to enhance the production and presentation of the Masters project report and oral defence.

Generic Cognitive Skills

The student is expected to demonstrate the ability to:

- Analyse critically a big data problem identifying key requirements, alternative solutions and evaluation methods.
- Develop an effective, original solution to a big data problem.
- Make calculated decisions in situations where information is incorrect and/or incomplete.
- Propose solutions to data storage, retrieval, extraction, analysis and visualisation problems, which satisfy user requirements, using appropriate notations to express solution concepts and aid reasoning about the efficacy of

the proposed design.

- Apply critical judgment in the selection and application of analysis/test strategies for validating research outcomes/testing a developed system and compliance to initial requirements.
- Propose (or select) and conduct the Masters project applying an analytic, rigorous and critical approach to identifying project goals, proposing and evaluating different research/solution strategies and generating a useful and effective output.

Communication, ICT and Numeracy Skills

The student is expected to demonstrate the skills required to:

- Communicate effectively, using appropriate methods to audiences with different levels of knowledge and understanding.
- Produce structured and coherent written reports to document the investigation and survey of a problem in the domain of big data.
- Formulate strategy/design decisions and record research/test strategies and results throughout the various stages of a major Big Data Analytics project using appropriate software tools.
- Produce a clear and coherent thesis, which documents the process and end result of a major big data applied research project.
- Analyse a variety of data (including numerical and unstructured data) to draw conclusions to aid decision making.
- Deliver a lucid and coherent oral defence of the work undertaken during the Masters project before a live audience of peers and/or academics.
- Deliver concise and relevant reviews of work undertaken within a predefined plan of work and make a valuable contribution to peer review tasks.

Autonomy, Accountability and Working with Others

The student has to demonstrate the ability to:

- Investigate and critically appraise specialist areas of research.
- Use tools and techniques to analyse existing complex data.
- Work independently, demonstrating a high level of autonomy, individual initiative and responsibility for own work.
- Integrate critical reflection into work roles and responsibilities; adopt an analytical approach to tasks to identify problems, solutions and evaluation methods.
- Show a willingness to learn from others and problem solve with others.
- Self-manage time and workload scheduling flexibly.
- Consider the ethical, social and professional issues of a big data problem/solution, and effectively address any such issues.

DISTINCTIVE FEATURES OF COURSE

The course offers specialist advanced technical skills with focus on Big Data Analytics in the areas of Data Warehousing (CMM701), Advanced Databases (CMM702), Data Analysis (CMM703), Data Mining (CMM704), Big Data Programing (CMM705), Text Analytics CMM706), and Cloud Computing (CMM707). The Research Methods module (CMM708) and the MSc Project (CMM799) provide project management and research

skills needed to conduct an independent study of the field to deliver a substantial Big Data Analytics project.

The course will benefit from IIT's strong collaborative links with industry partners. Highly skilled practitioners will be invited to provide guest lectures and present case studies based on current industry trends. This creates an effective practice-led learning environment for students.

In addition to industry collaborations, IIT will leverage its inter-university links to organise invited lectures in particular from the Universities of Colombo and of Moratuwa, which have strong computing and engineering departments.

WHAT THE COURSE INVOLVES

The course will normally involve a two year period with three cohorts planned in each year (September, late January and May).

As illustrated in Figures 1 and 2, the three semesters will comprise a programme of rolling modules that are independent of each other. The curriculum of the Big Data Analytics course is structured so that individual modules do not have a requirement for prior study of any other Big Data Analytics modules. This arrangement provides flexibility in delivery and is made possible given the decoupled nature of the big data topics. This means that students can enter into any semester and begin credit accumulation at a pace that fits with their work commitments. The maximum duration for completion of the course is 4 years (this includes the 104 weeks specified in RGU Academic Regulations A1: Courses, paragraph 4.7). Pace of credit accumulation must be discussed and approved by the Course Leader.

Students will normally attend five semesters spread over two years. The first two semesters in the first year contain three modules each. The third semester contains two modules. Modules taught in each semester are as follows:

- Semester 1 - Data Warehousing (CMM701), Big Data Programing (CMM705)
- Semester 2 - Advanced Databases (CMM702), Data Analysis (CMM703) and Data Mining (CMM704)
- Semester 3 - Text Analytics (CMM706), Cloud Computing (CMM707) and Research Methods (CMM708)

All modules (except the MSc Project CMM799) are assessed by coursework only. Each module has one reassessment opportunity. In the second year two (or three) further semesters can be dedicated to completing the Masters project.

The modules are scheduled so that the three intakes in any one year will study most of the same taught modules together, giving them the opportunity to have more interaction and discussions within the lectures. The students has the option of enrolling onto on-campus learning during weekdays or online learning during the weekends. Students will attend a minimum three-hour (maximum four hour) session each week per module. A week will normally have three modules being delivered over 3 selected days. Lectures will be scheduled on weekdays (after 6pm) on-campus and on weekends for online learning. The session consists of a combination of a lecture, tutorial and a lab. Students from all annual intakes (i.e. September, January and May) will be awarded the respective award

on the appointed graduation day once credits are accumulated for the relevant exit award.

For instance, the first intake (September) could complete the course in two years by completing the MSc Project (CMM799) in the second semester of the second year, to graduate in the summer. The second intake (January) completes the course in the third semester of the second year but would wait for the graduation ceremony held in the summer of the third year. The third intake (May) completes the course in the first semester of the third year, to graduate in the summer along with the second intake students. There is flexibility to continue the Masters Project over three semesters in the second year, if it better serves the needs of the student.

PROFESSIONAL EXPERIENCE / PLACEMENT

A placement is not a core element of the course. Most of the students who enrol are typically working in the Sri Lankan IT industry. However, students could use their workplace experience in choosing an industry-based MSc Project.

OPPORTUNITIES FOR FURTHER STUDY

The course has a strong grounding in research techniques and enables students to advance into research and development at Doctoral level. RGU and IIT are exploring this avenue of jointly supervised PhD opportunities with matched funding schemes.

Increasingly, Doctoral programmes by distance learning are growing in number and in format, subject area and modes of delivery. It offers an opportunity to diversify RGU's Doctoral offer and further expand to international markets.

EXTERNAL AND INTERNAL INDICATORS OF QUALITY AND STANDARDS

IIT Mission Statement

"Our mission is to develop creative and highly skilled professionals with an international outlook, who will make a significant contribution to the global knowledge economy." We will achieve this by providing:

- *The highest quality learning, teaching, and research environments.*
- *An excellent student experience with an exciting range of social and cultural activities.*
- *Empowerment that prepares the students for professionalism in the world of work.*
- *Outstanding education that imparts knowledge, wisdom and skill needed to thrive as global citizens.*
- *An employability development and career development process that increases student and graduate employment opportunities.*
- *Support to students to realize their potential notwithstanding their social, cultural and financial environments."*

Internal and External Indictors

- IIT have been endorsed by the British High Commission as an institute that upholds UK education standards and recognised for their contribution to improving education in

both countries (Celebrating IIT's contribution to Sri Lankan education, gov.uk news article, 3rd Oct 2015, **https://www.gov.uk/government/world-location-news/celebrating-iits-contribution-to-sri-lankan-education**

- IIT is also involved in primary and secondary school IT education through its own, curriculum development and delivery programmes.
- IIT has sponsored Big Data industry seminars, conferences, Hackathons etc. For example, IIT has already sponsored "Federation of Information Technology Industry Sri Lanka (FITIS) Tech Forum 2015: BIG DATA" (**http://readme.lk/tech-forum-2015-big-data/**). Another example is, CodeSprint: First Inter University Hackathon in Sri Lanka (organised by IIT – IEEE Student Branch) **http://island.lk/index.php?page_cat=article-details&page=article-details&code_title=136033**
- The Sri Lankan Board of Investment have granted IIT to deliver degrees in partnership with UK institutes that are members of the Associations of Commonwealth Universities (ACU) or are listed in the International Year Book recognition. Currently RGU is listed in the latter and is also exploring membership of ACU.

ACADEMIC REGULATIONS

This course is governed by the provisions of the university's Academic Regulations, which are available at **www.rgu.ac.uk/academicregulations**. In particular:

Regulation A1: Courses

Regulation A2: Admission and Enrolment

Regulation A3: Section 1: Student Appeals (Awards and Progression) Procedure

Regulation A3: Section 2: Student Misconduct Procedure

Regulation A4: Assessment and Recommendations of Assessment Boards

Applicants must satisfy the university's general admission requirements for undergraduate and postgraduate courses as contained in *Academic Regulation A2: Admission and Enrolment*, including proficiency to a minimum standard in the English language. Specific entry requirements for this course are detailed below.

Course Specific Academic Regulations

IIT will adopt RGU's Academic Regulations (available at **www.rgu.ac.uk/academicregulations**) with the following agreed adaptations and amendments:

Regulation A1: Courses
Paragraph 4. **Maximum Period of Enrolment**
- Paragraph 4.6: The Masters Degree part-time at IIT can be completed in a **minimum** of 5 semesters, (5 x 15 weeks) 75 weeks but this may extend to 6 semesters (90 weeks) if the student wishes to accumulate credits at a different pace.
- Paragraph 4.7: The **maximum** duration allowed for a student from first enrolment is 4 years.

Regulation A2: Admission and Enrolment
Paragraph 4 **Admission Requirements for Taught Postgraduate Degrees**
- Paragraph 4.1: Applicants for this course will normally have an Honours Degree (2nd class or better) in a discipline with significant IT, Computing, Mathematics or Statistics

content. Interviews are mandatory at IIT and all potential applicants will be called for an interview to discuss their qualifications and experience gained. Students whose prior qualifications or experience are outwith the normal criteria can also be considered for instance where they possess a qualification or industrial experience of equivalent standard or an approved professional qualification. In such situations IIT will refer a decision to RGU's Head of School.

- Paragraph 4.2 English Language Proficiency: A minimum standard of IETLS 6.0 overall with no less than 5.5 in any of the four components. However students with a degree taught in English equivalent to a Bachelor's degree or above shall be eligible for a waiver of IELTS.

Regulation A3: Section 1 Student Appeals (Awards and Progression)

This is replaced by IIT's 16B Appeals Handling Procedure with the following agreed adaptations: IIT will consider appeals against decisions relating to academic performance and/or recommended academic awards, on the following grounds:

i. That the student's performance was adversely affected by illness or other factors which the student was unable, for valid reasons, to divulge to the course leader prior to the decision being made; and/or

ii. That there had been a material administrative error, or that the assessment was not conducted in accordance with the current regulations governing the course or that some other irregularity which materially affected the assessment had occurred.

Disagreement with the academic judgement, i.e. judgement about a student's academic performance, of an Assessment Board cannot constitute grounds for appeal.

Appeals Procedure
Level 1:

The appeal should be submitted, using the appeal form, to the Registrar who, in consultation with the Course Leader, considers whether there are grounds for appeal. The appeal will be considered by the Assessment Board.

The appeal should be made in writing within 5 days of receiving the official assessment results. The outcome will be communicated to the student within 3 weeks.

Level 2:

If the appeal is not resolved at Level 1, the student can continue with their appeal by providing further information, as appropriate. The Registrar would consult with the Dean (or an independent assessor, as appropriate) to determine whether there is a prima facie case. Where there is a case, the appeal will be referred back to the Assessment Board.

The second appeal should be made in writing within 5 days of receiving the Level 1 appeal outcome. The outcome will be communicated to student within 3 weeks whether the case is referred back to Board or not.

Where relevant/appropriate IIT will seek guidance from RGU.

Regulation A3: Section 2 Student Misconduct Procedure

This is replaced by IIT's Policy "15 Misconduct or Malpractice Procedure – Students".

Regulation A3: Section 1 para 4.1 (ii) and Academic Regulation A4, para 9.3

Attendance Requirements

Attendance is compulsory and IIT students will adhere to attendance requirements set by IIT and acknowledge that failure to do so in particular in relation to assessment will be taken into account by the relevant Assessment Board. Students with attendance falling below the expected 80% threshold will be followed up and procedures put in place to encourage a positive change in attendance behaviour. Students falling below the expected attendance threshold are unlikely to successfully complete the module due to the intense delivery of the content.

Regulation A4: Assessment and Recommendations of Assessment Boards

Assessment and examination arrangements shall be in accordance with the regulations of RGU (www.rgu.ac.uk/academicregulations) . Refer to RGU Academic Regulation A4: Assessment and Recommendations of Assessment Boards and more specifically paragraph 7 Assessment Boards - Recommendations for Postgraduate Courses.

The course will be delivered in accordance with RGU's *Fit To Sit Policy and Extenuating Circumstances.* Where appropriate, as specified below, some aspects of IIT quality procedures will also apply. (https://www.rgu.ac.uk/about/governance/academic-governance/student-and-applicant-forms).

Approval of Assessment

Assessments will be internally moderated by IIT, overseen by RGU and sent to the External Examiner.

This course will also be governed by IIT's *Assessment Verification Policy* regulations document (*A1-Internal-Verification-Policy.pdf)*.

Assessment Board Composition and Operation
- The Assessment Board normally constitutes: the Convener (or nominee), External Examiner, RGU Moderator, Course Leader, and a representative from Registry/quality. Refer *RGU Organisational Regulation O7, paragraph 3* (https://www.rgu.ac.uk/about/governance/organisational-regulations).
- The Assessment Board will be convened each semester to decide on student progression and award.

External Examiner Arrangements

An External Examiner will be appointed and approved by RGU following RGU's appointment procedures.

Assessment Specific Requirements

Grading Scheme

The University's grading scheme will be used to assess work. All module grades will be expressed as an alpha grade as follows A, B, C, D, E, F. The assessment components can be marked on a numerical scale. The Module Performa Descriptor will identify clearly performance required to achieve each grade. For each assessment, three sample batches of coursework are taken (top band, middle band, lower band) and are reviewed by a second marker. This ensures that the marks given by the first marker are uniform and un-biased. For viva-based assessments, a moderator would be present to give a second opinion on presentation skills, clarity and projection.

Condonement

MSc Project (CMM799) cannot be condoned because it is central to the objectives of the course. Refer to RGU Academic Regulation A4 paragraph 11. At the discretion of the Assessment Board, one module from the taught modules can be condoned in the event of a marginal failure.

Assessment Opportunities

For assessment of postgraduate awards students shall be permitted an initial assessment and, as necessary, up to a maximum of one further opportunity for re-assessment to be taken at the next scheduled assessment occasion. The re-assessed work is marked on its merits without capping. However when a grade contributes to the determination of the classification or grading of an award, including the determination of Distinction or Merit, then for this purpose the re-assessed module shall be attributed the maximum of a threshold pass of Grade D. Refer RGU Academic Regulation A4 paragraphs 7.2 and 9.6.

Merit and Distinction

All awards can be recommended with Merit or Distinction, refer RGU Academic Regulation A4 paragraph 8.

Complaints Procedure

Complaints would be managed through IIT QMS 16A Complaint Handling Procedure.

EQUALITY AND DIVERSITY

IIT are committed to the active promotion of equality across its functions, including its course provision. Please refer to IIT's Equality and Diversity Policy Level 2 Section 20 outlined in IIT's Quality System Process (QSP).

NOTE

This document constitutes one of two course documents that should be read together:
Course Specification: Core Award Data
Course Specification: Student Learning Experience

CONTACT DETAILS

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In compiling this information the university has taken every care to be as accurate as possible, though it must be read as subject to change at any time and without notice. The university reserves the right to make variations to the contents or methods of delivery of courses, to discontinue, merge or combine courses, and to introduce new courses.

DETAILED COURSE STRUCTURE

Part-Time				
Stage 1	**Semester 1**		*CREDITS*	*LEVEL*
CMM701	Data Warehousing		15	11
CMM705	Big Data		15	11
		Total for Semester:	**30**	

Part-Time				
Stage 1	**Semester 2**		*CREDITS*	*LEVEL*
CMM702	Advanced Databases		15	11
CMM703	Data Analysis		15	11
CMM704	Data Mining		15	11
		Total for Semester:	**45**	

Part-Time				
Stage 1	**Semester 3**		*CREDITS*	*LEVEL*
CMM706	Text Analytics		15	11
CMM707	Cloud Computing		15	11
CMM708	Research Methods		15	11
		Total for Semester:	**45**	

Part-Time				
Stage 1	**Semester 4**		*CREDITS*	*LEVEL*
CMM799	MSc Project		-	11
		Total for Semester:	**0**	

Part-Time				
Stage 1	**Semester 5**		*CREDITS*	*LEVEL*
CMM799	MSc Project		60	11
		Total for Semester:	**60**	

		Total for Stage:	**180**	

Notes:

This details the course structure for a September intake although the course does have two additional intakes in January and May. On-campus delivery and online delivery will share the same course structure.

COURSE STRUCTURE DIAGRAM

Modules taught in each semester are as follows in:
Semester 1: CMM701, CMM705 and CMM707
Semester 2: CMM702, CMM703 and CMM704
Semester 3: CMM706 and CMM708

COURSE SPECIFICATION:
Student Learning Experience

Master of Science [MSc] Big Data Analytics

STUDENT LEARNING EXPERIENCE

The university's mission is to be consistently one of the best modern universities in the UK. To achieve this ambition, the university focuses on the needs of students, economies and societies, aiming to:

- Enrich the all-round experience of students throughout their engagement with the university;
- Enhance the quality and relevance of taught provision;
- Increase the diversification of the student population;
- Expand the provision of corporate programmes and lifelong learning opportunities;
- Grow internationally excellent research and knowledge exchange activities and reputation;
- Secure economic and environmental sustainability.

The university believes a professional education starts with excellent teaching and research within a supporting environment and is about a lifelong and sustainable approach to working and living. The university's portfolio is informed by its commercial and public sector partners, who are instrumental in helping to develop courses to ensure their relevance for the evolving economy and society. Many include practical experience and placements and are professionally accredited. These contribute to the university's position as one of the UK's top universities for graduate employment.

By combining the best of both academic and professional worlds, the university aims to give its students the best possible start to their careers. A degree from Robert Gordon University is confirmation to a future employer that a student will possess the blend of learning, skills and experience.

Design Philosophy

The overall philosophy and strategy proposed for the course is to provide a sound knowledge and understanding of big data in the broader context. As the student progresses through the course, they are encouraged to expand their understanding and critical appreciation of big data and develop research skills. The course is aimed at instilling in students the importance of life-long learning in the pursuit of knowledge for either personal or professional progression. The vocationally orientated nature of the course requires the student to achieve general and specific skills, which are addressed through a combination of teaching and learning methods.

The course induction programme is aimed at ensuring students gain familiarity with the (academic and non-academic) policies and procedures required for the successful completion of the course, e.g., assessment, extenuating circumstances, grading schemes and student services. A Handbook "MSc Big Data Analytics Student Handbook" is provided to all students. Students are also expected to, where appropriate; seek help from Module Leaders, self-help groups and others, as appropriate.

Student-Centred Learning

This course demands a relatively rapid pace of delivery. Consequently, student-centred learning strategies play an important role in most subjects, reinforcing and supplementing more traditional methods of subject delivery. Directed reading, independent progress through computer-based exercises, independent reading, analysis of case studies and directed searches of on-line information resources are all commonplace.

Group Work

Group exercises are used to develop team-working skills and encourage discussion through peer review of literature. This is particularly relevant when reviewing research literature in modules such as Data Mining (CMM704), Data Warehousing (CMM701), Text Analytics (CMM706) and Research Methods (CMM708). Students will also investigate legal, ethical, professional and social issues with respect to one or more industry-based case studies in the Research Methods (CMM708) module. These case studies will be organised as Group exercises in tutorials.

Module Approaches

Modules delivered on the course are divided into three broad areas:

- Core technological modules (CMM701 Data Warehousing, CMM702 Advanced Databases, CMM703 Data Analysis, CMM704 Data Mining, CMM705 big data Programming, CMM706 Text Analytics, CMM707 Cloud Computing).

- Professional skills modules (CMM708 Research Methods and, to a lesser extent other core technical modules that involve technical writing and class presentations as part of their assessment components).

- Integrative course modules (CMM799 MSc Project).

Core Technological Modules

These modules impart specialist technical knowledge through the medium of lectures and tutorials, supplemented as necessary by student-centred materials and tasks. All core modules have a supporting practical element, which is delivered through laboratory work. In practical sessions students are expected to progress through a series of graded exercises that are designed to foster analytical skills and to illustrate the synthesis of fundamental knowledge and problem solving techniques in both structured and unstructured problem domains.

Professional Skills Modules

Technical report writing skills are exercised in all modules. Group work is used in some of the modules to enhance and develop team working skills. The course addresses project planning skills that are vocationally relevant and that also directly underpin the planning and management of the MSc Project. Student feedback in this course takes the form of critical self-appraisal, peer appraisal, and commentary from academic staff. Through directed reading, and by listening to invited external speakers, students are also encouraged to develop a broader perspective of big data and to sharpen their awareness of the need for professional standards and ethics in the workplace.

Integrative Course Modules

The MSc Project module CMM799 serves the primary purpose of integrating technological and professional strands, in the context of a substantial big data project. It involves an investigation of a technical problem and its domain, examining relevant methods and tools and to gain deep understanding of the problem and its context and develop a specification

for a substantial professional (or equivalent) big data project. It will require students to conduct a literature survey and critically appraise and organise literature to provide insights about gaps and areas for contribution. Following on from this investigation, the project will proceed to the development and evaluation phases where the solution to a problem will require the skills to make judgements in complex unstructured big data domains. The problem is original to the student and its solution, therefore, requires the innovative application of knowledge and techniques either studied in the previous PgD stage or acquired through independent research of recent and relevant literature. The MSc Project provides a vehicle for integrating specialist knowledge with analytic, problem solving, managerial and communication skills. All of these are exercised and evidenced through the execution and outcomes of the project, which include a project plan, dissertation, final oral presentation, and project "viva" (demonstration).

Teaching and learning are reviewed through an annual appraisal mechanism and strategies are liable to change for the sake of continuing improvement and to reflect best practice.

TEACHING AND LEARNING STRATEGY

Introduction

The broad nature of the course including common and specialist elements necessitates the use of a broad range of learning and teaching techniques. These include lectures, seminars, tutorials, computer laboratories, interactive materials, group work, presentations and demonstrations, student-centred learning and private study. The relationship between these methods and the acquisition of knowledge, understanding and skills development is detailed in the following sections.

Knowledge and Understanding

All core technological modules will utilise lectures, seminars and tutorials. *Lectures* provide a formal discourse for the purposes of dissemination of information, the demonstration of techniques and the discussion of supporting idea. Lectures are supported by whiteboard, video, computer projection facilities, and online engagement using a virtual learning environment where appropriate. Students will have the opportunity for questions, interaction and discussion. Invited guest lectures will emphasise professional skills as well as provide an industrial context.

At IIT, seminar and tutorials are used for a wide range of activities, each suited to the particular subject. Some tutorials will focus on staff supporting students in problem solving. Some tutorials may involve group activities. This type of student contact is used to support lectures, to clarify material and experiment with techniques and skills required.

Practice: Applied Knowledge and Understanding

All core technological modules have a significant practical component. The nature of the computing elements of all courses requires students to gain practical skills in the use of sophisticated big data tools and including systems design and development tools. This activity normally takes place in the computer laboratories and consists of the student, supported by a staff member.

Online materials, sometimes interactive, will be used to both explain theoretical aspects of modules and to guide students on practical exercises. Video, audio and text media will be used and students will be encouraged to actively seek video lectures from reputed research institutes and international conferences.

Generic Cognitive Skills

Students are expected to take an active role in their learning. As well as studying formally delivered materials, they are required to expand their knowledge and skills by reading related materials and undertaking increasingly more challenging theory- and practice-based research. All core technical modules will require that students critically analyse, evaluate and synthesise issues that are informed by research developments.

Research Skills are emphasized through all modules but particularly in the Research Methods module (CMM708), which is designed to foster understanding and competence in conducting literature surveys, peer review, project management and planning issues and in the testing and evaluation of implemented systems. Due to the novel nature of the MSc project, and the rapid evolution of computing, it is essential that students also acquire competence in research skills. These skills are intended to assist the student in the investigation of emerging techniques and technologies that may be relevant to the achievement of the MSc project goals. Beyond the confines of the MSc Project, these same research skills are useful for continuing professional development and act as a safeguard against technological obsolescence. All students who embark on the MSc Project are required to attend a Library Workshop. This is intended to familiarise students with available information sources (journals, monographs and on-line resources) and to inform them of systematic and effective methods to review current literature in the field of computing. The Workshop is not assessed directly but evidence of independent research and a review of the project context are elements of the overall assessment of the MSc Project.

Autonomy, Accountability and Working with Others

Group work sessions will be used to enable students to develop team-working skills and to encourage discussions. In particular the Research Methods module (CMM708) will contain group work exercises where each team will consider the legal, ethical, professional and social issues of a given big data case-study project and present their findings to the rest of the class. The MSc Project (CMM799) further requires students to work to project deadlines, generate deliverables as set in the project plan, develop a functional working relationship with their supervisor and be able to progress the project through their own-initiative and ability to work independently. As the course progresses, students will be increasingly expected to learn independently, work unsupervised, critically reflect on their learning and establish their own learning objectives.

Communication, ICT and Numeracy Skills

The majority of the core technological modules include the preparation of technical reports as part of the coursework assessment component.

The MSc Project (CMM799) provides a vehicle for integrating specialist knowledge with analytic, problem solving, managerial and communication skills. The investigation exercises evidence skills in information gathering, analysis and communication. In addition to problem solving, managerial skills are exercised and evidenced through the execution and outcome of the project, which include a project dissertation, final oral presentation and project 'viva' (demonstration).

Learning Resources

The course will make use of a wide range of learning resources. IIT Staff will upload module-specific course materials to RGU's CampusMoodle. This will include all lecture materials, guided tutorial questions and solutions, guided laboratory work, case studies, coursework specifications and guidelines and sample solutions to exercises as appropriate. Feedback on performance will be given during tutorials and/or laboratories to enable the student to

learn from past performance. Module Leaders are responsible for ensuring that students are aware of essential readings and additional textbook recommendations at the beginning of each module.

The library stocks a high number of electronic learning resources. Academic staff will submit resource recommendations for consideration by the library to ensure up-to-date portfolio offering.

Learning Environment

At every opportunity students will be provided a seamless view of their attachment to both institutes. For instance RGU's enrol systems will be personalised for IIT students and relevant web links from RGU will point to the validated MSc Big Data Analytics course website at IIT. Students will access RGU's CampusMoodle, which is a widely used virtual learning environment which not only enables academic staff to upload materials but also contains a wide variety of facilities including forums and a site for the submission of coursework by students.

IIT has a number of computer laboratories for exclusive use of computing students. These are state-of-the-art facilities with up-to-date software. Supervised laboratory sessions are provided for all modules for on-campus delivery. For online learning, the students are assisted in setting up their home computing environment with up-to-date software that is required for each module. Students working on the MSc Project will have access to a dedicated lab area for their use. Students may contact a wide variety of staff using a variety of communication methods depending on their needs, e.g. face to face, email, chat, virtual learning environment forums, online virtual meetings, messaging apps and phone. We list these below indicating normal modes of communication:

- A Module Leader: module related queries **(via Email, Messaging Apps, Face To Face, Virtual Meeting)**
- The Course Leader: course queries and/or personal issues **(Email, Phone, Messaging Apps, Face to Face, Virtual Meeting)** Student Relations Manager: non-academic matters and personal issues **(Face to Face, Virtual Meeting)** The Postgraduate Registrar; module registration related issues. **(Phone, Email)**
- IT Services: for technical support in the laboratories and/or for setting up software on their own devices e.g. Wi-Fi **(Phone, Email)**
- Library staff **(Phone, Email)**
- Designated email contact at RGU: course validity related questions **(Email)**

ASSESSMENT

A range of assessment methods are used, with particular emphasis placed on coursework assignments, including design exercises (ranging from design studies to fully implemented solutions), comparative studies, investigative reports, demonstrations, and presentations. Students are informed in advance what assessment methods will be used for each module and will have access to examples of past assessments. Where the format of assessment varies significantly from one year to the next, model assessments will be created to ensure students understand what the assessment entails. All assessments include a marking/grading scheme, which describes the criteria used for the award of marks/grades.

Assessment Plan

Coursework deliverables cover a variety of artefacts such as, technical reports, presentations, and demonstrations. These will be used to assess problem identification, problem analysis with evaluation of alternative solution strategies, solution design, evaluation of solution performance, documentation, and presentation skills. The use of state-of-the-art computational tool kits and programming skills will be assessed in all

practical coursework assignments in addition to analytical and critiquing skills (i.e. literature survey, evaluation methodologies) and communication skills (result presentation and documentation). Technical reports will be used to document big data development assignments. Demonstration of IT competence is mandatory in production of documentation to support all coursework submissions.

With the MSc Project, a plagiarism analysis report, such as from Turnitin will accompany the final dissertation. Supplementary documentation on project management will record project progress, quality guidelines and project deliverables. It will also contain information on the use of online resources to present interim MSc Project progress updates and guidelines on the live presentation and demonstration of MSc Project outcomes.

The following sections detail the teaching and assessment of various skills including: (i) knowledge and understanding; (ii) practice: knowledge and understanding; (iii) generic cognitive skills; (iv) communication, ICT and numeracy skills and; (v) autonomy, accountability.

Knowledge and Understanding

A range of assessment methods are used, with particular emphasis on coursework assignments, including design exercises (ranging from design studies to fully implemented solutions), comparative studies, and investigative. For taught modules the focus will be to assess the student's ability to integrate key features, boundaries, and conventions through a critical understanding of the principal theories, concepts and principles. Students will be expected to have an extensive detailed and critical knowledge when addressing assessment components in each of the core technological modules. Additionally, with more programming-based coursework, such as CMM705 Big Data Programming, students will be tested on their creative problem-solving skills, ability to make judgments on suitability of design patterns and demonstrate deep understanding of best practices.

Practice: Applied Knowledge and Understanding

Practical skills are assessed throughout via coursework assignments which involve the use of a variety of big data tools as well as programming environments and other computing tools and packages. Evaluation skills are key to demonstrating knowledge and understanding of big data practice. A variety of practical skills are assessed in the MSc Project (CMM799) which involves the demonstration of the practical skills required to complete a substantial practical big data task.

A majority of the core technical modules will assess a range of specialised tools and packages that are at the forefront of big data developments. For instance big data offerings in CMM705 (such as Hadoop, Spark), cloud frameworks in CMM707 (Amazon and Microsoft Cloud offerings), statistical computing environment in CMM703 (R), and comparative evaluation methodologies in CMM704 and CMM706 (NLP and text mining tool kits). Students will be expected to integrate from a range of such offerings and techniques of inquiry to create novel solutions to assessment tasks.

A range of the principal professional skills, techniques, best practice informed by legal, ethical and social aspects will be assessed in the Research Methods module (CMM708). Opportunity to assess group working is also integrated within CMM708's assessment components.

The integrative MSc Project module is primarily designed to assess the student's ability to plan and execute a significant project of research, investigation and software development to demonstrate originality, creativity, and aptitude for innovation. Presentations and viva component further tests the student's ability to respond positively to critique and participate in peer-review processes. Importantly, it will also expose students to the

unknown, and often unpredictable, variety that is to be expected of professional level contexts.

Generic Cognitive Skills

Assessment generally involves the production of technical report content, which reflects on problem identification, critical appraisal of alternative solution strategies, evaluation of solution performance.

With core technical modules, assessments will focus on testing the student's ability to critically analyse, evaluate and synthesis issues that are informed by research developments, in particular in the following modules: Data Warehousing (CMM701), Advanced Databases (CMM702), Data Mining (CMM704), Text Analytics (CMM706) and Cloud Computing (CMM707). More generally, assessment components will require students to identify, conceptualise and define new and abstract problems and issues.

The assessment of generic cognitive skills is particularly evident in the MSc Project module (CMM799). In particular, students will be expected to critically review, consolidate and extend knowledge, skills, practices and thinking in relation to their chosen MSc big data project. These projects provide the student with the opportunity to excel in their original and creative problem-solving skills. Although not a requirement, it has the potential to generate work that can lead to publishable research material.

Communication, ICT and numeracy skills

Communication: Technical reports documenting big data development assignments; structured project documents to manage project conduct, establish quality guidelines, archive project deliverables; use of web resources to present interim MSc Project progress; live presentation of MSc Project outcomes. Communication tasks are implicitly assessed in tasks which involve both oral/written communication as well as documentation.

ICT: The use of IT tools in all coursework assignments (i.e. use of tools to plan, aid design, collate results and document coursework). Demonstration of IT competence is mandatory in production of documentation to support all coursework submissions including development of support materials for the project oral presentation.

Numeracy skills: These skills are essential for the successful completion of most course modules and are implicitly assessed in coursework. Numeracy skills are particularly key to data analysis tasks and the evaluation or project results.

Autonomy, Accountability and Working with Others

These skills are assessed implicitly in all modules. Explicit assessment of these skills is evident in the project conduct grade of the MSc project (CMM799), which reflects the student's interaction with their supervisor and includes demonstration of own-initiative and ability to work independently. Other coursework that involves presentations will equip students to handle peer pressure and respond appropriately to questions. Team-working skills are mainly assessed in the Research Methods module (CMM708) which includes group work for the compilation of a critical report on legal, ethical, professional and social issues.

SUPPORT FOR TEACHING, LEARNING AND ASSESSMENT

IIT provides a number of means of supporting teaching and learning:
- Student induction/orientation program organised for each intake (September / January / May)
- An extensive library of learning resources
- Close collaboration with industry and professional, statutory and regulatory bodies

- CampusMoodle (https://campusmoodle.rgu.ac.uk), the RGU's dedicated virtual learning environment
- A commitment to knowledge exchange and technology transfer through focused research activity, which contributes to the critical underpinning for all taught courses
- The expanding provision of state-of-the-art, purpose-built facilities and buildings.

RGU will provide guidance and direction to IIT in relation to setting coursework assessments, Turnitin, managing MSc projects, and related quality procedures for on-campus delivery as well as for online delivery. IIT Module Leaders will be put in contact with the relevant Module Leaders at RGU to work collaboratively on developing teaching materials and explore research opportunities.

IIT will organise inductions on an intake basis. They will have a well-stocked library with corresponding books related to the MSc Big Data course.

Computing facilities at IIT comprises a number of labs with state-of-the-art PCs, each updated over a 3 year cycle to ensure they deliver high performance and support the latest software. IIT offers wireless network coverage for laptops and other handheld devices. Established relationships with major software suppliers mean access to the latest software either for free or very low prices. IIT believes the academic success of the students is founded in the desire to develop and maintain close links with industry and to actively seek state-of the-art technologies and integrate these into course modules.

All students have access to a Student Relations Officer as well as the Course Leader and the Postgraduate Registrar who work as a team in order to ensure that comprehensive support is given to students not only on academic matters but also personal matters that may impact performance. The project supervisor provides general advice in all aspects related to the MSc Project.

RGU's Campus Moodle Virtual Learning Environment, will be used for a variety of purposes to support on-campus and online learning including: (i) a repository for learning material; (ii) a discussion forum; (iii) a place for uploading coursework by students; (iv) a tool for electronic assessment; (v) a facility for feedback to students; (vi) a tool for conducting online teaching sessions; (vii) a facility for module leaders and project supervisors to connect virtually with students.

MONITORING OF QUALITY AND STANDARDS

The University employs several mechanisms for evaluating and improving the quality and s RGU's key process for evaluating and improving the quality and standards of teaching, learning and assessment is though the *Annual Course Appraisal* activity. The process involves the Course Team's analysis of key data sources including; External Examiners, student academic performance, employment data and student feedback (refer below). IIT will adopt a similar appraisal process and will draft a Course Appraisal, which will be approved by the IIT Dean and then considered by the School Academic Board of RGU's School of Computing.

Apart from Annual Course Appraisal, IIT employs several mechanisms for evaluating and improving the quality and standards of teaching, learning and assessment during course delivery. These include conducting random real-time peer reviews of lecturers while they are delivering a module. There is also ongoing; feedback from industrial/professional liaison groups; review of student performance at Assessment Boards and overall oversight by IIT's Academic Syndicate.

FEEDBACK FROM STUDENTS

IIT uses a variety of mechanisms to obtain feedback from students, and to involve them in their learning experience. This is integral to IIT's approach to the quality assurance and enhancement of teaching and learning, and the holistic student experience. Formal feedback is gathered from Student Questionnaires, the class representative system (class representatives are involved in formal Committees including the Course Committee), and Semester wise meetings of the Management and Dean with Student Representatives. Informal feedback is gained from discussion with students.

The student questionnaires provide feedback on the course and modules and give students the opportunity to comment in detail on all aspects of the course as well as the general environment, support services and facilities. Student questionnaires used by IIT will align with survey tools used by the University and will be approved by RGU. Responses to, and actions resulting from, these comments are addressed fully through the Course Committee.

NOTE

This document constitutes one of two course documents that should be read together:
Course Specification: Core Award Data
Course Specification: Student Learning Experience

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