



ICON College of Technology and Management

BSc (Hons) Computing Top-Up

Course Handbook 2021- 2022

Course Handbook 2021- 2022

Course Title: BSc (Hons) Computing Top-UP

Course Code: ICON005TOPUP

1. Key Information

Award: BSc (Hons) Computing Top-Up
Course Id: ICON
Location: ICON College of Technology and Management, London
Awarding Institution: Falmouth University
Credit Value: 120 Level 6 Credits
Course Structure: 4x20 credits; 1x40 Computing Project (Dissertation)
Duration: One Year
Academic year: 2021 -2022
Mode of Study: Full Time
Language of Study: English
Course Fees: £7500
Timetables: Day, Evening and Weekend

Introduction

ICON College of Technology and Management offers a BSc (Hons) Computing in partnership with Falmouth University, a TEF Gold Rated University.

The overall aim of the course of awards is to develop learners' intellectual, practical and interpersonal skills to the best of their abilities at their selected level of study, and to prepare them for, or further their prospects in, a career in the field of Computing. This will be achieved by providing a thorough educational basis in the fundamental theoretical, practical, sustainable and managerial aspects of Computing.

Entry Requirements

To meet the entry criteria for admission, a candidate must have:

- HND in relevant subject area

and,

- Demonstrate a Commitment to Study and a reasonable expectation of success on the Course (ICON internal graduates would not go through interview process)
- Where applicants have a formal HND qualification from other educational institution, they may be required to undertake **two weeks** bridging Course before or at the start of semester, based on the judgment of the senior admission tutor in the interview, if they are accepted to the Course.

Course Map – BSc (Hons) Computing Top - Up

Level 6

Study Block 1		Study Block 2	
Network Engineering	Software Engineering	Network Engineering	Software Engineering
COMP 610 (Part 1) Computing Project Compulsory (40 credits)		COMP 610 (Part 2) Computing Project Compulsory (40 credits)	
COMP 620 Network Infrastructure & Design Compulsory (20 credits)	COMP 640 Big Data Analytics Compulsory (20 credits)	COMP 660 Internet of Things (IoT) Compulsory (20 credits)	
COMP 630 Network Security Compulsory (20 credits)	COMP 650 Mobile Applications Development Compulsory (20 credits)	COMP 670 Machine Learning and Artificial Intelligence Compulsory (20 credits)	

Course specific employability skills

The course tailors the development of learners' technical skills towards the development and application of computer engineering relevant to the computing disciplines. These include the following:

Knowledge & Understanding

- Explain and apply essential facts, concepts, principles and theories relating to computing and computer applications as appropriate to the course of study;
- Discuss scientific and engineering practice and theory in computing and extend knowledge through self-led study;
- Discuss management issues concerning the planning, design and delivery of computer-based systems;
- Identify and model requirements for specialised computing systems and propose and evaluate solutions to fulfil them;
- Demonstrate knowledge of systems architecture;
- Use appropriate theories, practices and tools for the specification, design,

implementation and evaluation of computer-based systems;

- Explain security issues in relation to the design and use of computer systems;
- Explain the concepts of computer programming and critically evaluate and predict their utility in models, tools and applications;
- Demonstrate advanced, specialist theoretical and practical knowledge in a range of computer science sub-fields;
- Explain the legal, social, ethical and professional issues involved in the use and exploitation of computer technology with respect to good professional practice.

Cognitive and Intellectual Thinking Skills

- Develop and critically evaluate specifications for specialist computer systems;
- Analyse and solve problems based on theoretical considerations;
- Analyse and abstract problems and propose and apply effective solutions;
- Synthesise information from disparate sources to compose systems and documents;
- Design and construct computer systems from given specifications;
- Identify the risks and benefits involved in a practical computing project;
- Apply controlled compromise in meeting requirements;
- Apply techniques and tools for modelling and managing information;
- Understand the commercial context in which content is developed and consumed.

Practical, Professional or Subject-specific Skills

- Understanding of and ability to use relevant materials, equipment, tools, processes, or products;
- Knowledge and understanding of workshop and laboratory practice;
- Ability to use and apply information from technical literature;
- Ability to use appropriate codes of practice and industry standards;
- Awareness of quality issues and their application to continuous improvement;
- Version control and continuous integration;
- Legal, social, ethical and professional issues and codes of practice;
- Professional standards and bodies in the computing sector;
- Materials and technologies appropriate to professional practice;
- Explain the issues of professionalism in computing, including the need for continuing professional development;
- Plan and manage a large-scale problem-solving computing project.

Transferable Key or Personal Skills

- Industry-relevant business practices and how to align them with future aspirations;
- The principles of communication design as it relates to personal branding;
- Adapting fundamental computing skills and knowledge to work in a diverse range of application domains;
- Communicating across technical specialisms and application domains;
- Assessing any risks or safety aspects that may be involved in the operation of computing and information systems within a given context;
- Understanding of the principles of managing engineering processes;
- Communicate requirements and proposals for computer systems to other

- computing professionals;
- To work as a member of a development team recognising the different roles within a team;
- Design and execute methodologically sound scientific and engineering studies;
- Plan work;
- Manage personal time;
- Present and communicate complex ideas;
- Apply sound research methods;
- Understand, evaluate, synthesise and apply complex ideas.

Career/Future Study Opportunities

The skills offered as part of the BSc (Hons) in Computing can provide graduates with the opportunity to work in many different areas of the Computing sector. Below are some examples of job roles to which each qualification could lead:

- Systems Analyst/Data Scientist
- Network Engineer
- Software Engineer
- Consultant
- System Administrator
- IT Project Manager
- Software developer
- Business analyst
- Web developer
- Technical architect
- Technical Manager
- Technologist
- User experience designer
- Helpdesk Engineer
- Lead Programmer/Chief Technical Officer
- Programmer
- Network Programmer
- Trainer/ Educator
- Platform to continue further higher studies at postgraduate level and research

Structure of Course Delivery

The course is delivered and assessed via a coordinated combination of: lectures (including programmed learner activity); supervised tutorials; supervised laboratory work; independent coursework; group project work; and individual project work and dissertation.

The teaching and assessment methods used throughout the course is to require increasingly thorough levels of analysis, autonomy, etc. as the learner progresses throughout the course.

The College will accommodate a variety of methods for the delivery of modules throughout the course as appropriate to meet the module expectations at different levels. The delivery will therefore be flexible, based on learning styles of the learners as well as diversity of the contents.

Project work plays an important course Stage in the Computing course. The Group Project provides learners with experience of the issues involved in network/software development projects as well as enhancing team-working and related transferable skills.

In the Individual Project learners are expected to carry out an independent investigation of a significant computing problem, allowing them to apply what they have learned throughout the course. This activity is carried out under the supervision of academic staff, offered through a series of supervision sessions.

Lectures are normally used to: (a) present and explain the theoretical concepts underpinning a particular subject; (b) highlight the most significant aspects of a module's syllabus; and (c) indicate additional topics and resources for private study. Tutorials are used to help learners to develop skills in applying the concepts covered in the lectures of the relevant module, normally in practical problem-solving contexts.

Laboratory sessions serve a similar purpose as the tutorials, but are geared towards demonstrating application of concepts and techniques through the use of software development tools, network design tools and environments.

Project supervision sessions will be used to indicate theories, methods, techniques and concepts which are relevant to the issues being investigated by the particular project as well as ways of applying these instruments in specific problem-solving contexts.

The ICON Virtual Learning Environment (ICON VLE) tools will be used to supplement face-to-face delivery through pre-recorded video, discussion fora, breakout sessions and so on, in order to support learners in different modules. The ICON VLE will continue to be used for submitting coursework for summative and formative assessments.

Throughout the module delivery tutors will be urged, through formative assessment, to keep track of learners' achievement in gaining specific employability skills outlined as relevant to specific module. In addition, guest lectures from relevant industries will share their experience of employability skills required in the field of computing. Special workshop sessions in formative assessment will be used to assess the learners' level of achievement in employability skills, including critical thinking, creativity, research and analysis, team working and self-management.

The Teaching and Learning

Through our teaching and learning, we aim to develop course-related employability skills along with knowledge and understanding of academic content, models and theories. *(See details of ICON College Teaching, Learning and Assessment Strategy in the ICON Quality Manual pp 80).*

To achieve these learners:

- Experience a range of delivery/teaching styles that address a diverse range of learning styles
- Become independent learners through taking responsibility for own learning
- Have access to resources on the ICON VLE that will help them
- Receive support that enhances learning.

To support the above, staff will:

- Provide a curriculum that is current, relevant and underpinned by up-to-date research and

- professional practice
- Provide a varied diet of teaching and learning methods.

Teaching Methods

A variety of teaching methods will be utilised as individual learners learn in different ways.

Lecturers will base their teaching on the Five Steps Model developed and indicated in the weekly plan:

- i) **Introduction** (information of the objectives of the session: introduce concept, theories and models)
- ii) **Lectures and delivery method** (session lecturer on specific topic, with learners participating answering questions: task-based learning will be used to develop problem solving skills and to relate theory to practice)
- iii) **Activity** (Group work during breakout sessions based on a case study, reading an article, blog, etc. This will encourage learners to communicate, share ideas and experiences and learn from each other)
- iv) **Reflection and feedback** (from group work: reflection and discussion will encourage application and analysis. This will also enable learners to develop higher level of learning skills of synthesis and evaluation)
- v) **Consolidation and integration** (learners will share their experience and share the summaries of Topic or case study. This will enable the learners to engage in the pursuit of life-long learning)

In addition, Feedback and Tutorial support classes for either groups or individuals will be provided regularly and also by appointment.

Learners will be expected to work independently both at home using the resources available on the ICON VLE and in the College library.

Course Assessment Strategy

A broad range of skills and knowledge are in demand in the computing profession and assessments are tailored to the particular activity being undertaken and to learners learning needs. Assessed activities include the development of working software, the design of computer network systems, the application of theory to practical problems, team work, project work and the communication of problem analysis and solutions through reports and presentations. The assessment of these activities is guided by relevant assessment criteria.

The assessment strategy aims to measure the skill and competence of the individual learner by means of a structured and integrated approach to a defined coursework schedule. The assessment strategy has been devised to reflect the diverse nature of the module content with a balance between those modules assessed through coursework and class tests, and others that are examined during or at the end of the session. A coursework descriptor will be issued with each element of assessment, which will provide details and guidance notes on the specified requirements.

Oral presentations aimed at developing the learner's communication and oratory skills are used at all levels, especially in design and project modules, where the ability to express ideas, concepts and thoughts are required. This addresses modern industry requirements for graduates to be able

to present information confidently. Elements of self- and peer-assessment are used, especially in group design and project activities.

Further details of assessments including types of assessment, word counts for reports, tests and presentation duration will be given in coursework descriptors.

Summative Feedback

Feedback on assessment is given in a variety of ways in order to maximise learners learning opportunities. For written reports or problem-solving tasks, the feedback may be written, while feedback on lab work, presentations and some group work will be given face-to-face. In all cases feedback is given in such a way that learners can learn the most they can from the work that they have done and apply that learning to future activities.

Feedback will be provided in line with the College Assessment Policy which would normally include a provisional grade or mark. This feedback session will enable learners to identify any deficiencies and areas for improvement and further development.

Formative Feedback

Non-mark bearing (formative) assessment also constitutes an important part of the assessment process. Formative assessment includes all the feedback received from tutors and in peer-review sessions. It provides the opportunity to receive constructive feedback on work at various stages of each module. Learners can use this feedback to shape the work being submitted for summative assessment. Level 6, assessments will provide progressively less scaffolding and more space to explore individual interests in ways that individuals determine will be most effective. This is to ensure that learners will be confident in developing independently and pitching their own solutions by the time they graduate.

Assessment Methods: Modular assessment methods reflect the specific Aims and Learning Outcomes. Coursework remain the major method of assessment and are designed to facilitate learning and how learners develop knowledge, along with critical and reflective thinking. Some coursework's may have more than one method used for assessment purposes. The Module Guide provides an explanation on how each module will be assessed. The following are typical assessment methods used in this course:

- CT: Class Test
- TH: Dissertation
- PO: Portfolio
- PP: Presentation of work
- CA: Coursework Assessment
- OT: Other type of assessment
- EX: Exam
- CR: Critical Review

Course Learning Outcomes

Learners who have successfully completed the BSc Computing Top-UP degree would be expected to demonstrate the following Learning Outcomes:

LO Name Level	Level 6
1. Code	Construct reusable and deployable Software systems, with appropriately verified functional coherence.
2. Architect	Refactor software systems in correspondence with relevant theories, practice, and discourse in the computing sector.
3. Solve	Synthesise knowledge of computing to address complex technical challenges.
4. Advocate	Assess the legal, social, ethical, and professional issues in research and development contexts in correspondence with the relevant law, codes of conduct, and theory.
5. Research	Defend an argument that addresses a research question(s), using appropriate primary and secondary sources and academic conventions.
6. Reflect	Plan your post-graduation pathway, with reference to how you will overcome obstacles, and how you will build a personal brand that highlights your professional attributes.
7. Collaborate	Produce work as part of a multidisciplinary team critically appraising practices, approaches, and tools; applying them to enhance development pipelines.
8 Application	Evaluate existing artefacts to identify opportunities, emphasise unique features that would fill a gap, and suggest optimal routes to audiences.
9. Deliver	Produce prototypes based on your own intellectual property that deliver distinguished experiences, justifying how and why it could engage, immerse an audience, and/or lead to innovation.

Assessment Criteria

COMMON ASSESSMENT CRITERIA

	OUTRIGHT FAIL	UNSATISFACTORY	SATISFACTORY	GOOD	VERY GOOD	EXCELLENT	EXCEPTIONAL
Assessment Criteria	0-29%	30-39%*	40-49%	50-59%	60-69%	70-84%	85-100%
1. Research Extent of research and/or own reading, selection of credible sources, application of appropriate referencing conventions	Little or no evidence of reading. Views and findings unsupported and non-authoritative. Referencing conventions largely ignored.	Poor evidence of reading and/or of reliance on inappropriate sources, and/or indiscriminate use of sources. Referencing conventions used inconsistently.	References to a limited range of mostly relevant sources. Some omissions and minor errors. Referencing conventions evident though not always applied consistently.	Inclusion of a range of research-informed literature, including sources retrieved independently. Referencing conventions mostly consistently applied.	Inclusion of a wide range of research-informed literature, including sources retrieved independently. Selection of relevant and credible sources. Very good use of referencing conventions, consistently applied.	A comprehensive range of research informed literature embedded in the work. Excellent selection of relevant and credible sources. High-level referencing skills, consistently applied.	Outstanding knowledge of research-informed literature embedded in the work. Outstanding selection of relevant and credible sources. High-level referencing skills consistently and professionally applied.
2. Knowledge Extent of knowledge and understanding of concepts and underlying principles	Major gaps in knowledge and understanding of material at this level.	Gaps in knowledge, with only superficial understanding. Some	Evidence of basic knowledge and understanding of the relevant concepts	Knowledge is accurate with a good understanding of the field of study.	Knowledge is extensive. Exhibits understanding of the breadth and depth of	Excellent knowledge and understanding of the main concepts and key theories. Clear	Highly detailed knowledge and understanding of the main theories/concepts, and a critical awareness of the ambiguities

associated with the discipline.	Substantial inaccuracies.	significant inaccuracies.	and underlying principles.		established views.	awareness of challenges to established views and the limitations of the knowledge base.	and limitations of knowledge.
3. Analysis Extent of summarising the key findings of internal and external analysis in relation to the marketing of a product or service	Little or no ability to critically engage with and analyse information and formulate reasoned arguments.	Some ability to critically engage with and analyse information and formulate reasoned arguments	Adequate ability to critically engage with and analyse information and formulate reasoned arguments.	A competent ability to critically engage with and analyse information and formulate reasoned arguments.	A very good ability to critically engage with and analyse information and formulate reasoned arguments	An excellent ability to critically engage with and analyse information and formulate reasoned arguments	An outstanding ability to critically engage with and analyse information and formulate reasoned arguments.
4. Application Effective deployment of appropriate methods, materials, tools and techniques; extent of skill demonstrated in the application of concepts to a variety of processes and evidence of innovative ideas.	Limited or no use of methods, materials, tools and/or techniques. Little or no appreciation of the context of the application. Limited innovative and creative ideas	Rudimentary application of methods, materials, tools and/or techniques but without consideration and competence. Flawed appreciation of the context of the application flawed innovative ideas.	An adequate awareness and mostly appropriate application of well established methods, materials, tools and/or techniques. Basic appreciation of the context of the application and basic innovative ideas.	A good and appropriate application of standard methods, materials, tools and/or techniques. Good appreciation of the context of the application, with some use of examples, where relevant and evidence of innovative ideas.	A very good application of a range of methods, materials, tools and/or techniques. Very good consideration of the context of the application, with perceptive use of examples, where relevant. Evidence of some innovation ideas.	An advanced application of a range of methods, materials, tools and/or techniques. The context of the application is well considered, with extensive use of relevant examples. Application and deployment extend beyond established conventions. Innovation evident throughout.	Outstanding levels of application and deployment skills. Assimilation and development of cutting edge processes and techniques and evidence of outstanding innovative ideas
5. Professional Practice Demonstrates attributes expected in professional practice including: individual initiative and collaborative working; deployment of appropriate media to communicate (including written and oral); clarity and effectiveness in presentation and organisation.	Communication media is inappropriate or misapplied. Little or no evidence of autonomy in the completion of tasks. Work is poorly structured and/or largely incoherent.	Media is poorly designed and/or not suitable for the audience. Poor independent or collaborative initiative. Work lacks structure, organisation, and/or coherence	Can communicate in a suitable format but with some room for improvement. Can work as part of a team, but with limited involvement in group activities. Work lacks coherence in places and could be better structured.	Can communicate effectively in a suitable format, but may have minor errors. Can work effectively as part of a team, with clear contribution to group activities. Mostly coherent work and is in a suitable structure.	Can communicate well, confidently and consistently in a suitable format. Can work very well as part of a team, with very good contribution to group activities. Work is coherent and fluent and is well structured and organised.	Can communicate professionally and, confidently in a suitable format. Can work professionally within a team, showing leadership skills as appropriate, managing conflict and meeting obligations. Work is coherent, very fluent and is presented professionally.	Can communicate with an exceptionally high level of professionalism. Can work exceptionally well and professionally within a team, showing advanced leadership skills. Work is exceptionally coherent, very fluent and is presented professionally.
6. Process Recognise the key academic and professional concepts and	Little or no ability to generate ideas, problem solving, concepts,	Some ability to generate ideas, problem solving, concepts,	An adequate ability to generate ideas, problem	Competent ability to generate ideas, problem solving,	Very good ideas generation, problem solving, concepts,	Excellent ideas generation, problem solving, concepts,	Outstanding ideas generation, problem solving, concepts, technical

express relevant technical processes in response set briefs and/or problem-solving context	technical competency and proposals in response to set briefs and/or self-initiated activity	technical competency and proposals in response to set briefs and/or self-initiated activity.	solving, concepts, technical competency and proposals in response to set briefs and/or self-initiated activity	concepts, technical competency and proposals in response to set briefs and/or self-initiated activity.	technical competency and proposals in response to set briefs and/or self-initiated activity	technical competency and proposals in response to set briefs and/or self-initiated activity	competency and proposals in response to set briefs and/or self-initiated activity
7. Industry Identify concepts relating to ethically informed industry practices and their real-world application(s)	Little or no ethically informed real-world experience of industry/business environments and markets.	Some ethically informed, real-world experience of industry/business environments and markets.	An adequate, ethically informed, real-world experience of industry/business environments and markets.	A competent, ethically informed, real-world experience of industry/business environments and markets.	A very good, ethically informed, real-world experience of industry/business environments and markets.	An excellent, ethically informed, real-world experience of industry/business environments and markets.	An outstanding, ethically informed, real-world experience of industry/business environments and markets.
8. Evaluation Extent of evaluation and synthesis of issues and material	Little or no evaluation and synthesis of issues and material	Some evaluation and synthesis of issues and material	Some critical evaluation and synthesis of key issues and material	Critical evaluation and synthesis of complex issues which does not include an original approach	Critical evaluation and synthesis of complex issues and material which includes an original approach	Critical evaluation and synthesis of complex issues and material which includes an original and reflective approach	Critical insightful evaluation and synthesis of complex high level of originality and reflection.

TPA Table

Module Code	Level	Module Name	Credits	Study Block	Compulsory (C) or Option (O)	Assessment Methods*	Contributing towards the Learning Outcomes* (Taught (T), Practised (P) and/or Assessed (A))								
							1	2	3	4	5	6	7	8	9
Level 6															
COMP 610	6	Computing Project	40	1,2	C	TH, PP	TPA		TPA	TPA	TPA			TPA	TPA
COMP 620	6	Network Infrastructure & Design	20	1	C	CA, OT	TPA		TPA		TPA	TPA			TPA
COMP 630	6	Network Security	20	1	C	CA, OT			TPA		TPA	TPA		TPA	TPA
COMP 640	6	Big Data Analytics	20	1	C	CA, CT, PP			TPA	TPA	TPA			TPA	
COMP 650	6	Mobile Applications Development	20	1	C	CA, CT, OT	TPA	TPA	TPA				TPA		
COMP 660	6	Internet of Things (IoT)	20	2	C	CA, CT, PP	TPA	TPA					TPA		TPA
COMP 670	6	Machine Learning and Artificial Intelligence	20	2	C	CA, CT, PP	TPA		TPA			TPA			TPA

Assessment Method	
CT	Class Test
TH	Thesis and Dissertation
PP	Presentation
OT	Other type of assessment
CA	Coursework Assessment
EX	Exam
PO	Portfolio
CR	Critical review

Learning Outcomes
1. Code
2. Architect

3. Solve
4. Advocate
5. Research
6. Reflect
7. Collaborate
8. Application
9. Deliver

Degree classification

The classification of the degree shall be determined in accordance to the following criteria:

First Class (1):

- Learners achieving an overall mean score of 70% or above.
- Learners achieving an overall mean score of between 68% and 70% with at least 60 Level 6 credits at above 70% with the approval of the Assessment Board.

Upper Second Class (2:1):

- Learners achieving an overall mean score of between 60% and 69%.
- Learners achieving an overall mean score of between 58% and 60% with at least 80 Level 6 credits at above 60% with the approval of the Assessment Board.

Lower Second Class (2:2):

- Learners achieving an overall mean score of between 50% and 59%.
- Learners achieving an overall mean score of between 48% and 50% with at least 80 Level 6 credits at above 50% with the approval of the Assessment Board.

Third Class (3):

- Learners achieving an overall mean score of between 40% and 49%.

Assessment Regulations

Learners submit coursework through the ICON VLE where a check for plagiarism is made and feedback from the tutor is provided. A learner will not be able to submit their coursework if their attendance is too low and not in line with College attendance policy.

Coursework submitted after the final submission deadline, and within one week of the deadline, will be capped at 40% (Pass) unless extenuating circumstances apply. Any coursework submitted later than two weeks after the deadline (week one being final submission and week two, the following week, being the late submission window) will not be accepted. A learner should then follow the relevant submission and resubmission process.

Where circumstances beyond a learner's control impact negatively on an assessment opportunity, a learner may submit a claim for exceptional extenuating circumstances and their work will be not be capped at Pass if it is accepted.

A learner who, for the first assessment opportunity and resubmission opportunity, still fails to pass the module will be allowed to repeat the module. The module will be capped at Pass and can be repeated only once.

For further information on Assessment regulations, please refer to the Student Handbook. For further information on Assessment regulations regarding submission, resubmission and repetition of the module, please refer to the Student Handbook.

Student Support

The College assigns every learner a designated Personal Tutor who is available by appointment throughout the academic year. The Personal Tutor is the first contact point at the College who will act as a mentor, and guide learners who encounter non-academic problems, e.g. financial hardship, accommodation matters, learning disabilities and so on. All Personal Tutors will be expected to have online meetings with each of their tutees at least once a semester.

The aims of the Personal Tutoring System are:

- To ensure a learner has someone who provides general advice and can point him/her in the direction of other resources in place to support the learner;
- To ensure a learner has someone who will support their academic progression and identify any problems;
- To ensure that a learner has a named person to whom they can go for support.

The College has a Hardship Fund intended to provide support to all learners who are experiencing exceptional financial difficulty during their studies.

The College provides pastoral care and counselling through a Private Therapy Clinic (an external healthcare company). A Student Career and Welfare Officer is available for published hours each week (including Saturdays) to provide counselling and welfare advice to ensure equality of access to provision.

The College has two members of staff, including the College Student Career and Welfare Officer, to provide advice regarding academic transition and progression following Course completion. The members of staff publish their availability on a noticeboard outside their office detailing the times each week they are available to provide this advice, including in the evening.

The College is committed to providing equality of access to education to all learners through disability support services. The Student Career and Welfare Officer is responsible for liaising with the learner and the relevant staff to implement all reasonable measures.

Evaluation and Revision

The Assessment Board receives and evaluates the external examiner's reports every year and evaluates the standard achieved by the learners and the quality of the provision of their work. They then produce a report for submission to the Academic Board.

The College also gives formative feedback on coursework to learners through an online Formative Feedback Forum.

The internal moderator checks a range of assessment decisions for all assessors and modules by sampling some of the coursework. In the event of unexpected assessment decisions, e.g. a preponderance of First-Class grades in the coursework, additional sampling will be conducted on individual modules/assessors.

The Academic Board has the responsibility to oversee the management of academic standards and quality of teaching and learning for all Courses and to ensure that the requirements of the College are fulfilled.

Further Information

See the ICON College website <https://www.iconcollege.ac.uk> for more information about the BSc (Hons) Computing .

Course Handbook in PDF

[Download Course Handbook in PDF](#)

General Module Information

Status	Draft
Module Name	Computing Project
Module Code	COMP 610
Credit Value	40
Level and Study Block	Level 6, Study Block 1 & 2
Pre-requisites	
Names Module Leader	Y Meressi

Module Aim

The aim of this module is to equip learners with research, management, design and implementation of a substantial project geared towards the production of a market-viable IT solution/IT product independently. Learners will demonstrate the application of engineering methods and techniques in the process of a development lifecycle from requirements analysis, design, implementation, testing, deployment and evaluation of the final solution.

Summary Module Description

This module is the culmination of the theoretical knowledge, research and practical skills gained throughout the undergraduate study. It encourages independent and self-directed learning where the learner is required to identify, evaluate, synthesise and apply effectively the knowledge and skills gained from the other modules into creating IT products and solutions.

Under a supervision of experts, learners will work on a major computing project focussing on delivering a realistic product or a technical solution with appropriate delivery milestones and by following relevant development methodologies. The project topic areas will vary but at the core of this module is academic creativity and an opportunity to specialise in a topic area or technology though the exploration of individual intellectual interests. Through this experience, the learner will emerge with expert knowledge of the subject areas and technologies engaged.

On completion of this module, the project deliverable should be a market-viable and complete solution that demonstrates creativity, individual contribution and academic professionalism.

Note: This module will be offered in two semesters (part 1 and part 2) and will be assessed at the end of semester 2.

Module-Specific Employability Skills

- Innovation
- Creativity
- Research and analysis
- Project management
- Logical thinking
- Critical thinking
- Problem-solving
- Communication
- Self-management
- Evaluation and reflection

Learning Outcomes

LO #	Learning Outcome Name	Learning Outcome Description	Assessment Criteria Category
1	Code	Construct reusable and deployable software systems, with appropriately verified functional coherence.	Process
2	Architect	Refactor software systems in correspondence with relevant theories, practice, and discourse in the computing sector.	None
3	Solve	Synthesise knowledge of computing to address complex technical challenges.	Analysis
4	Advocate	Assess the legal, social, ethical, and professional issues in research and development contexts in correspondence with the relevant law, codes of conduct, and theory.	Professional Practice
5	Research	Defend an argument that addresses a research question(s), using appropriate primary and secondary sources and academic conventions.	Research
6	Reflect	Plan your post-graduation pathway, with reference to how you will overcome obstacles, and how you will build a personal brand that highlights your professional attributes.	None
7	Collaborate	Produce work as part of a multidisciplinary team critically appraising practices, approaches, and tools; applying them to enhance development pipelines.	None
8	Application	Evaluate existing artefacts to identify opportunities, emphasise unique features that would fill a gap, and suggest optimal routes to audiences.	Evaluate
9	Deliver	Produce prototypes based on your own intellectual property that deliver distinguished experiences, justifying how and why it could engage, immerse an audience, and/or lead to innovation.	Industry

Assessment Methods

Assessment Method	Description of Assessment Method	%	Learning Outcomes Assessed	Compulsory or Compensable
TH	Dissertation	70	1, 3, 5, 8 & 9	Compulsory
PP	Presentation of work	30	1, 3, 4	Compulsory

The following codes for assessment methods apply

TH	Thesis & Dissertation
PP	Presentation of Work

Assessment Criteria

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Modes of delivery

Module Target Learner Hours: 400	
Activity	Hours
Lecture	10
Project supervision	30
Practical sessions	30
Tutorial	18
Supervised time in workshop	65
Independent learning hours:	247

Indicative list of resources

Key Text:

Tahir Ahmed, Julian Cox, Lynda Girvan, Alan Paul, Debra Paul, Peter Thompson, James Cadle, 2014. *Developing Information Systems: Practical Guidance for IT Professionals*.

Steve Skidmore, Malcom Eva, 2003. *Introducing Systems Development*.

Jeremy Savell, 2019. *Agile Project Management: A Beginner's Guide to Agile Implementation and Leadership*.

Joshua Boyde, 2014. *A Down-To-Earth Guide To SDLC Project Management: Getting your*

system /software development life cycle project successfully across the line using PMBOK adaptively.

Costley, C., Elliot, G. and Gibbs, P. 2010. *Doing Work Based Research: Approaches to Enquiry for Insider-researchers*. London: SAGE Publications Ltd.

Gray, D. 2009. *Doing Research in the Real World. 2nd Ed*. London: SAGE Publications Ltd.

Dawson, C. 2016. *Projects in Computing and Information Systems: A Student's Guide. 2nd ed*. London: Pearson Education.

Dow, C., 2018. *Internet of Things Programming Projects: Build Modern IoT Solutions with the Raspberry Pi 3 and Python*, Birmingham: Packt Publishing.

Shovic, J. C., 2016. *Raspberry Pi IoT Projects: Prototyping Experiments for Makers*, Washington: Liberty Lake.

Kurniawan, A., 2019. *Internet of Things Projects with ESP32*. Birmingham: Packt Publishing.

Websites:

<https://www.scrum.org/resources/what-is-scrum>

<https://www.projectsart.co.uk/9-steps-to-a-hassle-free-and-effective-software-development-project.php>

<https://plan.io/blog/software-development-process/>

<https://relevant.software/blog/7-steps-for-effective-software-product-development-2018/>

Named Awards

Course	Compulsory
BSc(Hons) Computing Top-Up	Compulsory

General Module Information

Status	Draft
Module Name	Network Infrastructure and Design
Module Code	COMP 620
Credit Value	20
Level and Study block	6, Study Block 1
Pre-requisites	Data Communication & Networks
Named Module Leader	M. J. Hasan

Module Aim

This module will equip learners to engage in a practical aspect of network infrastructure, enterprise network modelling and design principles, including analysing business needs and technical requirements and also evaluate alternative network design methods and techniques in order to plan, design and test a local or wide area network.

Summary Module Description

In this model, learners will be exposed to the introduction to network design, network design module, IP addressing, three-layer design model, enterprise architecture design model, features of hierarchical networks (redundancy, hierarchy, scalability, availability, reliability), analyse and evaluate business technical requirements, the importance of wireless network; Network features - bandwidth, delay, load balancing, redundancy, spanning tree concepts, Spanning Tree Protocols, link aggregation concepts and operations, bandwidth aggregation; network technology - selecting network devices, modularity, multi-layer switching and router, IP telephony, IPTV, Internet of Thing (IoT), network simulation, wireless devices and VLAN.

Learners will gain knowledge in network protocol and configuration - allocation of IP addresses subnetting, DHCP, NAT/PAT, IPv4/IPv6, and protocol suited to enhance the performance and scalability of network, VTP, IEEE802.1q etc.; site networks - network planning: peer-to-peer, client-server, intranets, extranets, network resilience; Network device selection -NICs, switches, routers, firewalls. selecting network devices, use of modularity, stackability, port density.

The module will also cover network implementation and configuration - configuring VLAN, device configuration, Layer 2 LAN redundancy: configuration of different Spanning Tree Protocols, First Hop Redundancy Protocols (FHRP), Hot Standby Routing Protocol (HSRP), EtherChannel technology; WAN technologies including PPP, ATM, Frame-Relay, VPN, configuring WAN network based on specific enterprise requirements; network troubleshooting - network baselines, troubleshooting methods, information gathering, network support and documentation.

On completion of this module, learners will be able to apply network design principles in the design and implementation of redundant networks (small/medium business) including configuration and documentation and evaluate wide area network (WAN) technologies and make choices based on specific enterprise requirements.

Module-Specific Employability Skills

- Creative thinking skills
- Analysing facts and figures
- Assessing processes
- Creating and implementing solutions
- Research & Analysis
- Problem solving
- Advanced Engineering
- Applying appropriate tools in preparing technical documents

Learning Outcomes

LO #	Learning Outcome Name	Learning Outcome Description	Assessment Criteria Category
1	Code	Construct reusable and deployable Software systems, with appropriately verified functional coherence.	Knowledge
2	Architect	Refactor software systems in correspondence with relevant theories, practice, and discourse in the computing sector.	None
3	Solve	Synthesise knowledge of computing to address complex technical challenges.	Application
4	Advocate	Assess the legal, social, ethical, and professional issues in research and development contexts in correspondence with the relevant law, codes of conduct, and theory.	None
5	Research	Defend an argument that addresses a research question(s), using appropriate primary and secondary sources and academic conventions.	Evaluate
6	Reflect	Plan your post-graduation pathway, with reference to how you will overcome obstacles, and how you will build a personal brand that highlights your professional attributes.	Industry
7	Collaborate	Produce work as part of a multidisciplinary team critically appraising practices, approaches, and tools; applying them to enhance development pipelines.	None
8	Application	Evaluate existing artefacts to identify opportunities, emphasise unique features that would fill a gap, and suggest optimal routes to audiences.	None
9	Deliver	Produce prototypes based on your own intellectual property that deliver distinguished experiences, justifying how and why it could engage, immerse an audience, and/or lead to innovation.	Professional Practice

Assessment Methods

Assessment Method	Description of Assessment Method	%	Learning Outcomes Assessed	Compulsory or Compensable
CA	Coursework	60	1,3,5, 6 & 9	Compulsory
OT	Demonstration of work	20	9	Compulsory

The following codes for assessment methods apply	
CA	Coursework Assessment
CB	Class Test
OT	Other type of assessment

Assessment Criteria

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Modes of delivery

Module Target Learner Hours: 200	
Activity	Hours
Demonstration	1
Lecture	12
Practical classes and workshops	15
Seminar	12
Tutorial	8
Independent learning hours:	152

Indicative list of resources

Meyers, M. (2015) *CompTIA Network+ Guide to Managing and Troubleshooting Networks*, Fourth Edition. London: McGraw Hill Professional.

Subramanian, M. (2012) *Network Management: Principles and Practices*. A: Prentice Hall.

Thomatis, M. (2015) *Network Design Cookbook: Architecting Cisco Networks*. UA: Lulu Press, Inc.

White, R. and Donohue, D. (2014). *The Art of Network Architecture: Business-Driven Design*.
UA: Cisco Press.

Named Awards

Course	Compulsory
BSc(Hons) Computing Top-Up	Compulsory

General Module Information

Status	Draft
Module Name	Network Security
Module Code	COMP 630
Credit Value	20
Level and Study block	Level 6 , Study Block 1
Pre-requisites	Data Communications and Security
Named Module Leader	M. J. Hasan

Module Aim

The aim of this module is to develop and equip learners to meet the IT industry ever challenging demands and requirements for network security, providing a solid theoretical and practical foundation enabling learners to assess and apply different principles, tools and techniques to protect and secure both physical and logical networks.

Summary Module Description

Network security is maintained by the ability to secure the confidentiality, integrity and availability of network infrastructure. This module will introduce learners to enterprise network security modelling and design principles. Learners will be expected to build on experience in configuring routers, switches, and firewalls including network monitoring devices and the ability to evaluate alternative network security design methods and techniques in order to plan, design and test a local or wide area network.

In this model, learners will gain knowledge of introductory network concepts, introductory network security concepts, principles of network security; network security threats, operations, physical and environmental security, network infrastructure and devices, threats and type of threats, identify risks, threats, vulnerabilities and countermeasures, differentiate between security policies, standards and guidelines; network security considerations - network security issues, their impacts and solutions, physical security, servers and servers placements, hardware, environmental electrical and maintenance threats, issues with different unsecured protocol, DHCP, SMTP; physical security and devices related: biometric technologies, CCTV, IoT. Sensors etc..

The module will also cover network security devices and protocols - secure protocols and VPNs: IPSec, Firewalls : Packet Filters (ACLs), stateful, stateless, bastion host, application gateway, DMZ, host-based firewall, network address translation (NAT), Routers, Switches, Port security, security policy. designing demilitarised zone (DMZ); Security and hardening devices: configuration of secure router, the importance of AAA, standard and extended ACLs, functions and operations of IDS and IPS systems; confidentiality - cryptography encryption algorithms, DES, 3DES, AES, PKI standards.

In addition, it will also cover, network security implementation and configuration - configuring VLAN, device configuration; Layer 2 LAN redundancy - configuration of different spanning tree protocols, first hop redundancy protocols (FHRP), hot standby routing protocol (HSRP),

EtherChannel technology, Demilitarised zone; managing and monitoring secured network - the use of system development life cycle (SDLC), intrusion detection systems, Internet of Things as a helper; network troubleshooting - network baselines, troubleshooting methods, information gathering, network support and documentation, network traffic filtering and monitoring.

On completion of this module, learners will be equipped with the knowledge and understanding of network security and the ability to secure small/medium network infrastructure, physical and logical security, including new and evolving technology such as IoT.

Module-Specific Employability Skills

- Creative thinking skills
- Analysing facts and figures
- Assessing processes
- Creating and implementing solutions
- Research & Analysis
- Problem solving
- Advanced Engineering
- Critical thinking

Learning Outcomes

LO #	Learning Outcome Name	Learning Outcome Description	Assessment Criteria Category
1	Code	Construct reusable and deployable Software systems, with appropriately verified functional coherence.	None
2	Architect	Refactor software systems in correspondence with relevant theories, practice, and discourse in the computing sector.	None
3	Solve	Synthesise knowledge of computing to address complex technical challenges.	Application
4	Advocate	Assess the legal, social, ethical, and professional issues in research and development contexts in correspondence with the relevant law, codes of conduct, and theory.	None
5	Research	Defend an argument that addresses a research question(s), using appropriate primary and secondary sources and academic conventions.	Evaluate
6	Reflect	Plan your post-graduation pathway, with reference to how you will overcome obstacles, and how you will build a personal brand that highlights your professional attributes.	Industry
7	Collaborate	Produce work as part of a multidisciplinary team critically appraising practices, approaches, and tools; applying them to enhance development pipelines.	None
8	Application	Evaluate existing artefacts to identify opportunities, emphasise unique features that would fill a gap, and suggest optimal routes to audiences.	Analysis

9	Deliver	Produce prototypes based on your own intellectual property that deliver distinguished experiences, justifying how and why it could engage, immerse an audience, and/or lead to innovation.	Professional Practice
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Assessment Methods

Assessment Method	Description of Assessment Method	%	Learning Outcomes Assessed	Compulsory or Compensable
CA	Coursework	60	3,5,6,8 & 9	Compulsory
OT	Demonstration of work	20	8	Compulsory

The following codes for assessment methods apply	
CA	Coursework Assessment
OT	Other type of assessment

Assessment Criteria

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Modes of delivery

Module Target Learner Hours: 200	
Activity	Hours
Demonstration	2
Lecture	12
Practical classes and workshops	15
Seminar	12
Tutorial	8
Independent learning hours:	151

Indicative list of resources

Bhaji Y. (2008). *Network Security Technologies and Solutions: CCIE Professional Development*. UA: Cisco Press

Clem A., (2006). *Network Management Fundamentals*. Cisco Press

Meyers, M. (2015). *CompTIA Network+ Guide to Managing and Troubleshooting Networks*, Fourth Edition. London: McGraw Hill Professional.

Stallings W. (2008). *Network Security Essentials: Applications and Standards*. Pearson

Subramanian, M. (2012). *Network Management: Principles and Practices*. UA: Prentice Hall.

Thomatis, M. (2015). *Network Design Cookbook: Architecting Cisco Networks*. UA: Lulu Press, Inc.

White G et al (2009) *CompTIA Security+ All-in-One Exam Guide*, Second Edition. McGraw Hill

White, R. and Donohue, D. (2014). *The Art of Network Architecture: Business-Driven Design*. UA: Cisco Press.

Named Awards

Course	Compulsory
BSc(Hons) Computing Top-Up	Compulsory

General Module Information

Status	Draft
Module Name	Big Data Analytics
Module Code	COMP 640
Credit Value	20
Level and Study Block	Level 6, Study Block 1
Pre-requisites	Microsoft Excel and Programming
Named Module Leader	Ifeoluwa Agboola

Module Aim

The aim of the module is to enable the learner to gain extensive, detailed knowledge and understanding of big data management principles and technological practices. Learners will understand how to create, extend models and trends to support decision making with a view to explaining, interpreting and synthesising knowledge from big data.

Summary Module Description

In this module, the learner will analyse large data sets and identify patterns that will improve any company's and organisation's decision-making process using data analytical programming languages, common algorithms, data mining frameworks and software to make sense of large amounts of data, which are applicable to most business and management problems.

The module offers extensive training in big data technology and methods, providing extensive insights in areas such as data mining, NoSQL databases, text analytics techniques and leveraging cloud computing platforms for big data analytics.

Through the medium of lectures and seminars the key concepts and technologies are introduced and illustrated. Real-world business data sets are analysed in the seminar sessions by applying the techniques learned from the lectures. In the workshops, learners will have the opportunity to collaborate as well as work independently analysing big data sets. Tutorials will provide learners with opportunities to review what they have learned and discuss the material through group tasks and exercises.

On completion of this module, learners will have a broad knowledge and practical skills with regard to big data, big data technologies, platforms and tools to visualise and interpret complex data sets.

Module-Specific Employability Skills

- Analytical and Logical thinking
- Team working
- Problem solving
- Project management
- Written and verbal communication
- Data visualization

Learning Outcomes

LO #	Learning Outcome Name	Learning Outcome Description	Assessment Criteria Category
1	Code	Construct reusable and deployable software/hardware systems, with appropriately verified functional coherence.	None
2	Architect	Refactor software/hardware systems in correspondence with relevant theories, practice, and discourse in the computing sector.	None
3	Solve	Synthesise knowledge of computing to address complex technical challenges.	Knowledge
4	Advocate	Assess the legal, social, ethical, and professional issues in research and development contexts in correspondence with the relevant law, codes of conduct, and theory.	Industry
5	Research	Defend an argument that addresses a research question(s), using appropriate primary and secondary sources and academic conventions.	Research
6	Reflect	Plan your post-graduation pathway, with reference to how you will overcome obstacles, and how you will build a personal brand that highlights your professional attributes.	None
7	Collaborate	Produce work as part of a multidisciplinary team critically appraising practices, approaches, and tools; applying them to enhance development pipelines.	None
8	Application	Evaluate existing artefacts to identify opportunities, emphasise unique features that would fill a gap, and suggest optimal routes to audiences.	Analysis
9	Deliver	Produce prototypes based on your own intellectual property that deliver distinguished experiences, justifying how and why it could engage, immerse an audience, and/or lead to innovation.	None

Assessment Methods

Assessment Method	Description of Assessment Method	%	Learning Outcomes Assessed	Compulsory or Compensable
CA	Coursework	60	3, 5	Compulsory
CT	Class Test(s)	20	8	Compulsory
PP	Presentation of work	20	4	Compulsory

The following codes for assessment methods apply	
CA	Coursework Assessment
CT	Class Test
PP	Presentation of Work

Assessment Criteria

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Modes of delivery

Module Target Learner Hours: 200	
Activity	Hours
Lecture	12
Practical classes and workshops	18
Seminar	10
Tutorial	10
Independent Learning Hours:	150

Indicative list of resources

Key Texts:

ANAND Rajaraman and JEFFREY D. Ullman 2011. *Mining of Massive Datasets*. 12th Edition. Cambridge University Press. ISBN: 1107015359 (ISBN13: 9781107015357)

ALEXANDER Loth. 2019. *Visual Analytics with Tableau*. John Wiley & Sons. ISBN-10: 1119560209

DONALD Miner and ADAM Shook 2012. *MapReduce Design Patterns: Building Effective Algorithms and Analytics for Hadoop and Other Systems*. 4th Edition. ISBN:1449327176 (ISBN13: 9781449327170)

HOLDEN Karau, ANDY Konwinski, WENDELL Patrick and ZAHARIA Matei 2015. *Learning Spark: Lightning-Fast Big Data Analysis*. 10th Edition. ISBN: 1449359051.

JOSHUA N. Milligan. 2016. *Learning Tableau 10: Business Intelligence and data visualization that brings your business into focus*, 2nd Edition. Packt Publishing. ISBN-13: 978-1786466358.

KONNOR Cluster 2019. *Machine Learning for Beginners: A Math Free Introduction for Business and Individuals to Machine Learning, Big Data, Data Science, and Neural Networks*. ISBN: 978-1691462902

PRABHU C.S.R., ANEESH Sreevallabh Chivukula, ADITYA Mogadala, ROHIT Ghosh 2019. *Big Data Analytics. Systems, Algorithms, Applications*.

TABLEAU 2019: *Tools for Business Intelligence*, Packt Publishing. ISBN-10: 1788839528.

LIAM Damien 2019. *Data Analytics. A Comprehensive Beginner's Guide to Learn the Realms of Data Analytics*.

NATHAN Marz and JAMES Warren. 2015. *Big data: principles and best practices of scalable real-time data systems* ISBN-10: 1292097612

PETER Ghavami 2019. *Big Data Analytics Methods. Analytics Techniques in Data Mining, Deep Learning and Natural Language Processing*.

RYAN Sleeper. 2018. *Practical Tableau*. 1st Edition. O'Reilly. ISBN-10: 1491977310

THOMAS H. Davenport 2014. *Big Data at Work: Dispelling the Myths, Uncovering the Opportunities*. Harvard Business Review Press.

VIGNESH Prajapati. 2013. *Big Data Analytics with R and Hadoop*. ISBN-10: 1292025824 • ISBN-13: 9781292025827

Journals

- Communications of the ACM
- Decision Sciences
- Information Systems Research
- Decision Support Systems
- ACM Trans. on Database Systems
- Computing

Databases

- Business Source Premier
- Science Direct
- Wiley

Indicative Web Sites:

Lynda

<https://www.lynda.com/Hadoop-tutorials/Big-Data-Analytics-Hadoop-Apache-Spark/2813260-2.html>

<https://www.lynda.com/Data-Science-tutorials/Data-Visualization-Storytelling-Information-Design/664825-2.html>

<https://www.lynda.com/course-tutorials/Data-Visualization-Data-Analysis-Analytics/2825746-2.html>

Tutorials Point

https://www.tutorialspoint.com/big_data_analytics/introduction_to_sql.htm

https://www.tutorialspoint.com/hadoop/hadoop_big_data_overview.htm

https://www.tutorialspoint.com/big_data_analytics/big_data_analytics_pdf_version.htm

https://www.tutorialspoint.com/big_data_analytics/index.htm

W3Schools

<https://w3points.com/what-is-big-data/>

<https://www.w3schools.in/hadoop-tutorial/what-is-big-data/>

<https://www.w3schools.in/category/hadoop-tutorial/>

Named Awards

Course	Compulsory
BSc(Hons) Computing Top-Up	Compulsory

General Module Information

Status	Draft
Module Name	Mobile Application Development
Module Code	COMP 650
Credit Value	20
Level and Study block	Level 6, Study Block 1
Pre-requisites	Object oriented analysis, design and implementation.
Named Module Leader	Y Meressi

Module Aim

The aim of the module is to enable learners to gain the knowledge and the skills required to design, implement, test and deploy cross-platform mobile applications. Learners will gain an understanding of technologies involved and the programming skills by focusing on issues and techniques specific to the delivery of content and applications for mobile platforms as well as the considerations they must make when developing applications for constrained platforms.

Summary Module Description

This module enables learners to understand and gain the skills required to develop cross-platform mobile applications utilising modern development tools and technologies. Learners will learn and apply appropriate design patterns (e.g. MVVM) for developing native and web-based mobile applications while considering the user experience and device capabilities.

The module will address the current trends in mobile application development: native, web-based and the hybrid approaches. This will equip learners with the skills and understanding required to make informed decisions on mobile development techniques, tools and technologies in order to meet specific business requirements.

Through lectures and seminars, key concepts and technologies are introduced and illustrated. In lab sessions and workshops, learners will work across all the stages of the software development lifecycle to solve real-world business problems by applying the techniques learned from the lectures and seminars. In the workshops, learners will have the opportunity to collaborate as well as work independently while developing non-trivial mobile applications. Tutorials will provide learners with opportunities to review what they have learned and discuss the material through group tasks and exercises.

On completion of this module, learners will gain the knowledge and the practical skills required to develop cross-platform mobile applications. They will have a broad understanding of mobile application development, its terminology, the tools and technologies required to design, implement, test and deploy mobile applications.

Module-Specific Employability Skills

- Logical thinking
- Problem-solving
- Collaborative working
- Research and Analysis
- Communication
- Self-management
- Project management

Learning Outcomes

LO #	Learning Outcome Name	Learning Outcome Description	Assessment Criteria Category
1	Code	Construct reusable and deployable software systems, with appropriately verified functional coherence.	Process
2	Architect	Refactor software systems in correspondence with relevant theories, practice, and discourse in the computing sector.	Analysis
3	Solve	Synthesise knowledge of computing to address complex technical challenges.	Knowledge
4	Advocate	Assess the legal, social, ethical, and professional issues in research and development contexts in correspondence with the relevant law, codes of conduct, and theory.	None
5	Research	Defend an argument that addresses a research question(s), using appropriate primary and secondary sources and academic conventions.	None
6	Reflect	Plan your post-graduation pathway, with reference to how you will overcome obstacles, and how you will build a personal brand that highlights your professional attributes.	None
7	Collaborate	Produce work as part of a multidisciplinary team critically appraising practices, approaches, and tools; applying them to enhance development pipelines.	Application
8	Application	Evaluate existing artefacts to identify opportunities, emphasise unique features that would fill a gap, and suggest optimal routes to audiences.	None
9	Deliver	Produce prototypes based on your own intellectual property that deliver distinguished experiences, justifying how and why it could engage, immerse an audience, and/or lead to innovation.	None

Assessment Methods

Assessment Method	Description of Assessment Method	%	Learning Outcomes Assessed	Compulsory or Compensable
CA	Coursework	60	1, 2	Compulsory

CT	Class Test(s)	20	3	Compulsory
OT	Demonstration of work	20	1, 7	Compulsory

The following codes for assessment methods apply	
CA	Individual Report
CT	Computer Based
OR	Other type of assessment

Assessment Criteria

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Modes of delivery

Module Target Learner Hours: 200	
Activity	Hours
Demonstration	2
Lecture	12
Practical classes and workshops	16
Seminar	10
Tutorial	10
Independent learning hours:	150

Indicative list of resources

Key Text:

Burton, Michael, 2015. Android App Development FD 3e (For Dummies).

FEILER, Jesse, 2014. iOS App Development For Dummies Paperback.

HORTON, John, 2018. Android Programming for Beginners: Build in-depth, full-featured Android 9 Pie apps starting from zero programming experience, 2nd Edition.

HORTON, John, 2019. Android Programming with Kotlin for Beginners: Build Android apps starting from zero programming experience with the new Kotlin programming language.

SNIDER, Ed, 2019. Mastering Xamarin.Forms: App architecture techniques for building multi-platform, native mobile apps with Xamarin.Forms 4, 3rd Edition Paperback.

KARLSSON, Johan, HINDRIKES, Daniel, 2018. Xamarin.Forms Projects: Build seven real-world cross-platform mobile apps with C# and Xamarin.Forms.

BIESSEK, Alessandro, 2019. Flutter for Beginners: An introductory guide to building cross-platform mobile applications with Flutter and Dart 2.

Websites:

<https://kotlinlang.org/docs/reference/>

<https://dotnet.microsoft.com/apps/xamarin>

<https://phonegap.com/>

<https://cordova.apache.org/>

<https://flutter.dev/>

Named Awards

Course	Compulsory
BSc(Hons) Computing Top-Up	Compulsory

General Module Information

Status	Draft
Module Name	Internet of Things
Module Code	COMP 660
Credit Value	20
Level and Study Block	Level 6, Study Block 2
Pre-requisites	Engineering and Hardware Basics
Named Module Leader	Ifeoluwa Agboola

Module Aim

The aim of the module is to equip learners with the knowledge and skills required for the design and development of the Internet of Things (IoT) systems, including its architecture, applications, technologies on each layer, and IoT-specific data processing and analytics frameworks including cloud technologies.

Summary Module Description

The module provides an insight into technological advances involving embedding uniquely identifiable computing devices within an internet infrastructure focusing on key technologies to develop an IoT system. Learners will implement and develop IoT systems (generally involving physical devices such as microcontrollers, other transmitting sensors) as well as the use of the simulation software and cloud technology platforms.

In addition, learners will gain the ability to engineer a range of interconnected physical devices and the ability to communicate with each other, embedding these things into larger diverse systems and architectures and intelligently analyse the data generated through the use of the IoT applications for enhanced business decision making.

A wide range of topics are covered including IoT components and architecture; sensors and sensing technology; data transmission and connectivity; IoT cloud platforms; IoT specific data processing and analytics; data models and semantics; applications of IoT including smart cities, smart homes; ongoing and future IoT challenges.

The module will be taught through lectures, problem-solving, coursework and practical sessions. Lectures are used to introduce principles and methods and also to illustrate how they can be applied in practice. Practical sessions and lab sessions will provide learners with guidance and help while developing real case scenario IoT applications allowing them to convert what has been learned in the lecture and seminar sessions into hands-on-practical work.

On completion of this module, learners will be able to gain skills in problem solving and to gain practical experience needed for career as an IoT Engineer, Product Designer, Industrial Engineer, IoT Product Manager and Developer.

Module-Specific Employability Skills

- Problem solving
- Research
- Analytical
- Advanced Engineering
- Project management
- Time Management
- Critical thinking
- Programming
- Creativity
- Teamworking skills.

Learning Outcomes

LO #	Learning Outcome Name	Learning Outcome Description	Assessment Criteria Category
1	Code	Construct reusable and deployable software/hardware systems, with appropriately verified functional coherence.	Application
2	Architect	Refactor software/hardware systems in correspondence with relevant theories, practice, and discourse in the computing sector.	Knowledge
3	Solve	Synthesise knowledge of computing to address complex technical challenges.	None
4	Advocate	Assess the legal, social, ethical, and professional issues in research and development contexts in correspondence with the relevant law, codes of conduct, and theory.	None
5	Research	Defend an argument that addresses a research question(s), using appropriate primary and secondary sources and academic conventions.	None
6	Reflect	Plan your post-graduation pathway, with reference to how you will overcome obstacles, and how you will build a personal brand that highlights your professional attributes.	None
7	Collaborate	Produce work as part of a multidisciplinary team critically appraising practices, approaches, and tools; applying them to enhance development pipelines.	Industry
8	Application	Evaluate existing artefacts to identify opportunities, emphasise unique features that would fill a gap, and suggest optimal routes to audiences.	None
9	Deliver	Produce prototypes based on your own intellectual property that deliver distinguished experiences, justifying how and why	Professional Practice

		it could engage, immerse an audience, and/or lead to innovation.	
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Assessment Methods

Assessment Method	Description of Assessment Method	%	Learning Outcomes Assessed	Compulsory or Compensable
CA	Coursework	60	1, 2	Compulsory
CT	Class Test(s)	20	2	Compulsory
PP	Presentation	20	7, 9	Compulsory

The following codes for assessment methods apply	
RE	Coursework Assessment
CB	Class Test
PP	Presentation of Work

Assessment Criteria

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Modes of delivery

Module Target Learner Hours: 200	
Activity	Hours
Lecture	12
Practical classes and workshops	16
Seminar	10
Tutorial	10
Independent learning hours:	152

Indicative list of resources

Essential Texts

ARSHDEEP Bahga and VIJAY Madiseti, (2015). *Internet of Everything: A Hands-on Approach*.

ALESSANDRO Bassi, MARTIN Bauer, FIEDLER Martin, THORSTEN Kramp, ROBERT VAN Kranenburg, SEBASTIAN Lange, MEISSNER Stefan (2013). *Enabling Things to Talk*

- *Designing IoE solutions with the IoE Architectural Reference Model* (open access springer)

MILENKOVIC Milan 2020. *Internet of Things: Concepts and System Design*. Springer. ISBN 978-3-030-41346-0

NEERAJ Kumar, AAISHA Makkar. 2020. *Machine Learning in Cognitive IoT*. 1st Edition. CRC Press. ISBN 9780367359164.

OVIDIU Vermesan and FRIESS Peter 2013. *Internet of Everything: Converging Technologies for Smart Environments and Integrated Ecosystems* (River Publishers' Series in Information Science and Technology).

POSLAD S. 2009. *Ubiquitous Computing: Smart Devices, Environments and Interactions*. Wiley, ISBN: 978-0-470-03560-3, pp. 26.

RAJKUMAR Buyya, AMIR Vahid Dastjerdi 2016. *Internet of Things*. ISBN 9780128053959

SOUVIK Pal, VICENTE García Díaz and DAC-NHUONG Le. (Eds.) 2020. *IoT Security and Privacy Paradigm*. CRC Press, ISBN 9780367253844

VLASIOS Tsiatsis, STAMATIS Karnouskos, JAN Holler, DAVID Boyle, MULLIGAN Catherine 2018. *Internet of Things: Technologies and Applications for a New Age of Intelligence*. 2nd Edition. Academic Press, ISBN: 9780128144350.

Journals

- Communications of the ACM
- Information Systems Research
- Decision Support Systems
- Computer Engineering
- ACM Trans. on Database Systems
- Computing

Indicative Websites

<http://www.buildinginternetofthings.com/>

<http://postscapes.com/internet-of-things-books>

<http://www.internet-of-things-book.com/>

https://www.fer.unizg.hr/download/repository/loE_comic_book%5B1%5D.pdf

Named Awards

Course	Compulsory
BSc(Hons) Computing Top-Up	Compulsory

General Module Information

Status	Draft
Module Name	Machine Learning and Artificial Intelligence
Module Code	COMP 670
Credit Value	20
Level and Study Block	Level 6, Study Block 2
Pre-requisites	Programming skill, knowledge in data structured with related mathematics, intermediate knowledge in Python or R, statistics.
Names Module Leader	Sanjib Raj Pandey

Module Aim

The aim of this module is to provide learners with the theoretical understanding of Artificial Intelligence (AI), its applications, techniques, ethics in AI and main areas of Machine Learning (ML) theory and practice, especially in concepts of supervised, unsupervised and reinforcement learning algorithm and to enable learners to identify and implement appropriate ML algorithm to solve complex real-world business problems.

Summary Module Description

The extraordinary successes and development of Artificial Intelligence (AI) tools and methods are proof that AI has the capabilities to understand and build intelligent systems. This subject, AI and ML, will equip learners with both the computing and scientific skills to solve various real-world problems. AI and ML is one of the current most popular topics in Computer Science. It has been used to solve problems for almost every business today. This subject explores the concepts of AI and ML and aims to understand how they are transforming the digital world. This subject provides an overview of AI concepts, workflows, ML algorithms, and performance metrics. It introduces Python or R, supervised, unsupervised and reinforcement learning algorithms, and various business cases and view to learners interested in starting careers and portfolio in AI and ML. Learners will understand how AI and ML are being used in various domains for instances Health and Social Care, Banking & Finance, Marketing, Agriculture, Engineering, Environment, Automobile, Gaming, Space, Academic etc.

In AI, learners will become familiar with the fundamental background of AI and be able to distinguish Weak AI, Strong AI and Super Intelligences. They will also learn the importance of ethics and social value and safety and security issues in AI-based application. Learners will cover AI areas such as robotics, computer vision, ML, NLP, Game, self-driving cars, smart homes, speech recognition, auto pilot, translation, Q&A/Chatbots etc. Learners will study AI techniques such as top-down approach such as fuzzy logic, knowledge-based system, natural language processing etc., bottom-up approaches such as neural networks, evolutionary computing, swarm

intelligence etc. Learners will also become familiar with propositional logic, first order predictive logic and descriptive logic. This subject also covers the basic concept of “reasoning with uncertainty” by using probabilistic reasoning (Bayesian networks) and fuzzy logic.

In ML learners will understand the theory and practice of ML algorithms (supervised, unsupervised and reinforcement learning) and practical implementation of some ML algorithms. Learners will learn about elementary classification problem (binary classification, multiclass classification) and regression problems (linear and logistics), training and loss (square loss function, mean square error), reducing loss using iterative approach and gradient decent.

Learners will also learn the ML model evaluation metrics such as confusion matrix, true positive, false positive, true negative, false negative, accuracy, precision, F1 score, ROC curve, root mean square and so on.

Learners will also become capable in reasoning under uncertainty using probability theory and fuzzy logic. As a consequence, learners will have the opportunity to improve their critical thinking, analysis problems and solving skills, reasoning and interpretation and be able to select appropriate algorithms to solve problems, which are essential for gaining employment and evolving academic competence.

Unsupervised learning includes: clustering approach such as Hidden Marko Models, K-Means, Fuzzy C-Means algorithm etc.

Supervised learning includes: (a) regression problems such as linear regression, random forest algorithms etc. (b) classification problems such as logistic regression, support vector machine, decision tree algorithms, Bayes classifier etc.

Reinforcement learning includes: Artificial Neural Network algorithm, Q learning, etc.

On completion of this subject, learners will be able to understand the basic concept of machine learning algorithms, obtain hands-on experience in implementing some machine learning algorithms using programming language such as C#, Java, R or Python, machine learning tools such as Scikit-learn, PyTorch, TensorFlow, Numpy, Pandas, Keras, matplotlib, Jupyter Notebook, Azure Machine Learning studio, Google cloud ML engine, Java - Weka, KNIME, Accros.Net for C#.

Module-Specific Employability Skills

- Specialist knowledge and application
- Critical and Logical Thinking
- Complex Problem solving
- Research and Analysis
- Programming and Decision Making
- Independent working
- Communication
- Ability to prioritise tasks and time management

Learning Outcomes

LO #	Learning Outcome Name	Learning Outcome Description	Assessment Criteria Category
1	Code	Construct reusable and deployable Software systems, with appropriately verified functional coherence.	Application
2	Architect	Refactor software systems in correspondence with relevant theories, practice, and discourse in the computing sector.	None
3	Solve	Synthesise knowledge of computing to address complex technical challenges.	Knowledge
4	Advocate	Assess the legal, social, ethical, and professional issues in research and development contexts in correspondence with the relevant law, codes of conduct, and theory.	None
5	Research	Defend an argument that addresses a research question(s), using appropriate primary and secondary sources and academic conventions.	None
6	Reflect	Plan your post-graduation pathway, with reference to how you will overcome obstacles, and how you will build a personal brand that highlights your professional attributes.	Professional Practice
7	Collaborate	Produce work as part of a multidisciplinary team critically appraising practices, approaches, and tools; applying them to enhance development pipelines.	None
8	Application	Evaluate existing artefacts to identify opportunities, emphasise unique features that would fill a gap, and suggest optimal routes to audiences.	None
9	Deliver	Produce prototypes based on your own intellectual property that deliver distinguished experiences, justifying how and why it could engage, immerse an audience, and/or lead to innovation.	Analysis

Assessment Methods

Assessment Method	Description of Assessment Method	%	Learning Outcome Assessed	Compulsory or Compensable
CA	Coursework	60	1, 3	Compulsory
CT	Class Test(s)	20	3	Compulsory
PP	Presentation of work	20	1, 6 & 9	Compulsory

The following codes for assessment methods apply.

CA	Coursework
CT	Class Test(s)
PP	Presentation

Assessment Criteria

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Modes of delivery

Module Target Learner Hours: 200	
Activity	Hours
Demonstration	2
Lecture	12
Practical classes and workshops	16
Seminar	10
Tutorial	10
Independent learning hours:	150

Indicative list of resources

Key-Text

SOLOMON, Justin. 2015. *Numerical Algorithms*. AK Peters/CRC Press.

FRANKISH, K. and RAMSEY, W. 2014. *The Cambridge Handbook of Artificial Intelligence*. Cambridge: Cambridge University Press.

ERTEL Wolfgang. Introduction to AI Second Edition, ISSN 1863-7310 ISSN 2197-1781 (electronic), *Undergraduate Topics in Computer Science*, ISBN 978-3-319-58486-7 ISBN 978-3-319-58487-4 (eBook), DOI 10.1007/978-3-319-58487-4.

BELL, J. 2014. *Machine Learning: Hands-On for Developers and Technical Professionals*. 1st Ed. Wiley.

ENGELBRECHT, A. 2007. *Computational Intelligence: An Introduction*. Wiley-Blackwell.

MOHRI, Mehryar, ROSTAMIZADEH .Afshin and TALWALKAR, Ameet. 2018. *Foundations of Machine Learning*. MIT Press.

SHAI SHALEV-SHWARTZ and SHAI BEN-DAVID. 2014. *Understanding Machine Learning: From Theory to Algorithms*. Cambridge University Press.

ROGERS S and GIROLAMI M.2011. *A First Course in Machine Learning*, CRC Press.

MITCHELL T. 1997. *Machine Learning*, McGraw-Hill.

BARBER D.2012. *Bayesian Reasoning and Machine Learning*.

FLACH, P. 2012. *Machine Learning: The Art and Science of Algorithms that Make Sense of Data*. 1st Ed. Cambridge: Cambridge University Press.

KIRK, M. 2014. *Thoughtful Machine Learning: A Test-Driven Approach*. O'Reilly Media.

KLETTE, R. 2014. *Concise Computer Vision: An Introduction into Theory and Algorithms*. Springer.

FANKHAUSER, W. 2015. *Artificial Intelligence Applications: Natural Language Processing*. Create Space Independent Publishing Platform.

LOTFI A Zadeh & RAFIK A Aliev. 2018. Fuzzy Logic Theory and Applications, Part I and Part II, <https://doi.org/10.1142/10936>, Pages: 612, By (author): LOTFI A Zadeh (University of California, Berkeley, USA), and RAFIK A Aliev (Azerbaijan State Oil and Industry University, Azerbaijan), Publisher: WSPC, eText ISBN: 789813238190, 9813238194.

BUCKLEY, JAMES J., ESLAMI, Esfandiar. 2002. "An Introduction to Fuzzy Logic and Fuzzy Sets", Springer.

Websites (Online Resources)

<https://plato.stanford.edu/entries/artificial-intelligence/> : Stanford Encyclopedia of Philosophy.

<http://archive.ics.uci.edu/ml/index.php> : University of California, Irvine "Machine Learning Repository" (Data sets).

<https://www.lfd.uci.edu/> : University of California, Irvine – Laboratory for Fluorescence Dynamics "Binaries for Python Extension Packages" (Development Tool).

<http://accord-framework.net/> : Accord.NET Framework (Development Tool).

<https://cran.r-project.org/> : The R Project for Statistical Computing "R Archive Network" (Development Tool).

<https://www.codechef.com/> : CodeChef educational initiative "List of Compilers" (Wiki).

<https://www.knime.com/>: Konstanz Information Miner "KNIME" (Development Tool).

www.nltk.org : Natural Language Toolkit "NLTK" (Development Tool).

<https://juliaang.org/> : Programming Language (Development Tool).

www.microsoft.com : Microsoft "Robotics Developer Studio" (Development Tool).

www.alicebot.org : ALICE A.I. Foundation "AIML: Artificial Intelligence Markup Language" (Development Tool).

<http://www.aforgenet.com/>: Open source C# framework "AForge.NET" (Development Tool).

<https://www.openml.org/> : Open Machine Learning.

<https://scikit-learn.org/stable/> : Scikit-Learn.

<https://www.tensorflow.org/> : End to end open source ML platform.

<https://www.scipy.org/> : Python-based open-source software.

<https://www.datacamp.com/community> : Data camp community.

<https://keras.io/> : Keras.

W3School for Python and Machine learning:

https://www.w3schools.com/python/python_ml_getting_started.asp.

Tutorial Point - Artificial Intelligence & Machine Learning with Python:

https://www.tutorialspoint.com/artificial_intelligence/index.htm

https://www.tutorialspoint.com/machine_learning_with_python/index.htm

Academic Journals

IEEE Transactions on Pattern Analysis and Machine Intelligence, ISSN : 01628828
IEEE Computer Society.

Foundations and Trends® in Machine Learning, Now Publishers Inc, Print ISSN: 1935-8237,
Online ISSN: 1935-8245.

Journal of Machine Learning Research, ISSN: 15337928, 15324435, Microtome Publishing.

IEEE Transactions on Fuzzy Systems, ISSN: 10636706, Institute of Electrical and
Electronics Engineers Inc.

Engineering Applications of Artificial Intelligence, Elsevier, ISSN: 0952-1976.

Artificial Intelligence, ISSN: 00043702, Evsevier.

Machine learning, ISSN: 15730565, 08856125, Springer.

Swarm Intelligence, ISSN: 19353820, 19353812, Springer.

International Journal of Fuzzy Systems, ISSN: 15622479, 21993211, Springer.

AI and Society, ISSN: 09515666, 14355655, Springer.

Intelligent Data Analysis, ISSN: 1088467X, 15714128, IOS Press.

Natural Language Processing, ISSN: 14698110, 13513249, Cambridge University Press.

Conferences

<https://www.aaai.org/> : The AAAI Conference on Artificial Intelligence.

<https://icml.cc/> : International Conference on Machine Learning.

Named Awards

Course	Compulsory
BSc (Hons) Computing Top-Up	Compulsory