PEARSON BTEC

LEVEL 4 HNC

IN

COMPUTING

COURSE HANDBOOK 2018-19

Contents

1. Introduction

1.1 Welcome to the Sheffield College

Congratulations on choosing higher education at the Sheffield College. We hope that the time you spend with us will be both enjoyable and rewarding and that you will be able to take full advantage of all that the College and the City of Sheffield have to offer.

Starting a new course can be a confusing and worrying time. As a group of students you come with a wide range of experiences. Some of you are living away from home for the first time; others have lived or worked in Sheffield for a considerable period. Some of you have come from school or college, others are returning to study after several years working outside the education system. You come in all shapes and sizes, age ranges, ethnicity and gender, from the UK, The European Union and other countries. What you all have in common is that you are about to begin study for the first time at higher level. We hope that you will quickly make friends within the group and that the group as a whole binds together so that you all support each other. In many ways you are each other's most important resource.

We hope you will find that the course you have chosen fulfils all your expectations and that by the time you leave us you will be fully equipped to meet the demands of employment and your chosen career path.

Steve Tipping
Head of HE and Access

1.2 The College

The Sheffield College has around 20,000 students in total, 600 of which are on university level courses. Higher Education at the Sheffield College operates across 2 campuses; City and Hillsborough. Higher Education is based within departments in order to give you access to specialist facilities. Each course has a designated HE Curriculum Leader, who is responsible for the day to day running of your course, and is your first point of contact.

We are proud of our vocational facilities, which are among the best in the north of England, and our staff work hard to ensure you get a valuable experience when using them. You will find your tutors and support staff approachable and available to help you every step of your journey. For us, your time here is 'all about you' and we hope that you will work with us to continue to build a vibrant HE community.

1.2 Purpose of this handbook and how to use it

An important aspect of offering high quality courses of study in higher education is the provision of information for students which is accurate, comprehensive and reliable for your learning needs.

In support of this objective, this handbook is designed to meet the expectations of the QAA Code of Practice for the Assurance of Academic Quality and Standards in Higher Education.

The handbook provides information about your course team, the course you have chosen to study, assessment, personal academic and pastoral support, learning resources, quality assurance, work-based learning and opportunities for further study. It is a document that you will need to dip into during the course, when you need to look up, for example, what to do if you are ill. It contains the rules by which we all must live; so keep it in a safe place for future reference.

2. Course Team

2.1 Contacting Staff

At the Sheffield College we are proud of the amount of tutor support we provide. We encourage you to contact tutors if you need any help or support with your work, or if you have any queries about their unit. Whilst you can often catch staff in their workrooms during breaks, email is usually the best method of contact at other times, as tutors have busy teaching commitments and may not be readily available by phone. If you do contact by phone, be prepared to leave a message with your phone number; your tutor will always phone you back to arrange a time to meet with you to discuss any concerns you may have.

As well as having tutors for different units of the course, each course has an HE Curriculum Leader, who is responsible for the day to day running of the course. You should contact the HE Curriculum Leader if you have any queries concerning the course and how it operates, or if you are unable to attend class for any reason, for example due to illness.

In addition, groups of courses are managed by a Director. You are unlikely to need to make contact with the Director, unless your HE Curriculum Leader is absent from College for any length of time. Contact details for individual tutors will be given to you in class, by the tutors themselves. Contact details for your HE Curriculum Leader and Director are listed below.

Course	HE Curriculum Leader	Director
Level 4 Higher National Certificate in Computing	John McToal john.mctoal@sheffcol.ac.uk 0114 2602037	Iain McKinney iain.mckinney@sheffcol.ac.uk 0114 2602605

2.2 The Sheffield College University Centre

The College has a dedicated specialist University Centre to service HE students. This is your first point of contact for all administrative queries. The administrator, Sue Fletcher can be contacted on 0114 260 2597 susan.fletcher@sheffcol.ac.uk Sue will either be able to answer your query herself, or give you the contact details of the appropriate person to help you. Carol Sheldon, carol.sheldon@sheffcol.ac.uk and Julia Mills, julia.mills@sheffcol.ac.uk are part time HE Administrators. The Head of HE and Access, Steve Tipping can be contacted on 0114 260 2587 stephen.tipping@sheffcol.ac.uk

3. The Course

3.1 Programme Specification

This is the Programme Specification for your proposed course. It gives you information that you will need in order to apply, and details of how you will be taught, assessed, and supported whilst at college.

Who is this qualification for?
The Pearson BTEC Higher National qualifications in Computing are aimed at students wanting to continue their education through applied learning. Pearson BTEC Higher Nationals provide a wide-ranging study of the computing sector and are designed for students who wish to pursue or advance their career in computing.

In addition to the knowledge, understanding and skills that underpin the study of the computing sector, Pearson BTEC Higher Nationals in computing give students experience of the breadth and depth of the sector that will prepare them for further study or training.

What award will I get?
Pearson BTEC Level 4 Higher National Certificate in Computing

Where am I going to study?
Sheffield College (City Campus)
Granville Road
Sheffield
S2 2RL
Tel: 0114 260 2600
Fax: 0114 260 2101

What do I need to get onto the course?
- A-Levels or a BTEC Level 3 Diploma in a relevant subject
- Grade C or above in GCSE English and Maths (or a Level 2 equivalent)
- Please note that mature students with relevant experience will also be considered on an individual basis.
- Applicants may be required to attend an interview prior to an offer being made.
- All applicants who are non-native English speakers or who have not studied the final two years of school in English must have an IELTS score of level 5.5 or above with a minimum of 5.0 for individual sections.

Is it approved by any professional bodies?
These qualifications have been approved by the following professional bodies as suitable qualifications for students wanting to gain membership. The professional bodies include:
- The British Computing Society
- The Institution of Engineering and Technology.

Progression
The Pearson BTEC Higher National Certificate provides a solid grounding in Computing at Level 4, vendor-accredited certification and Professional Body membership, all of which students can build on should they decide to continue their studies beyond the Certificate stage.

On successful completion of the Level 4 Higher National Certificate, a student can progress onto the Level 5 Higher National Diploma in Computing via the general Computing pathway, or one of the following six specialist pathways:

- Network Engineering
- Software Engineering

- Data Analytics
- Security
- Intelligent Systems
- Applications Development

On successful completion of the Pearson BTEC Higher National Diploma at Level 5, students can develop their careers in the computing sector through:

- Entering employment
- Continuing existing employment
- Linking with the appropriate vendor accredited certificates
- Committing to Continuing Professional Development (CPD)
- Progressing to university.

The Level 5 Higher National Diploma is recognised by higher education providers as meeting admission requirements to many relevant computing-related courses.

3.2 Purpose, Objectives and Aims of the Pearson BTEC Higher Nationals in Computing

Purpose
The purpose of Pearson BTEC Higher Nationals in Computing is to develop students as professional, self-reflecting individuals able to meet the demands of employers in the computing sector and adapt to a constantly changing world. The qualifications aim to widen access to higher education and enhance the career prospects of those who undertake them.

Objectives
The objectives of the Pearson BTEC Higher Nationals in Computing are as follows:

- To equip students with computing skills, knowledge and the understanding necessary to achieve high performance in the global computing environment.
- To provide education and training for a range of careers in computing, including network engineering, software engineering, data analytics, security, intelligent systems, and applications development.
- To provide insight and understanding into international computing operations and the opportunities and challenges presented by a globalised market place.
- To equip students with knowledge and understanding of culturally diverse organisations, cross-cultural issues, diversity and values.
- To provide opportunities for students to enter or progress in employment in computing, or progress to higher education qualifications such as an Honours degree in computing or a related area.
- To provide opportunities for students to develop the skills, techniques and personal attributes essential for successful working lives.
- To provide opportunities for those students with a global outlook to aspire to international career pathways.
- To provide opportunities for students to achieve a nationally recognised professional qualification.
- To provide opportunities for students to achieve vendor accredited certifications.
- To offer students the chance of career progression in their chosen field.
- To allow flexibility of study and to meet local or specialist needs.
- To offer a balance between employability skills and the knowledge essential for students with entrepreneurial, employment or academic aspirations.

These objectives are met by:

- Providing a thorough grounding in computing principles at Level 4 that leads the student to a range of specialist progression pathways at Level 5 relating to individual professions within the computing sector.
- Enabling progression to a university degree by supporting the development of appropriate academic study skills.
- Enabling progression to further professional qualifications in specific computing areas by mapping to units in a range of vendor accredited certificates.

Aims

The Pearson BTEC Level 4 Higher National Certificate in Computing offers students a broad introduction to the subject area via a mandatory core of learning, while allowing for the acquisition of skills and experience through the selection of optional units across a range of occupational sectors at Level 4. This effectively builds underpinning core skills while preparing the student for subject specialisation at Level 5. Students will gain a wide range of sector knowledge tied to practical skills gained in research, self-study, directed study and workplace scenarios.

At Level 4 students develop a broad knowledge and awareness of key aspects of the computing sector through *six core* units, which include one unit assessed by a Pearson-set assignment, and *two optional* units. The units are:

Pearson BTEC Level 4 Higher National Certificate in Computing	**Unit credit**	**Level**
Core / Mandatory Units		
1 Programming	15	4
2 Networking	15	4
3 Professional Practice	15	4
4 Database Design & Development	15	4
5 Security	15	4
6 Managing a Successful Computing Project (Pearson-set)	15	4
Optional Units		
7 Strategic Information Systems 8 Computer Systems Architecture	15 15	4 4
9 Software Development Lifecycles	15	4
10 Website Design & Development 11 Maths for Computing	15 15	4 4
12 Data Analytics	15	4

Graduates successfully completing the Pearson BTEC Higher National Certificate in Computing will be able to demonstrate a sound knowledge of the basic concepts of computing. They will be able to communicate accurately and appropriately and they will have the qualities needed for employment that requires some degree of personal responsibility. They will have developed a range of transferable skills to ensure effective team working, independent initiatives, organisational competence and problem-solving strategies. They will be adaptable and flexible in their approach to computing, show resilience under pressure, and meet challenging targets within a given resource.

3.3 How will I be taught?

The programme will be taught using:
- Cisco packet tracer for the *Networking* unit
- Access and SQL for the *Database Design & Development* unit
- The *Project* is a board set task and will make use of Microsoft project and other planning tools
- *Website Design & Development* will be one of the optional units taught

Programme Learning Methods
The table below shows the programme learning methods:

	Learning Methods
Knowledge and Understanding	• Lectures and seminars • Directed study of textbooks and journal articles • Assignment work • Project work
Intellectual Skills	• More active learning processes • Assignments or projects • Group-learning activity such as a seminar or tutorial • Laboratory, workshop,
Subject Specialist Skills	• Application in context • Opportunities to practise the activity in an appropriate learning context (e.g. lab, Project work) • Workbooks or guidance manuals may also be used to support learning
Key Skills	• Through naturally arising opportunities within the curriculum e.g. written communication skills through essays or dissertations • Oral communication skills through presentations in seminars • Team working skills through collaborative projects

What will my timetable look like?
Your lectures will usually be spread over 3 days with lessons starting at 09:00 and potentially finishing as late as 18:30.

Activities to support your studies, eg, field excursions, residential trips and practical activities may take place on days you are not normally timetabled to attend college and should take priority over other commitments. You will be informed of these activities well in advance to enable you make arrangements.

How will I be assessed?
The table below shows the programme assessment methods:

	Assessment Method
Knowledge and Understanding	• Most methods require some demonstration of knowledge and understanding typically through written assessment activities and Presentations
Intellectual Skills	• Problem-based exercises • Independent project work • Practical activities • Research dissertations
Subject Specialist Skills	• Application in context • Practical demonstration of skill in simulated work settings.

Key Skills	• Through naturally arising opportunities within the curriculum • E.g. written communication skills through essays or dissertations • Oral communication skills through presentations in seminars • Team working skills through collaborative projects

The purpose of assessment is to ensure that effective learning of the content of each unit has taken place. Evidence of this learning, or the application of the learning, is required for each unit. This will be assessed by coursework.

The assessment of the evidence relates directly to the assessment criteria for each unit, supported by the generic grade descriptors. All units will be individually graded as 'pass', 'merit' or 'distinction'. To achieve a pass grade for a unit you must meet the assessment criteria set out in the unit specifications.

What are my responsibilities as a student?
It is your responsibility to manage your personal and professional development. You will be mentored and supported in this by the personal tutor. The amount of support given will be driven by your needs, as determined by you and / or Unit tutors, and is therefore expected to decrease in quantity and nature as you progress through the course and become more independent.

Higher National qualifications are vocational courses which prepare you for working in a professional environment as well as to undertake further study. These courses require you to behave in a professional manner, in much the same way as you would in a working environment. Therefore we expect your attendance rate to be high, and that if you have to miss a class for some unavoidable reason, you inform your HE Curriculum Leader, and make arrangements to catch up the class you miss. Our courses move at a fast pace, and there is a strong relationship between good attendance and success.

Group work is a key component of all courses, and will form part of your assessment. Good attendance enables you to build working relationships with your peers and play your full part in collaborative activities. Being able to work as part of a team is an important employability skill, and is highly valued on our courses.

For all these reasons, your personal tutor will monitor your attendance and, should an issue arise for any reason, will help you to action plan so that you get back on track. However, it is your personal responsibility to ensure that you **do not take holidays during term time**. To help you with your planning, you will receive a college calendar at induction.

The College reserves the right to withdraw you from your course should your attendance pattern indicate a lack of commitment to your studies with the likelihood that you will not successfully complete the course. If you do not attend for 4 consecutive weeks, or have a pattern of haphazard attendance, you will be withdrawn and the student loans company will be informed. This will result in your funding being stopped, and you will owe the college the balance of any unpaid fees.

It is your responsibility to keep a copy of all written coursework submitted.

What support and help can I get?
Your personal tutor is there to support and guide you on your learning journey and is your first point of contact if you have any concerns or need to access support, counselling or careers guidance. Your personal tutor will be responsible for writing your reference when you apply for further courses or employment. You will be given contact details for your personal tutor during induction.

You will receive academic support from your Unit tutors. This may take the form of face to face academic tutorials, advice surgeries and appointments or remotely by telephone or email conversations and conferences on the college intranet. Never be afraid to ask for help or advice – we are here to support you. Unit tutors will provide you with contact details during the first lesson.

Other sources of support
During induction you will be given details of all the support services which the college provides. Each Campus has a Student Services base staffed by a manager and a team of staff who are there to support you throughout your time at College. This team of staff includes our own Educational Guidance Advisors who can advise you about appropriate courses, careers etc. As a student of the college you have access to free and confidential counselling where you may find it helpful to talk to someone who won't judge you.

The College offers a wide range of assistance to learners with additional needs. We believe that everyone should be enabled to learn effectively and have access to College facilities. Learners with additional needs include people with:

- physical or mobility difficulties
- visual impairment e.g. blind and partially sighted
- hearing Impairment e.g. deaf or hard of hearing
- communication difficulties e.g. Autistic and Asperger syndrome
- learning difficulty e.g. dyslexia, ADHD
- medical condition e.g. epilepsy, diabetes and heart disease
- mental health difficulties e.g. depression and anxiety

In order to access specialist support you must apply for Disabled Students Allowance. You need to complete an online application form and send the documents requested to Student Finance England, who will assess your claim. If successful, they will fund you to attend an assessment centre where your particular support needs can be assessed. For more information visit Disabled Students' Allowances. If you need help with the process, contact Liz Escadale, the HE Disability Advisor, on 0114 2602075.

How Can I Find Out More?
The College has a dedicated specialist University Centre to service HE students. This is your first point of contact for all administrative queries. The administrator, Sue Fletcher can be contacted on 0114 260 2597 susan.fletcher@sheffcol.ac.uk Sue will either be able to answer your query herself, or give you the contact details of the appropriate person to help you. Working with the administrator is the Head of HE and Access, Steve Tipping, who can be contacted on 0114 260 2587 stephen.tipping@sheffcol.ac.uk.

4. Course Specific Information

Course
HNC Level 4 in Computing
Additional Costs
Text Books £50-£100 – note; essential texts will be provided on a loan basis. Stationery – you will need to provide your own writing materials etc.
Equipment
All computing facilities are provide within the department in the Learning Resource Centre.
Printing /Reprographic Costs
Printing facilities are provide in the computing department free of charge. Specialist printing facilities may be required from time to time but should not be more than £20.
Residential Trips
No residential trips have been planned but visits to events will require a contribution towards travels expences.
Please include any other course specific information not given elsewhere
N/A

5. Assessment

5.1 Assessment Schedule

Deadlines will be given for each unit during the first lesson for that module, and published in unit guides and the course assessment schedule.

5.2 Assessment Regulations

All HE students are entitled to have access to fair assessment. The College follows QAA and Awarding Body guidance regarding reasonable adjustments and special considerations. Teachers, trainers and assessors will follow the procedures, and design assessment instruments that give all candidates the fairest possible opportunities to show attainment. Internal verifiers will check that assessments give all students equal opportunities to show attainment, and that there is no discrimination or bias in the design or format.

All courses have a Review Board at the end of each semester. These boards confirm your results for all completed modules, and for the award at the end of the course. Pearson BTEC HNC/D regulations require us to specify a set of rules that all HNC/D programmes adhere to, and which are considered during the Review Board. These rules are listed below:

- all students must meet the pass or merit or distinction criteria to achieve each unit
- if there are exceptional circumstances explaining why a student is unable to meet deadline dates, the decision to defer outstanding work must be agreed by an Exceptional Circumstances Panel. It follows that the Exceptional Circumstances Panel must meet prior to the Review Board.
- If a student does not achieve the pass standard for the first submission of summative assessment of the unit, s/he will be given a refer grade, and will be required to resubmit work by a clearly stated deadline. The grade awarded will depend upon the student profile for the unit.
- the outcome of the refer work will be discussed at the next Review Board; if still not at the required standard, the student will fail the unit and will need to re-register, subject to the unit's availability
- if it is not possible for a student to retake all re-registered units during the planned 2 years, then a decision to allow a student to continue for a 3rd year of the course may be taken at the discretion of the Assessment Board
- all students are to be provided with feedback on their work within 3 weeks of the deadline date
- units that are assessed using group work must also include measurable assessment of the contribution of each individual student

Standards Verifiers consider samples of student work to verify quality and standards. The Review Board will consider their comments about these samples whether or not it is possible for the Standards Verifier to attend in person. Each Review Board must also report progress on actions taken in response to any Standards Verifier recommendations.

No discussion of individual results or counselling of students takes place prior to the Review Board. Discussions that take place during the Review Board are strictly confidential. Only the board decisions are reported to you.

Your Standards Verifier is Mrs Zainab Hamza. Her email address is zainabhamza@hotmail.com

5.3 Extenuating Circumstances

The Sheffield College's Extenuating Circumstances Policy and Procedure is intended to provide support if you experience unexpected and unanticipated difficulties during your time as a student which adversely impacts on your studies and your ability to complete assessments or complete them to your usual standard.

If you are experiencing such difficulties, please refer to the Extenuating Circumstances Policy and Procedure for guidance and speak to a member of the teaching staff about your specific situation. They will be able to advise which procedure you need to follow and who to submit the relevant paperwork to.

The Extenuating Circumstances Policy and Procedure is available here, https://www.sheffcol.ac.uk/about-us/terms-and-conditions and click on *Extenuating Circumstances Policy & Procedure*. You will also find a link on your Moodle/Google classroom VLE site.

You should read this information if you are experiencing personal problems, for example, if you are ill, have been in hospital, have experienced an exceptional family emergency or are suffering from exceptional stressful life events, and they are having a significant impact on your ability to study

Whilst studying with us you may well encounter some of the difficulties of life experienced by most people, such as ill-health or personal issues. Normally you will be able to overcome or manage these without any impact on your ability to study and complete assessment.

Occasionally however you might experience ill-health or personal issues that are exceptional in nature and which have a significant impact on your ability to study and to complete assessment. **We define these as extenuating circumstances**. Generally such circumstances will occur suddenly, will be unexpected and are beyond your immediate control to overcome or manage due to their severity and/or timing.

Our policy is to help you where we can to mitigate the impact of your extenuating circumstances on your studies and to consider all requests for help sensitively, fairly and equitably.

It is important you inform us as soon as you are aware that your studies and/or ability to take assessment are being affected by ill-health or personal issues. You should contact your **HE Curriculum leader** immediately if your circumstances are preventing you from attending classes or are affecting your ability to complete assessment. We understand you might not always feel comfortable doing this particularly when your circumstances are of a personal and sensitive nature. However we encourage you to do so. Any information you disclose will be handled in confidence.

The appropriate mechanism to help mitigate the impact of your circumstances will depend on the timing and severity of those circumstances.

- Where the circumstances occur close to a coursework submission deadline and are of the type that can quickly be overcome, you can request a short extension to that deadline.
- Where your circumstances will prevent any sustained meaningful engagement with your studies, then you can request a planned break in studies.
- Where your circumstances are having a detrimental impact on your ability to attempt or reach a pass standard in an assessment task, you can request to repeat your attempt at that assessment task.

We will consider any request sensitively, fairly and equitably based on the extent to which you have:

- Submitted the request in a timely manner.
- Clearly stated the nature of your circumstances and the impact they are having on your ability to study and take assessment.
- Provided appropriate documentary evidence where it can be reasonably obtained.

The Sheffield College will support students in completing a Request Repeat Assessment Task (RRAA) form.

The Sheffield College will hold Extenuation Circumstances Panels (ECPs) to determine if students RRAA will be accepted or declined. The Sheffield College will confirm RRAA outcomes to students.

*NB: The following list indicates the type of **situations which do not meet** the definition of extenuating circumstances because we believe they can be avoided or that you can act to limit the impact. The list is not exhaustive.*

Medical

- *long-standing medical conditions (as these should be covered by a Learning Contract)*
- *planned health appointments*
- *minor ailments such as a cold*

Personal

- *the break-up of a short-term relationship*
- *financial difficulties*
- *attending or taking part in sporting events*
- *holidays or travel*
- *moving house*
- *normal domestic issues*
- *work commitments for fulltime students reducing time available for study and coursework*
- *voluntary work*
- *weddings*

Study related

- *completing coursework too late and missing deadlines*
- *losing coursework*
- *not following the assessment timetable*
- *transport difficulties which could have reasonably been avoided*
- *withdrawal of IT facilities as a result of being in debt to the College*
- *circumstances that affect another individual in relation to group work*
- *English being a second language*

For further information, please refer to The Sheffield College *Extenuating Circumstances Policy and Procedure*, a copy of which can be obtained from your HE Curriculum Leader.

5.4 Malpractice

Malpractice is any form of cheating, including plagiarism, collusion, impersonation and the use of inadmissible material. It is a breach of the College's Assessment Regulations. If malpractice is suspected, it will be established beyond all reasonable doubt before any formal sanction is imposed. The College views all instances of malpractice, including plagiarism, as a serious offence, and will respond to all allegations of malpractice in accordance with Pearson BTEC HNC/D regulations. This may require the College to report any suspected malpractice to the Awarding Body. It may also require the College to investigate, in which case the Student Disciplinary procedure will be used. Instances of malpractice that are upheld following investigation, will lead to disciplinary action.

For full details of the policy and procedures regarding Academic Misconduct, see https://www.sheffcol.ac.uk/about-us/terms-and-conditions and click on *Assessment Malpractice Policy & Procedure*. You will also find a link on your Moodle/Google classroom VLE site.

Malpractice includes:

Misconduct, for example:

- any form of impersonation
- falsification, fabrication or alteration of results, certificates or assessment evidence
- failure to follow Awarding Body regulations Pearson BTEC HNC/D regulations or the instructions or advice of assessors, supervisors or invigilators
- misuse of assessment or examination material
- taking unauthorised material into assessment rooms
- obtaining, receiving, exchanging or passing on assessment-related information during assessment sessions
- behaviour that disrupts or undermines the integrity of assessment
- any form of cheating to gain an unfair advantage
- deliberate destruction of another person's work
- resubmitting previously graded work

Collusion

- unauthorised co-operation between a learner and another person, in or outside of College, in the preparation and production of work that is eventually submitted by one or both learners as the outcome of his or her individual efforts
- allowing another student to copy your work

You should not be discouraged from teamwork, as this is an essential key skill for many subject areas. However, methods of avoiding collusion, for example, the use of minutes, allocating tasks, agreeing outcomes, etc, are an essential part of team work, and the requirement to use such methods must be made clear to all students.

Plagiarism

Plagiarism is where a student submits someone else's work as if it is their own.

- copying work (artwork, images, artefacts, products, designs, words) from a published source and presenting the copied work as if it were the student's own
- the use of another person's work (artwork, images, artefacts, products, designs, words), with or without permission, without appropriately acknowledging the source

Examples of plagiarism include:

- copying from published text without an acknowledgement of source
- copying images, graphs, tables, art, music etc, without acknowledging the source
- copying small or large sections of assignments from other learners;
- downloading original material from the internet without acknowledging the source
- imitating too closely an existing work of art or music, design idea or concept

5.5 Appeals

Appeals may be made against the decisions e.g. on assessment, the decisions of a Review Board, Extenuating Circumstances Panel or Academic Conduct Panel, on the grounds stipulated in these regulations, no later than 10 days from receiving the decision against which you wish to appeal.

For full details of the appeals regulations, see https://www.sheffcol.ac.uk/about-us/terms-and-conditions and click on *Academic Appeals Policy & Procedure*. You will also find a link on your Moodle/Google classroom VLE site. You are advised to read these regulations in full.

Grounds for appeal can relate to decisions made about procedures such as:

- exceptional extensions
- extenuating circumstances
- academic misconduct

Grounds for appeal can include:

- that there was an error or irregularity in the process
- that the decision was not in accordance with the relevant regulations
- that the person or panel making the decision did not take sufficient account of the circumstances

Failure to follow College procedures and deadlines does not in itself constitute grounds for an appeal. The appeal process should not be used as an opportunity to simply re-enter the procedure under consideration, and documents etc., originally submitted after the relevant deadlines, that were not considered when the original decision was taken, will not necessarily be taken into account during the appeal.

You cannot appeal against an academic judgement of the marks awarded but you may request confirmation of their validity if you think there has been an error or irregularity. You are therefore strongly advised to discuss the nature of the appeal with appropriate members of staff.

Assessment Appeal

If you are not happy with your provisional grades, you must discuss your concerns with the subject tutor in the first instance. He or she will then discuss the reason for the decision for awarding the provisional grade. If you are still not happy with the outcome of discussions over provisional grades with your tutor, then discuss your concerns with the Curriculum Leader. He or she will discuss the decision with the subject tutor and/or an internal verifier. If you are still not fully satisfied with your provisional grade, the matter can be pursued in line with the College Appeals Policy.

Stage 1

1. If you disagree with the assessment decision you must explain the reason, in writing, as soon as possible.

2. The tutor must consider this and provide you with a response e.g.:

    - Clear explanation of the assessment decision following re-evaluation of the evidence, or
    - If appropriate, amendment of the assessment record.

If you agree with the decision then the Appeal does not need to progress further but if you remain unhappy with the decision reached, the Appeal must proceed to Stage 2.

Stage 2

The tutor will pass all of the relevant information to an appropriate curriculum specialist via the moderation procedure, which will examine all the issues and evaluate the original decision. If you are still unhappy with this decision you can go to Stage 3.

Stage 3

Within 10 working days of the decision from Stage 2 your work will be passed to an external manager who will consider your Appeal. The decision reached is final.

If necessary, the matter can be referred to the Awarding Organisation Pearson (http://qualifications.pearson.com/en/contact-us/feedback-and-complaints.html#tab-LearnersPearson.com.) and also, the Office of the Independent Adjudicator (OIA) http://www.oiahe.org.uk.

5.6 Complaints

Complaints Procedure

The Sheffield College is committed to providing a high quality, educational experience and aims to provide a supportive environment, responsive to any concerns raised by students. Students should feel able to make a complaint relating to the action, or lack of action, or about the standard of a service or facility provided to students of the College. The procedures are intended to ensure that all complaints are treated fairly and consistently and, wherever possible, to resolve the matter to the complainant's satisfaction. Full details of the Complaints Policy can be seen here, https://www.sheffcol.ac.uk/about-us/terms-and-conditions and click on *Complaints Policy*.

The College complaints procedure has two stages:

1. Informal stage – resolving a concern through informal discussion
2. Formal stage – resolving a concern through the formal complaints procedure, of which there are three possible stages

Full details of the two stages, and who to approach for help and advice, can be seen here https://www.sheffcol.ac.uk/about-us/terms-and-conditions and click on *Complaints Procedure*.

Informal Stage
Most concerns are straightforward and can be resolved quickly with staff directly involved without the need to complete and submit a complaint form. Therefore, in the first instance, having considered the responsibilities of both students and the College as detailed within the Student Charter, any concerns/issues should be discussed, informally, with the person concerned or another member of staff. For example, if your complaint concerns teaching/tutorial matters you may wish to talk to your tutor or other members of teaching staff. If your complaint is about a service, then you should talk to an appropriate member of staff from that service. You could also consider raising your concern via the student forums.

If you are not sure who to speak to, or you do not feel able to approach the person most directly involved, you can seek advice regarding this from your Tutor Mentor, Deputy Head of Department, or from the Students' Union which acts independently of the College.
You can contact the Students' Union on 0114 2602188 or email to studentsunion@sheffcol.ac.uk or call into one of the reception areas to make an appointment. At this point managers may wish to speak to staff involved and also obtain further guidance from Human Resources.

If a satisfactory resolution is not found informally, students are entitled to proceed to the College's formal complaints procedure.

Formal Stage

Stage 1

You should complete a Registration of Complaint form, copies of which can be obtained from College reception areas, or you can complete the online form via the College website http://www.sheffcol.ac.uk/About/Public-Documents/Complaints. You can ask a member of staff for help to complete the form or ask a friend, parent, carer or a representative of the Students' Union to submit a complaint on your behalf but we would require written agreement from you.

In addition to personal details and other information on the form, you will need to provide:

- details of the complaint
- an explanation of the steps you have already taken to try to resolve the complaint informally and why the responses you have received are not satisfactory
- where applicable, the outcome you would like from your complaint
- any supporting evidence (ie, copies of emails, notes of meetings, references to procedures, handbooks etc).

It is important to keep a copy of the completed form and other documentation submitted for your own records. Completed complaint forms should be submitted to any campus reception area or by email to collegecomplaints@sheffcol.ac.uk.

Within 5 working days of receipt of your complaint form, you will receive an acknowledgement. Your complaint will be considered to determine that the complaints procedure is appropriate and if so, it will be referred to a senior member of staff who will manage your complaint, ensuring that necessary action is taken and monitoring it through to completion.

After a further 10 working days you will receive a letter informing you of the progress of your complaint. We aim to complete the enquiry and reach a conclusion within 30 working days of receipt of your complaint form. If this is not possible you will be informed of the progress made. Complaints identified as requiring particularly speedy resolution will receive special attention.

You may be invited to attend a meeting to consider your complaint. You may bring a friend or representative to support you and/or for assistance but they cannot be a professional employed to act on your behalf.

Matters raised in a formal complaint will remain confidential to those directly involved in the investigation (which includes any members of staff concerned). All staff and students who become aware of any of the issues involved in a formal complaint are required to keep this information confidential (except as is necessary to progress, investigate or respond to the complaint). Failure to do so may result in formal disciplinary action being taken. However, there may be occasions when it is not possible to maintain confidentiality, for example if another person is at risk. In such cases the situation will be explained to the complainant and/or the representative.

If your complaint is upheld you will be informed how and when any resolution or redress will be implemented. If the complaint is not upheld you can expect to receive clear reasons why this decision has been reached and advice on further action available to you including a review of the process of the complaint by the awarding body where appropriate (see Stage 2 below).

Stage 2

If you are not satisfied with the outcome of Stage 1, you can write to the Chief Executive, within 10 working days of receipt of the letter informing you of the outcome, to apply for a review of the process by the awarding/validating organisation. You should state the reason(s) why you are dissatisfied. Correspondence should be sent to the Chief Executive, c/o PA to the Chief Executive, Sheffield College, Granville Road, Sheffield S2 2RL.

Within 10 working days of receipt of your letter you will be informed of the action to be taken to review your complaint and any action you may need to take directly with the awarding/validating organisation.

Feedback
In accordance with the Student Charter, at the end of the two formal stages, you will be invited to complete a short evaluation of the process.

Stage 3

Following the action taken at Stage 2 (and not before), if you still feel that the matter has not been resolved to your satisfaction, having exhausted the College's procedures you may wish to contact Pearson, the Awarding Organisation, to refer the matter further.
https://qualifications.pearson.com/en/contact-us/feedback-and-complaints.html
If not resolved to the complainant's satisfaction, Higher Education students can apply for a review of their complaint to The Office of the Independent Adjudicator for Higher Education (OIA) http://www.oiahe.org.uk

5.7 Marking Arrangements

When you are set coursework, you will be given the deadline by which it is to be submitted. It is vital that you ensure you know the date, time and place for submission of coursework. Failure to meet a deadline counts as non-submission, and has serious repercussions.

It is your responsibility to keep a copy of all written coursework submitted. Your work will be marked by the unit tutor, and a sample will be internally verified by another member of staff. In addition, the Standards Verifier will sample work from all units.

You will receive feedback and marks for your work within 3 working weeks of submission. If for any reason this is not possible, you will be informed of the reason and given a date when work will be returned. The feedback you receive will be both written and oral, and forms a vital part of the learning process. Do make sure that you fully understand the feedback given, so that you can use it to improve your future work. Do not hesitate to ask the tutor if you need further guidance and explanation of your marks.

Please note that any marks you receive as part of the feedback process are provisional until confirmed by the Standards Verifier at a Review Board.

5.8 Guidance on Referencing

Accurate and consistent referencing is essential in all academic work. Whenever you refer to either the work or ideas of someone, or are influenced by another's work, you must acknowledge this. Similarly if you make a direct quotation from someone's work this should be referred to accurately.

There are a number of systems of referencing. The system you will use on this course is called the Harvard System. This system is described in the guides which can be found via the link below.
http://lcdatastore.shu.ac.uk/RefGuideV7.pdf

Referencing is a skill which improves with practice. It is a very important part of your academic development. The guides are comprehensive and explain how to reference any information source. Your tutor will give you feedback on your referencing in assignments to help you develop your referencing skills.

5.9 Notification of Results

At the end of each semester there will be a Review Board, which is chaired by the Head of HE and Access at the College, and attended by the HE Curriculum Leader and unit tutors from your course. The Standards Verifier is often, but not always present also. Whether or not the Standards Verifier attends the Board they will have reviewed samples of your assessed work.

These Review Boards consider your marks and confirm whether or not you have passed each unit, or whether you are awarded the Higher National Certificate. The Sheffield College University Centre normally sends out results letters within 2 weeks of the Review Board meeting.

Further information regarding Review Boards can been seen here, https://www.sheffcol.ac.uk/about-us/terms-and-conditions and click on *Review Boards Policy & Procedure*.

5.10 Provision of Certificates and Diploma Supplements

On successful completion of the course, your results are submitted to Pearson, who will issue your Certificate to the college. It is vital that you ensure TSC University Centre always has your current address so that these important documents go to the correct address.

You must notify TSC University Centre if you change either your term time or the permanent address given at enrolment.

5.11 Graduation

During the summer following successful completion of your course you will receive an invitation to attend our graduation ceremony. This is a memorable occasion where family and friends join you and your tutors to celebrate your achievements. Our media students usually film this event to capture the moment when, wearing your cap and gown, you shake hands with the guest speaker and receive your scroll. They film interviews with students and tutors. The college photographer also takes group shots of graduates. The resultant DVD is sent to all those attending graduation. The ceremony takes place in the autumn following successful completion of your course.

6. Learning Resources

All college campuses provide Wi-Fi access so that you can connect your own devices. There are drop in sessions at all college campuses to help you if you experience difficulties.

6.1 Access to College Resources

Learning Resource Centres (LRCs) provide open access to resources, study space and computing facilities, in a pleasant and welcoming environment. You will find a Learning Resource Centre located at all of the College campuses – Hillsborough, Peaks and Sheffield City College. Opening times can be found on the college website, in our information leaflets, and are displayed in each centre, as well as 24/7 electronic access where available.

It is our aim to make the LRC a flexible service, giving support throughout your time in college. Regular Student Forum meetings are held, where we welcome feedback and suggestions from students in order to improve our service.

LRCs provide you with an extensive range of resources to support your learning, including:

- Books, magazines and newspapers
- DVDs, multimedia, online and electronic resources
- Study support materials and learning packages
- Internet access, including Wi-Fi to connect your own device. Secure access to online resources is provided through an authentication service (currently Shibboleth) and the college VLE / Moodle found via the link http://vle.sheffcol.ac.uk/moodle/course/view.php?id=3913
- Resources can be produced in alternative formats and equipment can be loaned to make the most of mobile learning technologies.

You will be able to borrow many of these resources but others are available only for use in the LRC. Equipment is provided where necessary so that you can access the resources e.g. DVD players and computers.

In each LRC we have dedicated staff available to support students' learning needs:

- Study Assistants are available during working hours for face to face support, and questions can be sent via email to be answered by the next available assistant.
- Study Assistants also offer small group workshops on particular study skills – for example: referencing; researching a subject; effective internet searching, etc.
- Staff are appropriately trained and keep up to date by attending regular updating sessions.

The LRC staff can help you with your study and research skills, and have specialist knowledge of the resources available in your subject area. The team can provide training in a range of library related information skills to enable you to use resources effectively to support your studies. During induction you will be given a tour of the facilities and have the opportunity to meet the staff.

Your access to the College's IT facilities is by means of a Student Account. Full-time students will create this as part of induction; part-time students should do this on their first visit to the LRC. Students are given a small starting balance on their printing and photocopying account. When that has been used, further credits can be purchased.

You can pre-book a computer to work on at any of the LRCs, so that you know a PC will be available when you need it.

The library catalogue and details of all the services offered are available from all college LRCs, or online in the LRC sections of the college website.

All students of the Sheffield College can borrow from any campus LRC. In order to borrow resources, students **must** bring their student card to the issue desk. Students are required to show their student card to gain access to College campuses.

Each student can borrow a total of up to 10 items, which may include:

Type of Loan	No. of items	Loan Terms
Ordinary Loan	Up to 10 items	3 Weeks
Short Loan	Up to 5 items	1 Week
Reference	Discretionary	Discretionary

The loan period is designated depending on the nature of resource and likely demand. The loan period may be changed following consultation with colleagues, or in periods of high demand.

Ordinary and short loan items can be renewed once, either by calling in to the LRC, by email, or by telephone. Reserved and overdue items will not be renewed.

Fines are charged for overdue items. Costs for lost or damaged items are the full cost of replacement, or is negotiable if the advertised price is not available.

Students can reserve items that are on loan to somebody else at the issue desk. If a resource is not available at their own centre, LRC staff can request it from another centre. This may take up to 5 working days. If your request cannot be satisfied within the college LRCs, we have access to a range of inter-library loan schemes, including links with the British Library.

The Learning Resource Centre Charter

We are here to help you be successful students - this is what we do for you:

Each working day we can give you:

- A welcoming place to study
- A wide range of books, journals, audio-visual materials and online resources relevant to your subject or course, most of which you are able to borrow
- A range of subject and study guides to support your learning
- Information Assistants to help you with your enquiries and information needs
- Study Assistants to help with your course work and IT enquiries
- Computers for you to use for your college work
- Wi-fi access for you to connect your own learning devices
- Photocopiers, printers and a range of learning equipment for you to use
- Access to all Sheffield College Learning Resource Centres to use their facilities
- Help in finding resources kept in other Libraries and Information Services

When you are not in college you can access many of our services 24/7:

- You can log in to our online services using your college user name and password
- You can email queries to us, to be answered when we are next working
- Our online catalogue helps you find resources in advance of your next visit
- We have a growing collection of e-books and e-journals for your course
- You can find our useful information guides through your Moodle/Google classroom VLE site

In return, this is what you can do for us:

- Ask us for any help that you need
- Take anything you want to borrow to the LRC desk with your Student ID Card
- Take care of any resources you use or borrow, and return them on time so they are available for other students to use
- Pay for any loss or damage caused to resources or facilities in your care, and the fines due on any items you didn't return on time
- Use the computers for course work only so they can be used by others too
- Respect the needs of other students and staff by keeping noise to a minimum for a pleasant and peaceful working atmosphere
- Use the LRC as a learning place – please don't bring food or drinks in
- Help us contribute to the environment by not wasting resources
- Tell us if you have any ideas on how we can improve our services

We aim to provide an efficient and effective LRC service. Your suggestions and comments are welcome.

7. Opportunities to Engage in Quality Assurance of the Course

7.1 Student Representation

You are invited to send representatives to attend Course Committees, where issues relating to the running and development of the course are discussed by teaching teams. At these meetings students can raise any concerns they have, so that prompt action can be taken to resolve matters. In addition, your personal tutor will discuss any concerns which arise during group tutorials, and report back on action taken. Student representatives are also invited to attend the course review at the end of each academic year.

The college employs a Student Involvement Facilitator, who calls termly meetings of the HE Student Forum, to which you are invited to send representatives. The Forum discusses non-course issues which are then raised with the appropriate college manager, who provides feedback to the next meeting. The Student Forum elects a lead Student representative, who represents the student voice at the HE Strategy Group (consisting of senior managers and directors). The HE Student Forum is invited to make a submission for the Higher Education Review (HER) conducted by the Quality Assurance Agency (QAA). This submission helps the review team to understand what it is like to be a student at the College. There is a brief guide to student involvement in HER, and the role of the Lead Student representative on this section of the QAA website.

Higher Education students elect a representative to sit on the Student Union.

7.2 Student Surveys

The College conducts an annual HE Student Survey, where you are asked to respond to a series of questions about the quality of teaching and learning on your course. In addition, you are asked to complete unit evaluation surveys at the end of each unit in order to help us to continuously improve. The results of these surveys are fed into the Annual Quality Review process, and action plans are devised which take account of student opinion. You will receive feedback on the action arising from these surveys through your representatives on course committees and your personal tutor during group tutorials.

7.3 Complaints Process

Definition

A complaint is an expression of concern or dissatisfaction with any aspect of the College's provision that requires a response. Complaints concerning assessment and accreditation may sometimes be dealt with through the college Appeals procedures and those set up by awarding/validating organisations.

- For further details of the Appeals procedure, please see paragraph 5.5 of this handbook.
- For further details of the Complaints procedure, please see paragraph 5.6 of this handbook.

8. Opportunities for Further Study

8.1 Opportunities at the Sheffield College

Details of courses suitable for Higher National graduates, including professional courses, can be found in the online HE prospectus, https://www.sheffcol.ac.uk/courses/he-professional-guide

If you are uncertain about what you need to study next to progress your career, you should book an interview with one of our careers guidance staff at student services reception.

8.2 Other Opportunities

You may choose to continue your qualification by studying for the Diploma (HND) in Computing Systems & Development. Alternatively, you could undertake a Higher Apprenticeship within the computing industry.

If you are a full time student, you may also consider going directly into employment, in which case you should book a careers interview to discuss the opportunities for trainee graduate and internship positions. Careers advisors can also help you with your job search and recommend sources of information such as graduate recruitment fairs.

Unit 1: Programming

Unit code D/615/1618
Unit type Core
Unit level 4
Credit value 15

Introduction

Programming involves describing processes and procedures which are derived from algorithms. The ability to program is what sets apart a developer and an end user. Typically the role of the developer is to instruct a device (such as a computer) to carry out instructions; the instructions are known as source code and is written in a language that is converted into something the device can understand. The device executes the instructions it is given.

Algorithms help to describe the solution to a problem or task; by identifying the data and the process needed to represent the problem or task *and* the set of steps needed to produce the desired result.

Programming languages typically provide the representation of both the data and the process; they provide control constructs and data types (which can be numbers, words, and objects, and be constant or variable).

The control constructs are used to represent the steps of an algorithm in a convenient yet unambiguous fashion. Algorithms require constructs that can perform sequential processing, selection for decision-making, and iteration for repetitive control. Any programming language that provides these basic features can be used for algorithm representation.

This unit introduces students to the core concepts of programming with an introduction to algorithms and the characteristics of programming paradigms. Among the topics included in this unit are: introduction to algorithms, procedural, object-orientated & event-driven programming, security considerations, the integrated development environment and the debugging process.

On successful completion of this unit students will be able to design and implement algorithms in a chosen language within a suitable Integrated Development Environment (IDE). This IDE will be used to develop and help track any issues with the code.

As a result they will develop skills such as communication literacy, critical thinking, analysis, reasoning and interpretation which are crucial for gaining employment and developing academic competence.

Learning Outcomes

By the end of this unit students will be able to:

LO1. Define basic algorithms to carry out an operation and outline the process of programming an application.
LO2. Explain the characteristics of procedural, object-orientated and event-driven programming, conduct an analysis of a suitable Integrated Development Environment (IDE).
LO3. Implement basic algorithms in code using an IDE.
LO4. Determine the debugging process and explain the importance of a coding standard.

Essential Content

LO1 **Define basic algorithms to carry out an operation and outline the process of programming an application**

Algorithm definition:
Writing algorithms to carry out an operation, e.g. Bubble sort.
The relationship between algorithms and code.
The generation process of code; the roles of the pre-processor, compiler and linker, interpreter.

LO2 **Explain the characteristics of procedural, object-orientated and event-driven programming. Conduct an analysis of a suitable Integrated Development Environment (IDE)**

Characteristics of code:
Definitions of: data types (the role of constants/variables), methods (including input/output), control structures, iteration, scope, parameter passing, classes, inheritance and events.
Key components of an IDE with a brief explanation each component.

LO3 **Implement basic algorithms in code using an IDE**

Implementation:
Developing simple applications which implements basic algorithms covered in LO1, using the features of a suitable language and IDE. Consider possible security concerns and how these could be solved.

LO4 **Determine the debugging process and explain the importance of a coding standard**

Review and reflection:
Documentation of the debugging process in the IDE, with reference to watch lists, breakpoints and tracing.
How the debugging process can be used to help developers fix vulnerabilities, defects and bugs in their code.
What a coding standard is and its benefits when writing code.

Learning Outcomes and Assessment Criteria

<table>
<tr><th>Pass</th><th>Merit</th><th>Distinction</th></tr>
<tr><td colspan="2">LO1 Define basic algorithms to carry out an operation and outline the process of programming an application</td><td rowspan="2">D1 Examine the implementation of an algorithm in a suitable language. Evaluate the relationship between the written algorithm and the code variant.</td></tr>
<tr><td>P1 Provide a definition of what an algorithm is and outline the process in building an application.</td><td>M1 Determine the steps taken from writing code to execution.</td></tr>
<tr><td colspan="2">LO2 Explain the characteristics of procedural, objectorientated and event-driven programming, conduct an analysis of a suitable Integrated Development Environment (IDE)</td><td rowspan="2">D2 Critically evaluate the source code of an application which implements the programming paradigms, in terms of the code structure and characteristics.</td></tr>
<tr><td>P2 Give explanations of what procedural, objectorientated and eventdriven paradigms are; their characteristics and the relationship between them.</td><td>M2 Analyse the common features that a developer has access to in an IDE.</td></tr>
<tr><td colspan="2">LO3 Implement basic algorithms in code using an IDE</td><td rowspan="2">D3 Evaluate the use of an IDE for development of applications contrasted with not using an IDE.</td></tr>
<tr><td>P3 Write a program that implements an algorithm using an IDE.</td><td>M3 Use the IDE to manage the development process of the program.</td></tr>
<tr><td colspan="2">LO4 Determine the debugging process and explain the importance of a coding standard</td><td rowspan="2">D4 Critically evaluate why a coding standard is necessary in a team as well as for the individual.</td></tr>
<tr><td>P4 Explain the debugging process and explain the debugging facilities available in the IDE.

P5 Outline the coding standard you have used in your code.</td><td>M4 Evaluate how the debugging process can be used to help develop more secure, robust applications.</td></tr>
</table>

Recommended Resources

This unit does not specify which programme language should be used to deliver this content – this decision can be made by the tutor.

Examples of languages that are used in industry are C#, Python, Ruby, Java, but any language which will allow the student to achieve the Learning Outcomes is acceptable.

Textbooks

AHO, A. V. et al. (1987) *Data Structures and Algorithms*. 1st Ed. Addison-Wesley.

HUNT, A. et al. (2000) *The Pragmatic Programmer: From Journeyman to Master.* 1st Ed. Addison-Wesley.

MCCONNELL, S. (2004) Code Complete: A Practical Handbook of Software Construction. 2nd Ed. Microsoft Press.

Links

This unit links to the following related units:

Unit 19: Data Structures & Algorithms
Unit 20: Advanced Programming
Unit 28: Prototyping

Unit 2: Networking

Unit code **H/615/1619**
Unit type **Core**
Unit level **4**
Credit value **15**

Introduction

Computer networks are the driving force behind the evolution of computer systems and allow users to access data, hardware and services regardless of their location. Being knowledgeable about the underlying principles of networking is of vital importance to all IT professionals. Networking is an environment that is increasingly complex and under continuous development.

Complex computer networking has connected the world by groups of small networks through internet links to support global communications. It supports access to digital information anytime, anywhere using many applications like email, audio and video transmission, including the World Wide Web, and this has opened the floodgates to the availability of information.

The aim of this unit is to provide students with wider background knowledge of computer networking essentials, how they operate, protocols, standards, security considerations and the prototypes associated with a range of networking technologies.

Students will explore a range of hardware, with related software, and will configure and install these to gain knowledge of networking systems. A range of networking technologies will be explored to deliver a fundamental knowledge of Local Area Networking (LAN), Wide Area Networking (WAN) and their evolution to form largescale networks and the protocol methodologies related to IP data networks will be explored.

On successful completion of this unit students will gain knowledge and skills to successfully install, operate and troubleshoot a small network; and the operation of IP data networks, router, switching technologies, IP routing technologies, IP services and basic troubleshooting. Supporting a range of units in the Higher National suite, this unit underpins the principles of networks for all and enables students to work towards their studies in vendor units, if applicable.

Students will develop skills such as communication literacy, critical thinking, analysis, reasoning and interpretation, which are crucial for gaining employment and developing academic competence.

Learning Outcomes

By the end of this unit students will be able to:

LO1. Examine networking principles and their protocols.
LO2. Explain networking devices and operations.
LO3. Design efficient networked systems.
LO4. Implement and diagnose networked systems.

Essential Content

LO1 **Examine networking principles and their protocols**

Role of networks:
Purpose, benefits, resource implications, communications, working practice, commercial opportunity, information sharing, collaboration.

System types:
Peer-based, client-server, cloud, cluster, centralised, virtualised.

Networking standards:
Conceptual models e.g. OSI model, TCP/IP model; standards: e.g. IEEE 802.x.

Topology:
Logical e.g. Ethernet, Token Ring; physical e.g. star, ring, bus, mesh, tree, ring.

Protocols:
Purpose of protocols; routed protocols e.g. IPv4, IPv6, IPv6 addressing, Global unicast, Multicast, Link local, Unique local, EUI 64, Auto configuration, FTP, HTTP, SMTP, POP3, SSL; management of protocols for addressing.

LO2 **Explain networking devices and operations**

Networking devices:
Servers; hub, routers; switches; multilayer switch, firewall, HIDS, repeaters; bridges; wireless devices; access point (wireless/wired), content filter, Load balancer, Modem, Packet shaper, VPN concentrator.

Networking software:
Client software, server software, client operating system, server operating system, Firewall.

Server type:
Web, file, database, combination, virtualisation, terminal services server.

Server selection:
Cost, purpose, operating system requirement.

Workstation:
Hardware e.g. network card, cabling; permissions; system bus; local-system architecture e.g. memory, processor, I/O devices.

LO3 **Design efficient networked systems**

Bandwidth:
Expected average load; anticipated peak load; local internet availability; cost constraints, throughput.

Users:
Quality expectations, concept of system growth.

Networking services and applications:
DHCP; static vs dynamic IP addressing, reservations, scopes, leases, options (DNS servers, Suffixes), IP helper, DHCP relay, DNS records, Dynamic DNS.

Communications:
Suited to devices, suited to users, supportive of lifestyle desires, supportive of commercial requirements, security requirements, quality of service needs.

Scalable:
Able to support device growth, able to support addition of communication devices, able to cope with bandwidth use and trend changes, protocol utilisation, addressing.

Selection of components:
Supporting infrastructure needs; supporting connectivity requirements.

LO4 **Implement and diagnose networked systems**

Devices:
Installation of communication devices, allocation of addresses, local client configuration, server configuration, server installation, security considerations.

Verification of configuration and connectivity:
Installation of internet work communication medium, ping, extended ping, traceroute, telnet, SSH.

System monitoring:
Utilisation, bandwidth needs, monitoring user productivity and security of the system.

Maintenance schedule:
Backups, upgrades, security, auditing.

Diagnose and resolve layer 1 problems:
Framing, CRC, Runts, Giants, Dropped packets, late collisions, Input/Output errors.

Policy review:
Bandwidth, resource availability.

Learning Outcomes and Assessment Criteria

<table>
<tr><th>Pass</th><th>Merit</th><th>Distinction</th></tr>
<tr><td colspan="2">LO1 Examine networking principles and their protocols</td><td rowspan="4">LO1 & 2

D1 Considering a given scenario, identify the topology protocol selected for the efficient utilisation of a networking system.</td></tr>
<tr><td>P1 Discuss the benefits and constraints of different network types and standards.

P2 Explain the impact of network topology, communication and bandwidth requirements.</td><td>M1 Compare common networking principles and how protocols enable the effectiveness of networked systems.</td></tr>
<tr><td colspan="2">LO2 Explain networking devices and operations</td></tr>
<tr><td>P3 Discuss the operating principles of networking devices and server types.

P4 Discuss the inter-dependence of workstation hardware with relevant networking software.</td><td>M2 Explore a range of server types and justify the selection of a server, considering a given scenario regarding cost and performance optimisation.</td></tr>
<tr><td colspan="2">LO3 Design efficient networked systems</td><td rowspan="2">D2 Design a maintenance schedule to support the networked system.</td></tr>
<tr><td>P5 Design a networked system to meet a given specification.

P6 Test and evaluate the design to meet the requirements and analyse user feedback.</td><td>M3 Install and configure network services and applications on your choice.</td></tr>
<tr><td colspan="2">LO4 Implement and diagnose networked systems</td><td rowspan="2">D3 Use critical reflection to evaluate own work and justify valid conclusions.</td></tr>
<tr><td>P7 Implement a networked system based on a prepared design.

P8 Document and analyse test results against expected results.</td><td>M4 Recommend potential enhancements for the networked systems.</td></tr>
</table>

Recommended Resources

Textbooks

BURGESS, M. (2003) *Principles of Network and System Administration*. 2nd Ed. John Wiley and Sons Ltd.

HALLBERG, B. (2005) *Networking: A Beginner's Guide*. 4th Ed. Osborne/McGraw-Hill US.

LIMONCELLI, T. and HOGAN, C. (2001) *The Practice of System and Network Administration*. Addison-Wesley.

LOWE, D. (2005) *Networking All-in-One Desk Reference for Dummies*. 2nd Ed. Hungry Minds Inc.

OLIFER, N. and OLIFER, V. (2005) *Computer Networks: Principles, Technologies and Protocols for Network Design*. John Wiley and Sons Ltd.

STALLINGS, W. (2003) *Data and Computer Communications*. 7th Ed.(Prentice Hall)

SUBRAMANIAN, M. (2000) *Network Management: An Introduction to Principles and Practice.* Addison-Wesley.

TANENBAUM, A. (2002) *Computer Networks*. Prentice Hall PTR.

Journals

The Institute of Engineering and Technology

Links

This unit links to the following related units:

Unit 8: Computer Systems Architecture
Unit 15: Transport Network Design
Unit 17: Network Security
Unit 35: Network Management
Unit 36: Client/Server Computing Systems

Unit 3: Professional Practice

Unit code **Y/615/1620**
Unit type **Core**
Unit level **4**
Credit value **15**

Introduction

The need to be effective as a communicator, critical thinker, analyser, team worker and interpreter is essential. Within the workplace these skills are needed on a daily basis to show proficiency in designated tasks as part of a job role. The development of academic competence, and also the continuation of life-long learning and Continuing Professional Development (CPD), is required to ensure that individuals have a valued set of interpersonal skills that can be applied to any situation or environment.

This unit provides a foundation for good practice in a variety of contexts. The ability to communicate effectively using different tools and mediums will ensure that practical, research, design, reporting and presentation tasks are undertaken professionally and in accordance with various communication conventions. In everyday life the ability to apply critical reasoning and solve problems are necessary skills to enable task resolution and facilitate effective decision-making. Working with others in a group environment academically or within the workplace is an integral part of everyday life. Therefore, understanding the dynamics of teams in terms of culture, roles and responsibilities will ensure that there is a better understanding and awareness of the importance and value of teamwork. Continuing professional development, self-improvement and working towards various goals is an area that is encouraged in the workplace through the appraisals framework. In addition, professional development extends into higher levels of learning and the need to demonstrate effective research skills and academic reporting skills is also required.

Among the topics included in this unit are: the development of communication skills and communication literacy; the use of qualitative and quantitative data to demonstrate analysis, reasoning and critical thinking; and tasks that require the integration of others within a team-based scenario and planning and problemsolving.

On successful completion of this unit students will be able to demonstrate leadership skills through the dynamics of team working, and through reflective practice be able to evaluate the contributions made as an individual and also of others. As a result they will develop skills such as communication literacy, critical thinking, analysis, reasoning and interpretation, which are crucial for gaining employment and developing academic competence.

Learning Outcomes

By the end of this unit students will be able to:

LO1 Demonstrate a range of interpersonal and transferable communication skills to a target audience.

LO2 Apply critical reasoning and thinking to a range of problem-solving scenarios.

LO3 Discuss the importance and dynamics of working within a team and the impact of team working in different environments.

LO4 Examine the need for Continuing Professional Development (CPD) and its role within the workplace and for higher level learning.

Essential Content

LO1 **Demonstrate a range of interpersonal and transferable communication skills to a target audience**

Effective communication:
Verbal and non-verbal e.g. awareness and use of body language, openness and responsiveness, formal and informal dialogue and feedback to a range of different stakeholders; academic report writing; use of IT to enhance communication; use of source information to undertake research.

Interpersonal skills:
Soft skills e.g. personal effectiveness, working with others, use of initiative, negotiating skills, assertiveness skills and social skills.

Time management skills:
Prioritising workloads; setting objectives; using time effectively; making and keeping appointments; planning and scheduling tasks and activities.

LO2 **Apply critical reasoning and thinking to a range of problem-solving scenarios**

Specification of the problem:
Definition of the problem; analysis and clarification.

Identification of possible outcomes:
Identification and assessment of various alternative outcomes.

Tools and methods:
Use of problem-solving methods and tools.

Plan and implement:
Sources of information; solution methodologies; selection and implementation of the best corrective action e.g. timescale, stages, resources, critical path analysis.

Evaluation:
Evaluation of whether the problem was solved or not; measurement of solution against specification and desired outcomes; sustainability.

LO3 **Discuss the importance and dynamics of working within a team and the impact of team working in different environments**

Working with others:
Nature and dynamics of team and group work; informal and formal settings; purpose of teams and groups e.g. long-term corporate objectives/strategy; problem-solving and short-term development projects; flexibility/adaptability; team player.

Teams and team building:
Selecting team members e.g. specialist roles, skill and style/approach mixes; identification of team/work group roles; stages in team development e.g. team building, identity, loyalty, commitment to shared beliefs, team health evaluation; action planning; monitoring and feedback; coaching skills; ethics; effective leadership skills e.g. setting direction, setting standards, motivating, innovative, responsive, effective communicator, reliability, consistency.

LO4 **Examine the need for Continuing Professional Development (CPD) and its role within the workplace and for higher level learning**

Responsibilities:
Own responsibilities e.g. personal responsibility, direct and indirect relationships and adaptability, decision-making processes and skills, ability to learn and develop within the work role; other e.g. employment legislation, ethics, employment rights and responsibilities.

Performance objectives:
Setting and monitoring performance objectives, measurement tools for success and achievement.
Continuing Professional Development: lifelong learning, training and development, personal development, professional development.

Evidence criteria:
Production data, personnel data, judgemental data; rating methods e.g. ranking, paired comparison, checklist, management by objectives; skills audit (personal profile using appropriate self-assessment tools); evaluating selfmanagement; personal and interpersonal skills.

Motivation and performance:
Application and appraisal of motivational theories and techniques, rewards and incentives; manager's role; self-motivational factors.

Development plan:
Current performance; future needs; opportunities and threats to career progression; aims and objectives; achievement dates; review dates; learning programme/activities; action plans; personal development plans.

Learning Outcomes and Assessment Criteria

<table>
<tr><th>Pass</th><th>Merit</th><th>Distinction</th></tr>
<tr><td colspan="2">LO1 Demonstrate a range of interpersonal and transferable communication skills to a target audience</td><td rowspan="4"></td></tr>
<tr><td>P1 Demonstrate, using different communication styles and formats, that you can effectively design and deliver a training event for a given target audience.

P2 Demonstrate that you have used effective time management skills in planning an event.</td><td>M1 Design a professional schedule to support the planning of an event, to include contingencies and justifications of time allocated.</td></tr>
<tr><td colspan="2">LO2 Apply critical reasoning and thinking to a range of problem-solving scenarios</td></tr>
<tr><td>P3 Demonstrate the use of different problem-solving techniques in the design and delivery of an event.

P4 Demonstrate that critical reasoning has been applied to a given solution.</td><td>M2 Research the use of different problem-solving techniques used in the design and delivery of an event.

M3 Justify the use and application of a range of solution methodologies.</td></tr>
<tr><td colspan="2">LO3 Discuss the importance and dynamics of working within a team and the impact of team working in different environments</td><td rowspan="2"></td></tr>
<tr><td>P5 Discuss the importance of team dynamics in the success and/or failure of group work.

P6 Work within a team to achieve a defined goal.</td><td>M4 Analyse team dynamics, in terms of the roles group members play in a team and the effectiveness in terms of achieving shared goals.</td></tr>
<tr><td colspan="2">LO4 Examine the need for Continuing Professional Development (CPD) and its role within the workplace and for higher level learning</td><td rowspan="2"></td></tr>
<tr><td>P7 Discuss the importance of CPD and its contribution to own learning.

P8 Produce a development plan that outlines responsibilities, performance objectives and required skills, knowledge and learning for own future goals.</td><td>M5 Compare and contrast different motivational theories and the impact they can have on performance within the workplace.</td></tr>
</table>

Recommended Resources

Textbooks

Cottrell, S. (2001) *Critical Thinking Skills: Developing Effective Analysis and Argument*. 2nd Ed. Palgrave Macmillan.

Forde, C. (2006) *Professional Development, Reflection and Enquiry*. Sage Publications.

Megginson, D. and Whitaker, V. (2007) *Continuing Professional Development*. 2nd Ed. Chartered Institute of Personnel and Development.

Winstanley, D. (2005) *Personal Effectiveness: A guide to action.* Chartered Institute of Personnel and Development.

Journals

Journal of Group Dynamics
Professional Development in Education

Websites

www.thinkwatson.com	Critical Thinking Resources "Critical Thinking Correlation Studies" (Research)
ipda.org.uk	International Professional Development Association (General Reference)

Links

This unit links to the following related units:

Unit 6: Managing a Successful Computing Project
Unit 13: Computing Research Project

Unit 4: Database Design & Development

Unit code **H/615/1622**
Unit type **Core**
Unit level **4**
Credit value **15**

Introduction

Organisations depend on their databases to provide information essential for their day-to-day operations and to help them take advantage of today's rapidly growing and maturing e-commerce opportunities. An understanding of database tools and technologies is an essential skill for designing and developing systems to support them.

Database systems continue to demand more complex data structures and interfaces, as applications get increasingly sophisticated. Most organisations collect and store large volumes of data, either on their own systems or in the cloud, and this data is used not just for the operational running of their business but also mined for other more intelligent and complex applications. Databases stand as the back-end of most systems used by organisations for their operations.

Database design and development is a fundamental and highly beneficial skill for computing students to master, regardless of their specialism.

The aim of this unit is to give students opportunities to develop an understanding of the concepts and issues relating to database design and development, as well as to provide the practical skills to translate that understanding into the design and creation of complex databases.

Topics included in this unit are: examination of different design tools and techniques; examination of different development software options; considering the development features of a fully functional robust solution covering data integrity, data validation, data consistency, data security and advanced database querying facilities across multiple tables; appropriate user interfaces for databases and for other externally linked systems; creating complex reports/dashboards, testing the system against the user and system requirements; and elements of complete system documentation.

On successful completion of this unit students will be able to use appropriate tools to design and develop a relational database system for a substantial problem. They will be able to test the system to ensure it meets user and system requirements and fully document the system by providing technical and user documentation. For practical purposes, this unit covers relational databases and related tools and techniques. A brief overview of object-oriented databases will also be covered.

Students will develop skills such as communication literacy, critical thinking, analysis, reasoning and interpretation, which are crucial for gaining employment and developing academic competence.

Learning Outcomes

By the end of this unit students will be able to:

LO1. Use an appropriate design tool to design a relational database system for a substantial problem.

LO2. Develop a fully functional relational database system, based on an existing system design.

LO3. Test the system against user and system requirements.

LO4. Produce technical and user documentation.

Essential Content

LO1 **Use an appropriate design tool to design a relational database system for a substantial problem**

The role of database systems e.g. as back-end systems, in e-commerce, for data mining applications etc.

Determining user and system requirements.

Design tools and techniques for a relational database system.

Logical design for relational databases e.g. tables, data elements, data types, indexes, primary/foreign keys, entity relationship modelling, referential integrity, data normalisation to third normal form.

Designs for data integrity, data validations, data security and data controls.

User interface design.

Output designs for user requirements.

Overview of object-oriented databases and their design tools.

LO2 **Develop a fully functional relational database system, based on an existing system design**

Consideration of database and platform options for system development.

Examination of different software development options for developing the relational database system.

Implementation of the physical data model based on the logical model.

Data stores, internal storage and external storage (e.g. the cloud).

Implementation of security elements in databases.

Relational databases with controls like data validation using; input masks, drop down lists, option buttons.

User interface for requirements, functionality, reliability, consistency and performance.

Consideration of interface links with other systems e.g. internet-based applications.

Data manipulation using appropriate query tools, including complex queries to query across multiple tables, and using functions and formulae.

Database maintenance and data manipulation: inserts, updates, amendments, deletions, data backup and recovery.

System reports using report writing tools and report generators, dashboards.

LO3 **Test the system against user and system requirements**

Identify elements of the system that need to be tested.

Consider data that should be used to fully test the system.

Match tests against user and system requirements.

Test procedures to be used: test plans, test models e.g. white box, black box; testing documentation.

Functional and system testing and testing the robustness of the system, including help menus, pop-ups, hot-spots, data validation checks.

LO4 **Produce technical and user documentation**

Technical and user documentation and their contents.

Learning Outcomes and Assessment Criteria

Pass	Merit	Distinction
LO1 Use an appropriate design tool to design a relational database system for a substantial problem		
P1 Design a relational database system using appropriate design tools and techniques, containing at least four interrelated tables, with clear statements of user and system requirements.	**M1** Produce a comprehensive design for a fully functional system which includes interface and output designs, data validations and data normalisation.	**D1** Assess the effectiveness of the design in relation to user and system requirements.
LO2 Develop a fully functional relational database system, based on an existing system design		**LO2 & 3**
P2 Develop the database system with evidence of user interface, output and data validations, and querying across multiple tables. **P3** Implement a query language into the relational database system.	**M2** Implement a fully functional database system which includes system security and database maintenance. **M3** Assess whether meaningful data has been extracted through the use of query tools to produce appropriate management information.	**D2** Evaluate the effectiveness of the database solution in relation to user and system requirements, and suggest improvements.
LO3 Test the system against user and system requirements		
P4 Test the system against user and system requirements.	**M4** Assess the effectiveness of the testing, including an explanation of the choice of test data used.	
LO4 Produce technical and user documentation		
P5 Produce technical and user documentation.	**M5** Produce technical and user documentation for a fully functional system, including diagrams showing movement of data through the system, and flowcharts describing how the system works.	**D3** Assess any future improvements that may be required to ensure the continued effectiveness of the database system.

Recommended Resources

Textbooks

Churcher, C. (2012) Beginning Database Design: From Novice to Professional. 2nd Ed. Apress.

Connolly, T. and Begg, C. (2014) Database Systems: A Practical Approach to Design, Implementation and Management. 6th Ed. Global Edition. Pearson.

Kroemke, D. and Auer, D. (2012) Database Concepts: International Edition. 6th Ed. Pearson.

Paulraj, P (2008). Database Design and Development: An Essential Guide for IT Professional. Wiley.

Stephens, R. (2008) Beginning Database Design Solutions. Wrox.

Journals

International Journal of Database Management Systems
Journal of Database Management
The Computer Journal
Journal of Systems Analysis and Software Engineering
Journal of Emerging Trends in Computing and Information Sciences

Websites

www.lynda.com	Database Training (Tutorials)
mva.microsoft.com	Microsoft Virtual Academy “Database Development” (Training)
mva.microsoft.com/ebooks	Microsoft Virtual Academy “Microsoft Press” (E-Books)

Links

This unit links to the following related units:

Unit 7: Strategic Information Systems
Unit 38: Database Management Systems

Unit 5: Security

Unit code **K/615/1623**
Unit type **Core**
Unit level **4**
Credit value **15**

Introduction

Security is one of the most important challenges modern organisations face. Security is about protecting organisational assets, including personnel, data, equipment and networks from attack through the use of prevention techniques in the form of vulnerability testing/security policies and detection techniques, exposing breaches in security and implementing effective responses.

The aim of this unit is to provide students with knowledge of security, associated risks and how security breaches impact on business continuity. Students will examine security measures involving access authorisation, regulation of use, implementing contingency plans and devising security policies and procedures.

This unit introduces students to the detection of threats and vulnerabilities in physical and IT security, and how to manage risks relating to organisational security.

Among the topics included in this unit are Network Security design and operational topics, including address translation, DMZ, VPN, firewalls, AV and intrusion detection systems. Remote access will be covered, as will the need for frequent vulnerability testing as part of organisational and security audit compliance.

Students will develop skills such as communication literacy, critical thinking, analysis, reasoning and interpretation, which are crucial for gaining employment and developing academic competence.

Learning Outcomes

By the end of this unit students will be able to:

LO1 Assess risks to IT security.
LO2 Describe IT security solutions.
LO3 Review mechanisms to control organisational IT security.
LO4 Manage organisational security.

Essential Content

LO1 **Assess risks to IT security**

IT security risks:

Risks: unauthorised use of a system; unauthorised removal or copying of data or code from a system; damage to or destruction of physical system assets and environment; damage to or destruction of data or code inside or outside the system; naturally occurring risks.

Organisational security: business continuance; backup/restoration of data; audits; testing procedures e.g. data, network, systems, operational impact of security breaches, WANs, intranets, wireless access systems.

LO2 **Describe IT security solutions**

IT security solution evaluation:

Network Security infrastructure: evaluation of NAT, DMZ, FWs.

Network performance: RAID, Main/Standby, Dual LAN, web server balancing.

Data security: explain asset management, image differential/incremental backups, SAN servers.

Data centre: replica data centres, virtualisation, secure transport protocol, secure MPLS routing and remote access methods/procedures for third-party access.

Security vulnerability: logs, traces, honeypots, data mining algorithms, vulnerability testing.

LO3 **Review mechanisms to control organisational IT security**

Mechanisms to control organisational IT security:

Risk assessment and integrated enterprise risk management: network change management, audit control, business continuance/disaster recovery plans, potential loss of data/business, intellectual property, hardware and software; probability of occurrence e.g. disaster, theft; staff responsibilities; Data Protection Act; Computer Misuse Act; ISO 3001 standards.

Company regulations: site or system access criteria for personnel; physical security types e.g. biometrics, swipe cards, theft prevention.

LO4 **Manage organisational security**

Manage organisational security:

Organisational security: policies e.g. system access, access to internet email, access to internet browser, development/use of software, physical access and protection, 3rd party access, business continuity, responsibility matrix.

Controlling security risk assessments and compliance with security procedures and standards e.g. ISO/IEC 17799:2005 Information Technology (Security Techniques – code of practice for information security management); informing colleagues of their security responsibilities and confirming their understanding at suitable intervals; using

enterprise risk management for identifying, evaluating, implementing and follow up of security risks according to ISO 3001 standards.

Security: tools e.g. user log-on profiles to limit user access to resources; online software to train and update staff; auditing tools to monitor resource access; security audits; penetration testing; ethical hacking; gathering and recording information on security; initiating suitable actions for remediation.

Learning Outcomes and Assessment Criteria

Pass	Merit	Distinction
LO1 Assess risks to IT security		
P1 Identify types of security risks to organisations. **P2** Describe organisational security procedures.	**M1** Propose a method to assess and treat IT security risks.	**LO1 & 2** **D1** Investigate how a 'trusted network' may be part of an IT security solution.
LO2 Describe IT security solutions		
P3 Identify the potential impact to IT security of incorrect configuration of firewall policies and thirdparty VPNs. **P4** Show, using an example for each, how implementing a DMZ, static IP and NAT in a network can improve Network Security.	**M2** Discuss three benefits to implement network monitoring systems with supporting reasons.	
LO3 Review mechanisms to control organisational IT security		
P5 Discuss risk assessment procedures. **P6** Explain data protection processes and regulations as applicable to an organisation.	**M3** Summarise the ISO 31000 risk management methodology and its application in IT security. **M4** Discuss possible impacts to organisational security resulting from an IT security audit.	**D2** Consider how IT security can be aligned with organisational policy, detailing the security impact of any misalignment.
LO4 Manage organisational security		
P7 Design and implement a security policy for an organisation. **P8** List the main components of an organisational disaster recovery plan, justifying the reasons for inclusion.	**M5** Discuss the roles of stakeholders in the organisation to implement security audit recommendations.	**D3** Evaluate the suitability of the tools used in an organisational policy.

Recommended Resources

Textbooks

Alexander, D. et al. (2008) *Information Security Management Principles*. BSC.

Steinberg, R. (2011) *Governance, Risk Management, and Compliance: It Can't Happen to Us – Avoiding Corporate Disaster While Driving Success*. Wiley.

Tipton, H. (2010) *Information Security Management Handbook*. 4th Ed. Auerbach Pubs.

Websites

www.bcs.org	British Computer Society (General Reference)
www.bsa.org.uk	Business Software Alliance (General Reference)
www.fast.org.uk	Federation Against Software Theft (General Reference)
www.ico.gov.uk	Information Commissioners Office (General Reference)

Links

This unit links to the following related units:

Unit 17: Network Security
Unit 23: Cryptography
Unit 24: Forensics
Unit 25: Information Security Management

Unit 6: Managing a Successful Computing Project (Pearson-set)

Unit code **T/615/1625**
Unit type **Core**
Unit level **4**
Credit value **15**

Introduction

This unit is assessed by a Pearson-set assignment. The project brief will be set by the centre, based on a theme provided by Pearson (this will change annually). The theme and chosen project within the theme will enable students to explore and examine a relevant and current topical aspect of computing in the context of a business environment.

In order to ensure that client expectations are met in terms of requirements, deadlines and the estimated cost, the work to deliver new computer systems or services to business organisations, or to revamp the existing ones, is always organised in projects. Therefore, skilful, knowledgeable and experienced project managers have always been in demand. It is projected that 15.7 million new project management roles will be created around the world by 2020.

The aim of this unit is to offer students an opportunity to demonstrate the skills required for managing and implementing a project. They will undertake independent research and investigation for carrying out and executing a computing project which meets appropriate aims and objectives.

On successful completion of this unit students will have the confidence to engage in decision-making, problem-solving and research activities using project management skills. They will have the fundamental knowledge and skills to enable them to investigate and examine relevant computing concepts within a workrelated context, determine appropriate outcomes, decisions or solutions and present evidence to various stakeholders in an acceptable and understandable format.

Learning Outcomes

By the end of this unit students will be able to:

LO1 Establish project aims, objectives and timeframes based on the chosen theme.

LO2 Conduct small-scale research, information gathering and data collection to generate knowledge to support the project.

LO3 Present the project and communicate appropriate recommendations based on meaningful conclusions drawn from the evidence findings and/or analysis.

LO4 Reflect on the value gained from conducting the project and its usefulness to support sustainable organisational performance.

Essential Content

LO1 **Establish project aims, objectives and timeframes based on the chosen theme**

Project management:

What is project management and what does it involve?

The key stages of project management.

The advantages of using project management and why it is important.

Initiation of the project and project planning phase:

Scoping a project − defining objectives, scope, purpose and deliverables to be produced.

Steps and documentation required in the initiation phase.

Developing the project plan, including planning for timescales and time management, cost, quality, change, risk and issues.

The work breakdown structure.

Use of Bar and Gantt Charts for effective planning.

LO2 **Conduct small-scale research, information gathering and data collection to generate knowledge to support the project**

Project execution phase:

Selecting appropriate methods of information gathering, data collection and material resourcing.

The distinct phases which support a coherent and logical argument.

Use of secondary research to inform a primary empirical study.

Qualitative and quantitative research methods.

Field work:

Selecting a sample of the consumer market, businesses or individuals (those who meet certain characteristics relevant to the research theme) is used to gather data (qualitative or quantitative).

Sampling approaches and techniques, including probability and nonprobability sampling.

Ethics, reliability and validity:

All research should be conducted ethically − how is this achieved and reported?

Research should also be reliable (similar results achieved from a similar sample) and valid (the research should measure what it aimed to measure).

Analysing information and data:

Using data collection tools such as interviews and questionnaires.

Using analytical techniques such as trend analysis, coding or typologies.

LO3 **Present the project and communicate appropriate recommendations based on meaningful conclusions drawn from the evidence findings and/or analysis**

Communicating outcomes:

Consider the method (e.g. written, verbal) and the medium (e.g. report, online, presentation).

Both method and medium will be influenced by the project research and its intended audience.

Convincing arguments:

All findings/outcomes should be convincing and presented logically where the assumption is that the audience has little or no knowledge of the project process.

Developing evaluative conclusions.

Critical and objective analysis and evaluation:

Secondary and primary data should be critiqued and considered with an objective mindset.

Objectivity results in more robust evaluations where an analysis justifies a judgement.

LO4 **Reflect on the value gained from conducting the project and its usefulness to support sustainable organisational performance**

Reflection for learning and practice:

The difference between reflecting on performance and evaluating a project − the former considers the research process, information gathering and data collection, the latter the quality of the research argument and use of evidence.

The cycle of reflection:

To include reflection in action and reflection on action.
How to use reflection to inform future behaviour, particularly directed towards sustainable performance.

Reflective writing:

Avoiding generalisation and focusing on personal development and the research journey in a critical and objective way.

Generalisation:

Many studies result in generalised findings. Research which has its basis in a specific field such as Human Resource Management (HRM) and in a specific context should avoid generalised conclusions.

Outcomes should be specific and actionable.

Learning Outcomes and Assessment Criteria

<table>
<tr><th>Pass</th><th>Merit</th><th>Distinction</th></tr>
<tr><td colspan="2">LO1 Establish project aims, objectives and timeframes based on the chosen theme</td><td rowspan="5">LO1 & 2

D1 Critically evaluate the project management process and appropriate research methodologies applied.</td></tr>
<tr><td>P1 Devise project aims and objectives for a chosen scenario.

P2 Produce a project management plan that covers aspects of cost, scope, time, quality, communication, risk and resources.

P3 Produce a work breakdown structure and a Gantt Chart to provide timeframes and stages for completion.</td><td>M1 Produce a comprehensive project management plan, milestone schedule and project schedule for monitoring and completing the aims and objectives of the project.</td></tr>
<tr><td colspan="2">LO2 Conduct small-scale research, information gathering and data collection to generate knowledge to support the project</td></tr>
<tr><td>P4 Carry out small-scale research by applying qualitative and quantitative research methods appropriate for meeting project aims and objectives.</td><td>M2 Evaluate the accuracy and reliability of different research methods applied.</td></tr>
<tr><td colspan="2">LO3 Present the project and communicate appropriate recommendations based on meaningful conclusions drawn from the evidence findings and/or analysis</td></tr>
<tr><td>P5 Analyse research and data using appropriate tools and techniques.

P6 Communicate appropriate recommendations as a result of research and data analysis to draw valid and meaningful conclusions.</td><td>M3 Evaluate the selection of appropriate tools and techniques for accuracy and authenticity to support and justify recommendations.</td><td rowspan="3">LO3 & 4

D2 Critically evaluate and reflect on the project outcomes, the decision-making process and changes or developments of the initial project management plan to support justification of recommendations and learning during the project.</td></tr>
<tr><td colspan="2">LO4 Reflect on the value gained from conducting the project and its usefulness to support sustainable organisational performance</td></tr>
<tr><td>P7 Reflect on the value of undertaking the research to meet stated objectives and own learning and performance.</td><td>M4 Evaluate the value of the project management process and use of quality research to meet stated objectives and support own learning and performance.</td></tr>
</table>

Additional Evidence Requirements

In addition to the above assessment criteria, students will also be required to complete a project logbook to record ideas, changes and developments as they progress and complete the project.

Recommended Resources

Textbooks

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

Dawson, C. (2016) *Projects in Computing and Information Systems: A Student's Guide*. UK: Pearson Education.

Flick, U. (2011) *Introducing Research Methodology: A Beginner's Guide to Doing a Research Project*. London: SAGE.

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

Guay, M., Schreiber, D. and Briones, S. (2016) *The Ultimate Guide to Project Management: Learn everything you need to successfully manage projects and get them done*. Free Kindle Edition. US: Zapier Inc.

Lock, D. (2013) *Project Management 8th Edition*. UK: Routledge.

Pinto, J.K. (2015) *Project Management: Achieving Competitive Advantage* 4th Ed. Pearson.

Journals

International Journal of Quantitative and Qualitative Research
Qualitative Research Journal

Websites

www.gov.uk/government/publications	Department of Business Innovations and Skills "Guidelines for managing projects – How to organise, plan and control projects." (Report)

Links

This unit links to the following related units:

Unit 3: Professional Practice
Unit 13: Computing Research Project
Unit 14: Business Intelligence
Unit 34: Systems Analysis & Design

Unit 7: Strategic Information Systems

Unit code **A/615/1626**
Unit type **Optional**
Unit level **4**
Credit value **15**

Introduction

Information is the most valuable resource that an organisation possesses. The effective gathering, protection, analysis, processing and dissemination of information is vital to the success of any organisation. As globalisation and the 24-hour economy develop and increase, organisations must ensure that their information systems are reliable, efficient and able to cope with rapid change.

This unit introduces students to the importance of information to organisations. It will examine how systems can be used to support core business functions and enable organisations to be more productive and competitive within the global marketplace.

Students will be required to analyse the information needs of an organisation at different levels and within different functional areas. It is important that computing professionals are able to understand how an organisation works and how it uses information in order to be able to design, implement, maintain and manage secure information systems to support its operations.

Among the topics included in this unit are understanding organisations in terms of their information needs and the variances within different functional areas. Examination of different information systems at the operational, tactical and strategic levels will be required, in addition to evaluating their effectiveness and role in terms of decision making and gaining competitive advantage.

On successful completion of this unit students will have an insight into the types of systems and technologies available for effective information processing. Critical analysis will also be used to examine the integrated role that each of these play in contributing to the efficiency and competitiveness of organisations.

As a result students will develop skills such as communication literacy, critical thinking, analysis, reasoning and interpretation, which are crucial for gaining employment and developing academic competence.

Learning Outcomes

By the end of this unit students will be able to:

LO1 Analyse the information requirements of organisations.

LO2 Discuss the types of information systems that are used within all levels of an organisation.

LO3 Demonstrate the use of an information system to produce management information.

LO4 Evaluate the effectiveness of strategic information systems.

Essential Content

LO1 **Analyse the information requirements of organisations**

Functional area information requirements:
Finance and accounts for payroll, pensions, supplier payments and invoicing etc., human resources e.g. employee records, personnel data, appraisals, CPD etc., stock control, sales, marketing, research and development, production, distribution, IT, customer service and administration.

Information needs:
How different functional areas use and process data effectively; the integration of data and information within an organisation.

Requirements analysis:
The inputs, outputs and processing activities; information distribution requirements e.g. by location, department, individual/customer.

LO2 **Discuss the types of information systems that are used within all levels of an organisation**

Information systems types:

Business information systems, decision support systems, management information systems, strategic/executive information systems, office information systems, transaction processing systems, expert systems, global information systems, data warehouse systems, enterprise systems, enterprise resource planning systems, integrated information systems.

Categories of information systems:
Operational, tactical and strategic information systems.

Information and data:
Definition of information and data, sources of information, information requirements and the needs for information at different levels within an organisation; storing information and its importance with regard to security, accuracy and relevance; outputs e.g. payroll, invoicing, ordering, bookings, stock control, personnel records, goods tracking, decision-making, marketing, customer service.

LO3 **Demonstrate the use of an information system to produce management information**

Management information:
Reports e.g. sales report, college enrolment statistics, marketing analysis (brick v click), trends in the market, competition and market share.

Gathering information:
Defining requirements; establishing sources of information; defining other factors to be considered e.g. constraints and access to information.

Selecting information:

Analysis of information in terms of validity, accuracy, currency and relevancy; identifying and rationalising meaningful information from data sets.

Uses:
Proficiency in terms of accessing quality information that can be used for decision-making, problem-solving, predictions, trending and forecasting.

LO4 **Evaluate the effectiveness of strategic information systems**

Models for strategic information systems:
Porters Competitive Advantage and Wiseman's Strategic Planning Process.

Competitive advantage:
How can competitive advantage be measured and attributed to the implementation of a strategic information system?

Gaining competitive advantage:
Delivering a differentiated product or service; delivering a product or service at a lower cost; specific segmentation of the market e.g. targeted marketing to specific target audiences; innovative product or service design and implementation.

Learning Outcomes and Assessment Criteria

Pass	Merit	Distinction
LO1 Analyse the information requirements of organisations		
P1 Discuss the information needs and requirements for the functional departments of an organisation. **P2** Produce an input/output (I/O) diagram to represent the data and information requirements of a functional department.	**M1** Compare and contrast different processing activities that occur within functional departments within an organisation.	**D1** Evaluate the inputs, outputs and processing activities of a selected organisation.
LO2 Discuss the types of information systems that are used within all levels of an organisation		**D2** Differentiate between the function and purpose of information systems at different levels within an organisation.
P3 Describe the function of different information systems. **P4** Discuss the information needs required at differing levels within an organisation.	**M2** Analyse the effectiveness of information systems at the operational, tactical and strategic levels within an organisation.	
LO3 Demonstrate the use of an information system to produce management information		**D3** Critique, with examples, how a given organisation can use information for effective decision-making and forecasting.
P5 Demonstrate the use of an information system for management reporting purposes. **P6** Discuss the importance of an organisation having data and information that is current, valid and accurate.	**M3** Analyse the constraints that an organisation can face when gathering data and information.	
LO4 Evaluate the effectiveness of strategic information systems		**D4** Evaluate how strategic information systems can contribute to the competitiveness of organisations.
P7 Identify different models that can be applied to strategic information systems.	**M4** Justify the ways in which an organisation can obtain competitive advantage within a global market.	

Recommended Resources

Textbooks

Peppard, J. (2016) *The Strategic Management of Information Systems: Building a Digital Strategy*. 4th Ed. John Wiley & Sons.

Robson, W. (1997) *Strategic Management and Information Systems: An Integrated Approach*. 2nd Ed. Financial Times/ Prentice Hall.

Ward, J. (2002) *Strategic Planning for Information Systems*. 3rd Ed. John Wiley & Sons.

Whitely, D. (2013) *An Introduction to Information Systems*. Palgrave Macmillan.

Journals

The Journal of Strategic Information Systems
Information Systems Journal

Websites

it.toolbox.com	ToolBox.com "Strategic Information System Toolbox" (Wiki)
www.mbaknol.com	MBA Knowledge Base "Strategic Information Systems" (Article)

Links

This unit links to the following related units:

Unit 4: Database Design & Development
Unit 38: Database Management Systems

Unit 8: Computer Systems Architecture

Unit code **J/615/1628**
Unit type **Optional**
Unit level **4**
Credit value **15**

Introduction

As technology develops, it is important to have a working foundation on which to build your knowledge. Despite hardware and software being constantly updated and seemingly becoming more complex, students with a solid, underpinned knowledge about computer systems architecture will not only be able to answer questions like, “How does a central processor work?”, “What does an operating system do?”, “How is information stored?”, “What is an instruction set?” and “How do I actually connect to the internet?”, but will also be able to transfer and apply their knowledge and skill to many other areas.

This unit introduces students to the foundations of computer systems architecture together with the integrated hardware and software components and subsystems that enable and allow data to be input, processed and output. The unit further explores the concepts of operating systems, hardware management and computer networks together with the practical skills needed to diagnose, troubleshoot and maintain computer systems taking the security of these systems into consideration.

Among the topics included in this unit are: CPUs, memory, input & output devices, ALU operations, program execution, operating systems (including kernel, file systems, API and system calls), hardware management, installation, firmware, device drivers, networking (including OSI and TCP/IP models), error and information gathering, fault diagnostics, security and problem resolution.

On successful completion of this unit, students will be able to explain the purpose and role of operating systems, the relationship between the subsystems embedded within a central processing unit, the core hardware and software components associated with computer operations and be able to configure the hardware and systems needed to establish a computer network together with practical diagnostic and troubleshooting techniques. As a result they will develop skills such as communication literacy, critical thinking, analysis, reasoning and interpretation which are crucial for gaining employment and developing academic competence.

Learning Outcomes

By the end of this unit students will be able to:

LO1 Explain the relationships between hardware components and the subsystems used in a computer system.

LO2 Categorise the key features and services provided by different computer operating systems and hardware.

LO3 Use network communication technology and the associated services to connect computer systems.

LO4 Demonstrate diagnostic and troubleshooting skills to solve hardware, software and networking related issues.

Essential Content

LO1 **Explain the relationships between hardware components and the subsystems used in a computer system**

Hardware components and subsystems:

Computers consist of four main subsystems (Von Neumann Architecture, Memory, CPU (Arithmetical & Logic Unit (ALU) and Control Unit), Input and output Systems).

Review Memory subsystems regarding programs and data (variable) storage (ROM, RAM, size, speed, operation and structure).

Explore Input/output systems and structure (communicating with other devices (screen, keyboard, printers, etc.), storage (Hard Disk Drives (HDD), DVD's, etc.), IO controllers & data transfer (speed, buffers, interrupts, etc.).

Discuss ALU subsystems (mathematical & logical operations, registers, bus, etc.).

Investigate how the Control Unit works (program code & language, fetch, decode, execute, halt) including an introduction to machine language instructions (reduced instruction and complex instruction sets: arithmetic, compare, branch, control, Program Counter (PC), Instruction Register (IR) and Instruction decoder.

LO2 **Categorise the key features and services provided by different computer operating systems and hardware**

Operating system types and hardware:

Introduce different operating systems and types (desktop & server/network, mobile, embedded systems (e.g. Windows 10, Windows Server 2012/2016, Linux, Unix, MacOS, IOS, Android, etc.).

Hardware management and connections including the hardware abstraction layer, firmware and device drivers (network cards, video cards, optical drives, magnetic disks, solid state drives, RAID, etc.).

Installing and configuring common peripheral devices (mouse, keyboard, scanners, biometrics, webcams, smartcards, motion sensor, printers, speakers, display devices, etc.).

Features and services:

Introduce Operating Systems Architecture (Kernel, File Systems, API).

Review how operating systems function and provide services (user interface, memory management (Direct Memory Access), file management).

LO3 **Use network communication technology and the associated services to connect computer systems**

Networking technology and services:

Introduction to network protocols (HTTP, SMTP, TCP, UDP, etc.) including the OSI and TCP/IP models.

Hardware and network addresses (physical/MAC addresses, logical/IP addresses).

Network devices and components (network interface cards (NIC), network cables, switches, wireless access points, routers, network services).

Connecting computer systems to a network:

Introduce topologies including physical and logical: bus, star (extended star), ring and mesh.

Establishing network connections including wired/wireless client configuration.

Security of networking systems and the importance of this.

LO4 **Demonstrate diagnostic and troubleshooting skills to solve hardware, software and networking related issues.**

Hardware, software & networking issues and maintenance:

Different hardware and software related problems and the implication of choices with regards to system administration, impact on users and business operations.

Explore methods of maintenance with regard to hardware and software.

Diagnostic and troubleshooting skills:

Discuss information gathering methods and techniques (such as: system documents, user information, error codes, error messages, failure domain, problem history, etc.).

Consider solutions to security problems.

Analyse evidence and establish possible problem domains, complexity, priority and impact; introduce ‘Research, Determine, Implement, Review, Document (and Repeat)’.

Creating and updating system documentation.

Learning Outcomes and Assessment Criteria

<table>
<tr><th>Pass</th><th>Merit</th><th>Distinction</th></tr>
<tr><td colspan="2">LO1 Explain the relationships between hardware components and the subsystems used in a computer system</td><td rowspan="5">LO1 & 2

D1 Evaluate the structure and functions of an operating system including memory, processor, device, file, security, performance and error management with regards to functionality, operation and dependency.</td></tr>
<tr><td>P1 Identify the main subsystems of a computer and explain how they are organised and connected.

P2 Explain the purpose of the Central Processing Unit (CPU) and include details on its operation.</td><td>M1 Review the operation of the CPU and assess its dependency and performance with regards to associated systems and subsystems.</td></tr>
<tr><td colspan="2">LO2 Categorise the key features and services provided by different computer operating systems and hardware</td></tr>
<tr><td>P3 Describe a range of different operating systems including the purpose, use and hardware requirements of each.

P4 Discuss the key features associated with the architecture of an operating system.</td><td>M2 Analyse the services provided by an operating system with regards to user interaction, memory management, file management and hardware support.</td></tr>
<tr><td colspan="2">LO3 Use network communication technology and the associated services to connect computer systems</td><td rowspan="3">D2 Evaluate the OSI and TCP/IP models with regards to hierarchy, layers and services including information on the associated protocols and hardware.</td></tr>
<tr><td>P5 Explain the relationships between hardware and network addresses including their use with regards to networking devices and components.

P6 Setup, configure and document appropriate hardware and software systems to establish computer based network connectivity.</td><td>M3 Compare common physical and logical networking topologies and explain the differences and purposes of each.</td></tr>
<tr><td colspan="2">LO4 Demonstrate diagnostic and troubleshooting skills to solve hardware, software and networking related issues.</td></tr>
<tr><td>P7 Use information gathering methods to assess, troubleshoot and document solutions to a number of different technical hardware, software and networking issues.

P8 Conduct and document a range of maintenance activities with regards to computer hardware and software.</td><td>M4 Review different diagnostic and troubleshooting skills including data gathering methods and techniques.</td><td>D3 Assess any future improvements that may be required to ensure the continued effectiveness of a computer system.</td></tr>
</table>

Recommended Resources

Textbooks

Docter, Q., Dulaney, E. and Skandier, T. (2015) *CompTIA A+ Complete Study Guide: Exams 220-901 and 220-902. USA*: John Wiley & Sons Inc.

Mueller, S. (2015) *Upgrading and Repairing PCs. USA*: Que Publishing.

Patterson, D. and Hennessy, J. (2013) *Computer Organization and Design*: The Hardware/Software Interface. USA: Elsevier.

Links

This unit links to the following related units:

Unit 2: Networking
Unit 15: Transport Network Design
Unit 17: Network Security
Unit 35: Network Management
Unit 36: Client/Server Computing Systems

Unit 9: Software Development Lifecycles

Unit code **J/615/1631**
Unit type **Optional**
Unit level **4**
Credit value **15**

Introduction

The software development lifecycle is an integrated process that promotes building good quality, secure software throughout the entire development process. The aim of this unit is to provide students with the knowledge and skills needed to understand software development lifecycles and to demonstrate their knowledge by implementing a software development lifecycle with a suitable methodology.

This unit introduces students to lifecycle decision-making at different stages of the software development process. Students will examine various lifecycle models and appreciate their particular characteristics to understand which project environments they are most appropriate for. Theoretical understanding will be translated into practical skills through an actual software development lifecycle project and students will become confident in the use of particular tools and techniques relevant to a chosen methodology.

Among the topics included in this unit are iterative and sequential models of software development lifecycles and reference frameworks for initially capturing conceptual data and information through a feasibility study and requirement gathering techniques through to analysis, design and software implementation activities.

As a result students will develop skills such as communication literacy, critical thinking, analysis, reasoning and interpretation, which are crucial for gaining employment and developing academic competence.

Learning Outcomes

By the end of this unit students will be able to:

LO1 Describe different software development lifecycles.

LO2 Explain the importance of a feasibility study.

LO3 Undertake a software development lifecycle.

LO4 Discuss the suitability of software behavioural design techniques.

Essential Content

LO1 **Describe different software development lifecycles**

Software development lifecycles:

Lifecycle models: understanding and use of predictive (Waterfall, Prototyping, RAD) and adaptive (Spiral, Agile, DSDM) software development models.

Lifecycle stage and connectivity: feasibility study, analysis, design, implementation, testing, review or analysis, design, implementation, maintenance, planning; requirements traceability.

Test and integration: building test environments; developing test harnesses; black box/white box testing; incremental testing; acceptance test and integration approaches; changeover strategies, trials and Go-Live prerequisites.

LO2 **Explain the importance of a feasibility study**

Importance of feasibility study:

Requirement gathering techniques: e.g., interviews, observation, investigation

Key drivers: performance and efficiency; legacy systems upgrade; automation; elimination of human error.

Feasibility criteria: issues e.g. legal, social, economic, technical, timescales; organisational constraints.

Components: purpose; structure; intended audience; outcomes.

Requirements: MosCow; Functional; non-functional; user; constraints.

LO3 **Undertake a software development lifecycle**

Carry out software development lifecycle:

Identify requirements: stakeholders; requirements identification; requirements specification e.g. scope, inputs, outputs, processes and process descriptors; consideration of alternate solutions and security considerations; quality assurance required.

Constraints: specific to activity e.g. costs, organisational policies, legacy systems, hardware requirements.

Report documentation: structure e.g. background information, problem statements, data collection process and summary, recommendations, appendices.

Systems analysis terminology and tools: data stores and entities; data flows; process representation techniques relationships – 1:1, 1:Many (1:M) and Many:Many (M:M).

Investigation: e.g. upgrading computer systems, designing new systems.

Techniques: examples relevant to methodology chosen e.g. Context Diagrams, Data Flow Diagrams (DFDs), Entity Relationship Diagrams (ERDs); Business Systems Options (BSOs); Technical Systems Options (TSOs); quality considerations e.g. Total Quality Management (TQM).

LO4 **Discuss the suitability of software behavioural design techniques**

Evaluate suitability of software behavioural design techniques:

Techniques: Flowcharts; Pseudocode; Formal specification Methods; Event/State/Data Driven; Finite State Machines (extended-FSM)/FSP; problem of e-FSM state explosion; reachability analysis, safety, liveness properties; Automatic analysis and animation tools.

Learning Outcomes and Assessment Criteria

Pass	Merit	Distinction
LO1 Describe different software development lifecycles		
P1 Describe two iterative and two sequential software lifecycle models. **P2** Explain how risk is managed in the Spiral lifecycle model.	**M1** Describe, with an example, why a particular lifecycle model is selected for a development environment.	**D1** Assess the merits of applying the Waterfall lifecycle model to a large software development project.
LO2 Explain the importance of a feasibility study		
P3 Explain the purpose of a feasibility report. **P4** Describe how technical solutions can be compared.	**M2** Discuss the components of a feasibility report.	**D2** Assess the impact of different feasibility criteria on a software investigation.
LO3 Undertake a software development lifecycle		
P5 Undertake a software investigation to meet a business need. **P6** Use appropriate software analysis tools/techniques to carry out a software investigation and create supporting documentation.	**M3** Analyse how software requirements can be traced throughout the software lifecycle. **M4** Discuss two approaches to improving software quality.	**D3** Critically evaluate how the use of the function design paradigm in the software development lifecycle can improve software quality.
LO4 Discuss the suitability of software behavioural design techniques		
P7 Explain how user and software requirements have been addressed.	**M5** Suggest two software behavioural specification methods and illustrate their use with an example. **M6** Differentiate between a finite state machine (FSM) and an extended-FSM, providing an application for both.	**D4** Present justifications of how data driven software can improve the reliability and effectiveness of software.

Recommended Resources

Textbooks

Ferguson, J. (2014) *BDD in Action: Behavior-driven development for the whole software lifecycle*. Manning.

Dennis, A. and Haley, W. (2009) *Systems Analysis and Design*. John Wiley & Sons Ltd.

Lejk, M. and Deeks, D. (2002) *An Introduction to System Analysis Techniques*. 2nd Ed. Addison-Wesley.

Murch, R. (2012) *The Software Development Lifecycle: A Complete Guide*. Kindle.

Websites

www.freetutes.com — FreeTutes
"Systems Analysis and Design – Complete Introductory Tutorial for Software Engineering" (Tutorial)

www.ijcsi.org — IJCSI International Journal of Computer Science Vol. 7, Issue 5, September 2010
"A Comparison Between Five Models Of Software Engineering" (Research)

www.ijcsi.org — IJCSI International Journal of Computer Science Vol. 6, Issue 1, 2015
"Software Development Life Cycle Models – Comparison, Consequences" (Research)

Links

This unit links to the following related units:

Unit 6: Managing a Successful Computing Project
Unit 13: Computing Research Project
Unit 28: Prototyping
Unit 30: Application Development
Unit 32: Game Design Theory
Unit 34: Systems Analysis & Design
Unit 47: Games Development

Unit 10: Website Design & Development

Unit code R/615/1633
Unit level 4
Unit type Optional
Credit value 15

Introduction

Wireless, public hotspots, mobile broadband and unlimited network connections means that accessing and using the internet to request, use and post information has never been so easy, or so important. As public, organisational and business demand increases, so does user expectation. Designers need to successfully use technology to deliver a high quality and consistent User Experiences (UX) through friendly and functional User Interfaces (UI). However, as the software and hardware evolves, so does the challenge of design.

This unit introduces students to the underpinning services required to host, manage and access a secure website before introducing and exploring the methods used by designers and developers to blend back-end technologies (server-side) with frontend technologies (client-side). To help ensure new designers are able to design and deliver a site that offers an outstanding User Experience (UX) supported by an innovative User Interface (UI) this unit also discusses the reasons, requirements, relationships, capabilities and features of the systems they will be using and gives them an opportunity to explore various tools, techniques and technologies with 'good design' principles to plan, design and review a multipage website.

Among the topics included in this unit are: domain structure, domain name systems, web protocols, database servers, development frameworks, website publishing, content management, search engine optimisation, web browsers, HTML standards, CSS and CSS pre-processing (LESS, SASS), presentation models, responsive design, integrated development environments, user requirements, interface design, user experience, branding, navigation, optimisation and validation.

On successful completion of this unit students will be able to explain server technologies and management services associated with the hosting and management of secure websites, categorise website technologies, tools and software used to develop websites, utilise website technologies, tools and techniques with good design principles to create a multipage website and create and use a Test Plan to review the performance and design of a multipage website.

As a result they will develop skills such as communication literacy, critical thinking, analysis, reasoning and interpretation, which are crucial for gaining employment and developing academic competence.

Learning Outcomes

By the end of this unit students will be able to:

LO1 Explain server technologies and management services associated with hosting and managing websites.

LO2 Categorise website technologies, tools and software used to develop websites.

LO3 Utilise website technologies, tools and techniques with good design principles to create a multipage website.

LO4 Create and use a Test Plan to review the performance and design of a multipage website.

Essential Content

LO1 **Explain server technologies and management services associated with hosting and managing websites**

Hosting and website management:

Investigate relationships between domain names, DNS services and communication protocols used to access a website.

Overview of publishing and managing secure websites, including search engine indexing and ranking.

Different server technologies:

Differences between web server hardware, software and host operating systems.

Advantages of an integrated database system with regards to expanding website capability.

Common web development technologies and frameworks.

LO2 **Categorise website technologies, tools and software used to develop websites**

Website technologies:

Using front-end technologies, presentation layers and client-side programming to build a User Interface (UI) and effect User Experience (UX).

How back-end technologies, application layers and server-side programming can be used to enable personalisation and deliver dynamic content.

Tools, techniques and software used to develop websites:

Improving User Experience (UX) through Rich Internet Application (RIA) design using JavaScript and CSS frameworks and packages.

Overview of online content management systems including possible advantages and limitations with regards to design.

Using web design and development software to design and build a secure website.

LO3 **Utilise website technologies, tools and techniques with good design principles to create a multipage website**

Establish the client and user requirements:

Differentiate client and user requirements from behaviours.

Consider how audience and purpose could influence the look and feel of a website.

Review accessibility standards and guidelines and their possible impact on design and aesthetics.

Research and create good content combined with good design principles to create a multipage website:

Introduce and use recognised design principles, incorporating accessibility guidelines to implement an appropriately branded, multipage site.

Discuss why and how the quality of content can affect the performance of a website.

LO4 **Create and use a Test Plan to review the performance and design of a multipage website**

Consider factors that influence website performance:

Review how intuitive interfaces and actions, user-friendly designs, appropriate graphics, effective navigation and good quality content can help establish user trust and deliver an improved User Experience (UX).

Consider the effects of good and bad search engine optimisation (SEO) and indexing on the performance of a website.

W3C Validation (HTML and CSS) and how it influences website design and performance.

Establish a Test Plan and use it to assess the performance of a website:

Assess the impact of poorly optimised website graphics.

Research and conduct Quality Assurance (QA) and usability testing on a multipage website.

Learning Outcomes and Assessment Criteria

<table>
<tr><th>Pass</th><th>Merit</th><th>Distinction</th></tr>
<tr><td colspan="2">LO1 Explain server technologies and management services associated with hosting and managing websites</td><td rowspan="6">LO1 & LO2

D1 Justify the tools and techniques chosen to realise a custom built website.</td></tr>
<tr><td>P1 Identify the purpose and types of DNS, including explanations on how domain names are organised and managed.

P2 Explain the purpose and relationships between communication protocols, server hardware, operating systems and web server software with regards to designing, publishing and accessing a website.</td><td>M1 Evaluate the impact of common web development technologies and frameworks with regards to website design, functionality and management.

M2 Review the influence of search engines on website performance and provide evidence-based support for improving a site’s index value and rank through search engine optimisation.</td></tr>
<tr><td colspan="2">LO2 Categorise website technologies, tools and software used to develop websites</td></tr>
<tr><td>P3 Discuss the capabilities and relationships between front-end and back-end website technologies and explain how these relate to presentation and application layers.

P4 Discuss the differences between online website creation tools and custom built sites with regards to design flexibility, performance, functionality, User Experience (UX) and User Interface (UI).</td><td>M3 Evaluate a range of tools and techniques available to design and develop a custom built website.</td></tr>
<tr><td colspan="2">LO3 Utilise website technologies, tools and techniques with good design principles to create a multipage website</td><td rowspan="2">D2 Critically evaluate the design and development process against your design document and analyse any technical challenges.</td></tr>
<tr><td>P5 Create a design document for a branded, multipage website supported with medium fidelity wireframes and a full set of client and user requirements.

P6 Use your design document with appropriate principles, standards and guidelines to produce a branded, multipage website supported with realistic content.</td><td>M4 Compare and contrast the multipage website created to the design document.</td></tr>
</table>

LO4 Create and use a Test Plan to review the performance and design of a multipage website		**D3** Critically evaluate the results of your Test Plan and include a review of the overall success of your multipage website; use this evaluation to explain any areas of success and provide justified recommendations for areas that require improvement.
P7 Create a suitable Test Plan identifying key performance areas and use it to review the functionality and performance of your website.	**M5** Evaluate the Quality Assurance (QA) process and review how it was implemented during your design and development stages.	

Recommended Resources

Textbooks

Frain, B. (2012) *Responsive Web Design with HTML5 and CSS. UK*: Packt Publishing.

Krug, S. (2013) *Don't Make Me Think: A Common Sense Approach to Web Usability*. USA: New Riders.

Lidwell, W., Holden, K. and Butler, J. (2010) *Universal Principles of Design, Revised and Updated: 115 Ways to Enhance Usability, Influence Perception, Increase Appeal, Make Better Design Decisions and Teach Through Design*. USA: Rockport Publishers.

Links

This unit links to the following related units:

Unit 40: User Experience & Interface Design

Unit 11: Maths for Computing

Unit code **D/615/1635**
Unit level **4**
Unit type **Optional**
Credit value **15**

Introduction

In 1837 English mathematicians Charles Babbage and Ada Lovelace collaboratively described a machine that could perform arithmetical operations and store data within memory units. This design of their 'Analytical Engine' is the first representation of modern, general-purpose computer technology. Although modern computers have advanced far beyond Babbage and Lovelace's initial proposal, they are still fundamentally relying on mathematics for their design and operation.

This unit introduces students to the mathematical principles and theory that underpin the computing curriculum. Through a series of case studies, scenarios and task-based assessments students will explore number theory within a variety of scenarios; use applicable probability theory; apply geometrical and vector methodology; and finally evaluate problems concerning differential and integral calculus.

Among the topics included in this unit are: prime number theory, sequences and series, probability theory, geometry, differential calculus and integral calculus.

On successful completion of this unit students will be able to gain confidence with the relevant mathematics needed within other computing units. As a result they will develop skills such as communication literacy, critical thinking, analysis, reasoning and interpretation, which are crucial for gaining employment and developing academic competence.

Learning Outcomes

By the end of this unit students will be able to:

LO1 Use applied number theory in practical computing scenarios.

LO2 Analyse events using probability theory and probability distributions.

LO3 Determine solutions of graphical examples using geometry and vector methods.

LO4 Evaluate problems concerning differential and integral calculus.

Essential Content

LO1 **Use applied number theory in practical computing scenarios**

Number theory:
Converting between number bases (Denary, Binary, Octal, Duodecimal and Hexadecimal).
Prime numbers, Pythagorean triples and Mersenne primes.
Greatest common divisors and least common multiples.
Modular arithmetic operations.

Sequences and series:
Expressing a sequence recursively.
Arithmetic and geometric progression theory and application.
Summation of series and the sum to infinity.

LO2 **Analyse events using probability theory and probability distributions**

Probability theory:
Calculating conditional probability from independent trials.
Random variables and the expectation of events.
Applying probability calculations to hashing and load balancing.

Probability distributions:
Discrete probability distribution of the binomial distribution.
Continuous probability distribution of the normal (Gaussian) distribution.

LO3 **Determine solutions of graphical examples using geometry and vector methods**

Geometry:
Cartesian co-ordinate systems in two dimensions.
Representing lines and simple shapes using co-ordinates.
The co-ordinate system used in programming output device.

Vectors:
Introducing vector concepts.
Cartesian and polar representations of a vector.
Scaling shapes described by vector co-ordinates.

LO4 **Evaluate problems concerning differential and integral calculus**

Differential calculus:
Introduction to methods for differentiating mathematical functions.
The use of stationary points to determine maxima and minima.
Using differentiation to assess rate of change in a quantity.

Integral calculus:
Introducing definite and indefinite integration for known functions.
Using integration to determine the area under a curve.
Formulating models of exponential growth and decay using integration methods.

Learning Outcomes and Assessment Criteria

Pass	Merit	Distinction
LO1 Use applied number theory in practical computing scenarios		
P1 Calculate the greatest common divisor and least common multiple of a given pair of numbers. **P2** Use relevant theory to sum arithmetic and geometric progressions.	**M1** Identify multiplicative inverses in modular arithmetic.	**D1** Produce a detailed written explanation of the importance of prime numbers within the field of computing.
LO2 Analyse events using probability theory and probability distributions		
P3 Deduce the conditional probability of different events occurring within independent trials. **P4** Identify the expectation of an event occurring from a discrete, random variable.	**M2** Calculate probabilities within both binomially distributed and normally distributed random variables.	**D2** Evaluate probability theory to an example involving hashing and load balancing.
LO3 Determine solutions of graphical examples using geometry and vector methods		
P5 Identify simple shapes using co-ordinate geometry. **P6** Determine shape parameters using appropriate vector methods.	**M3** Evaluate the coordinate system used in programming a simple output device.	**D3** Construct the scaling of simple shapes that are described by vector coordinates.
LO4 Evaluate problems concerning differential and integral calculus		
P7 Determine the rate of change within an algebraic function. **P8** Use integral calculus to solve practical problems involving area.	**M4** Analyse maxima and minima of increasing and decreasing functions using higher order derivatives.	**D4** Justify, by further differentiation, that a value is a minimum.

Recommended Resources

Textbooks

Stroud, K. A. (2009) *Foundation Mathematics*. Basingstoke: Palgrave Macmillan.

Journals

Journal of Computational Mathematics. Global Science Press.

Links

This unit links to the following related units:

Unit 18: Discrete Maths
Unit 22: Applied Analytical Models

Unit 12: Data Analytics

Unit code **K/615/1637**
Unit level **4**
Unit type **Optional**
Credit value **15**

Introduction

Like the physical universe, the digital universe is enormous and is doubling in size every two years. By 2020 the digital universe – the data we create and copy annually – is projected to reach 44 zettabytes or 44 trillion gigabytes.

Data is everywhere in the world. Without knowing how to interpret this data it would be difficult to understand its meaning or make use of the data to increase the productivity of an organisation. Data analytics is a range of processes that converts data into actionable insight using a range of statistical techniques. Data analytics is a relatively new term – it is an overarching term for all decision support and problem-solving techniques. Most of the time the term 'data analytics' and 'business analytics' are used interchangeably.

This unit will introduce the theoretical foundation of data analytics and a range of data analytic processes and techniques to provide hands-on experience for enhancing students' skills.

Topics included in this unit are: data analytic terminologies, types of data analytics, data exploration and visualisation, understanding data with descriptive, predictive and prescriptive analytics.

On successful completion of this unit students will be able to understand the theoretical foundation of data analytics, data analytic processes and techniques. Moreover they will gain hands-on experience of implementing data analytic processes and techniques using a programming language such as Python, R, or a tool such as Weka, KNIME, PowerBI, Excel etc.

As a result students will develop skills such as communication literacy, critical thinking, analysis, reasoning and interpretation which are crucial for gaining employment and developing academic competence.

Learning Outcomes

By the end of this unit students will be able to:

LO1 Discuss the theoretical foundation of data analytics that determine decisionmaking processes in management or business environments.

LO2 Apply a range of descriptive analytic techniques to convert data into actionable insight using a range of statistical techniques.

LO3 Investigate a range of predictive analytic techniques to discover new knowledge for forecasting future events.

LO4 Demonstrate prescriptive analytic methods for finding the best course of action for a situation.

Essential Content

LO1 **Discuss the theoretical foundation of data analytics that determine decision-making processes in management or business environments**

Data analytics terminologies:
Population, sample, categorical data, nominal data, ordinal data, continuous data, discrete data etc.

Types of data analytics:
Descriptive data analytics, predictive data analytics and prescriptive data analytics.

Exploratory data analysis (EDA):
Variable identification, univariate and bi-variate analysis, missing values treatment, etc.

Data visualisation:
Graphs, charts, plots.

LO2 **Apply a range of descriptive analytic techniques to convert data into actionable insight using a range of statistical techniques**

Descriptive statistics:
Measures of central tendency, measure of position and measures of dispersion.

Probability distribution:
Cumulate distribution, discrete distribution, continuous distribution.

Sampling and estimation:
Random sampling, systematic sampling, point estimate, interval estimate and so forth.

Statistical inferences:
Models and assumptions.

LO3 **Investigate a range of predictive analytic techniques to discover new knowledge for forecasting future events**

Regression analytics:
Linear regression, multiple linear regression and logistic regression.

Forecasting techniques:
Qualitative, average approach, naïve approach, time series methods, causal relationship and so forth.

LO4 **Demonstrate prescriptive analytic methods for finding the best course of action for a situation**

Optimisation:
Classical optimisation, linear programming techniques, nonlinear programming techniques, dynamic programming.

Decision analysis:
Models, justifiable decisions and defensible decisions.

Learning Outcomes and Assessment Criteria

<table>
<tr><th>Pass</th><th>Merit</th><th>Distinction</th></tr>
<tr><td colspan="2">LO1 Discuss the theoretical foundation of data analytics that determine decision-making processes in management or business environments</td><td rowspan="11">LO1 & LO2

D1 Apply an appropriate programming language or tool to demonstrate how these descriptive analytic techniques contribute to decision-making.

D2 Apply an appropriate programming language or tool to demonstrate how these predictive analytic techniques are used in forecasting future events.

D3 Apply an appropriate programming language or tool to demonstrate how these prescriptive analytic techniques are used to find the best course of action in a situation.</td></tr>
<tr><td>P1 Identify data analytic activities, techniques, and tools.

P2 Demonstrate an ability to use a popular programming language or tool used in the data analytics industry.</td><td>M1 Investigate the three types of data analytic methods and their use in industry.</td></tr>
<tr><td colspan="2">LO2 Apply a range of descriptive analytic techniques to convert data into actionable insight using a range of statistical techniques</td></tr>
<tr><td>P3 Investigate descriptive analytic techniques and explain with appropriate examples.

P4 Apply an appropriate tool or programming language to demonstrate these descriptive analytics techniques.</td><td>M2 Show how these descriptive analytic techniques contribute to decision-making.</td></tr>
<tr><td colspan="2">LO3 Investigate a range of predictive analytic techniques to discover new knowledge for forecasting future events</td></tr>
<tr><td>P5 Identify predictive analytic techniques and describe these techniques with examples.

P6 Apply an appropriate tool or programming language to demonstrate these predictive analytic techniques.</td><td>M3 Explain how these predictive analytic techniques are used for forecasting.</td></tr>
<tr><td colspan="2">LO4 Demonstrate prescriptive analytic methods for finding the best course of action for a situation</td></tr>
<tr><td>P7 Analyse prescriptive analytic techniques with appropriate examples.

P8 Demonstrate these techniques using an appropriate programming language or tool.</td><td>M4 Describe how these prescriptive analytic techniques are used to find the best course of action in a situation.</td></tr>
</table>

Recommended Resources

Textbooks

Evans, J. (2016) *Business Analytics.* 2nd Ed. Pearson.

Runkler, T. (2016) *Data Analytics: Models and Algorithms for Intelligent Data Analysis*. 2nd Ed. Vieweg+Teubner Verlag.

Websites

archive.ics.uci.edu/ml	University of California, Irvine “Machine Learning Repository” (Data sets)
www.lfd.uci.edu	University of California, Irvine – Laboratory for Fluorescence Dynamics “Binaries for Python Extension Packages” (Development Tool)
cran.r-project.org	The R Project for Statistical Computing “R Archive Network” (Development Tool)
www.cs.waikato.ac.nz	University of Waikato – Machine Learning Group “Data Mining Software in Java” (Development Tool)
www.knime.org	Konstanz Information Miner “KNIME” (Development Tool)
powerbi.microsoft.com	Microsoft Power BI “Power BI Desktop” (Development Tool)

Links

This unit links to the following related units:

Unit 14: Business Intelligence
Unit 21: Data Mining