

LEEDS BECKETT UNIVERSITY

Course Specification

BSc (Hons) Computer Security

2017-18 (COMPS)

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Record of Enhancement

| No. | Detail of modification (Provide a brief description of the modification and where the Course Specification has been updated) | Date Effective (Indicate the academic year of entry and course level(s) to which the modification will apply) |
|------------|----------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| | Example Assessment changed from examination to presentation in Module X, see section entitled Module Assessment Methods. | Level 5 from September 2018-19 entry |
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Version Control

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| Next Re-validation date | |

Target award, course title and programme code: BSc (Hons) Computer Security - COMPS

Level of qualification: 6

Course Rationale and Philosophy:

Overview and Aims:

Background and philosophy

In 2006 the Faculty introduced an Undergraduate award in Computer Forensics and ran an award in Computer Security and Ethical Hacking, this was previously run under another pseudonym. An increasing demand for these undergraduate awards and industry changes now means the Undergraduates awards of Computer Forensics and Computer Forensics & Security are offered. In 2012 an MSc in Digital Forensics & Security and in 2015 a distance learning MSc in Computer Security were launched. As a testament to the quality of teaching and student experience, in the last published National Student Survey (NSS) results the BSc (Hons) Computer Forensics & Security achieved 100% overall satisfaction and BSc (Hons) Computer Forensics achieved 95% overall satisfaction.

The School of Computing, Creative Technologies and Engineering is currently expanding their portfolio of Digital Forensics & Security awards. This is in response to the current market and sector requirements of cybersecurity (forensics and security) awards across all levels of education - at the Digital Skills Committee meeting in the House of Lords in October 2014 (Parliament, 2014¹), that in 2017 there will be a global shortage of two million cyber security professionals (Morgan, 2014²).

Whilst the University offers current courses at both MSc and BSc level, we offer no UG provision specifically for Computer Security. Students who wish to take just Digital Forensics can join the BSc Computer Forensics, those unsure can undertake Computer Forensics & Security – but we are closed from the market who want a pure degree. The development of such an award will increase the portfolio of the University/Faculty but will not significantly increase the use of resources within the School, as the course team are already specialised in this subject area.

Overview

¹ <http://www.parliament.uk/business/committees/committees-a-z/lords-select/digital-skills-committee/news/digital-cttee-evidence-28oct14/>

² <http://www.itgovernance.co.uk/blog/global-shortage-of-two-million-cyber-security-professionals-by-2017>

This course aims to develop a student's understanding of computer security, with an underpinning knowledge of forensics and the broader computing area. Students who undertake the course will be well versed with the two subject areas and be in a position to perform forensic analysis and/or implement computer security mechanisms into any business they obtain employment with.

The field of computer forensics and computer security have traditionally distanced themselves, both within academia and the professional market, however with the ever increasing use of digital devices and the risks posed by them the disciplines are starting to merge – with a significant shift in this in recent years with the emergence of cybercrime; with the identification that the skill sets required for each are essentially the same and complimentary. Students with the dual skill set are not only ultimately in the position to undertake a more rigorous forensic analysis, but also to implement more robust security mechanisms. The course covers key topics such as authentication, access control, malware and vulnerabilities, secure coding, sandboxing, virtualisation, vulnerability assessment, Unix security, and ethical hacking and penetration testing techniques. Our students will also develop the security mind-set, and be better prepared for the immense challenges facing ICT and security professionals.

The programme will provide a mix of academic and practical content; provide students with the theoretical knowledge to excel in their field and the practical experience to be able to physically implement their skills. The course will allow students who are unsure as to which field to focus on, to become proficient in both; creating a much wider student intake base.

This course aims to develop students within specific subject areas that are at the forefront of news and government policy. Technology is advancing at a rapid rate, creating new opportunities in this dynamic and diversifying sector. The Computer Security course ensures students are equipped with the skills to engage confidently with these opportunities and challenges. Fundamental to this is the understanding of computer systems and the broader computing field. On the course students will gain expertise in the use of computer forensic and security tools and will develop an understanding of the motivation for crimes. Students will also work with employers, lawyers and experts to gain experience of preparing work for use by courts, customers and subsequently presenting it. Students will study general computing topics during Level 4 of the course; giving the necessary grounding in the various technologies related to computing that will be relied upon in the specialist subject areas. In Years 2 and 3 students will increasingly specialise in aspects unique to computer forensics and security. The opportunity for students to perform significant aspects of hands-on forensic analysis and security assessments, directly interact with employers through guest lectures and projects, and interaction with the legal system provides a course that is different from many other HE institutions – developing capable practitioners who have practical employer related skills.

The course aims to prepare students for a career in the computer security industry working with small consultancies or large organisations. However, the course will also prepare students for any career in the IT sector including software development, web design, IT network management and database administration within business, voluntary or public sectors.

The Digital Knowledge Economy is regarded as “fundamental to the UK’s future prosperity” and there is an aim to be a global centre for the creative industries. “The strength of Digital Britain is in its strong network of universities, business and people and that this strength is multiplied when the country works together. The Government therefore encourages all sectors of the Digital Community to get involved in cross promoting the UK through the strategy to grow and enhance our digital proposition to the world.” (Digital Britain 2015)

Computing and information technology in general has a very strong industrial presence. The use of computers and technology has become ubiquitous within the modern world. The use of computers and technology has become ubiquitous within the modern world. The need for graduates within the science and technology area has also being recognised by the government hence the recent STEM initiative which is designed to promote appropriate provision for areas of significant importance to the country’s workforce requirements.

With an increase in the use of computers within every walk of life now means that there is not a single crime that a digital device cannot be linked to. The legal and commercial sectors have identified this factor and now analyse digital devices on a regular basis to help identify or dismiss user activity. Companies and institutions are also bound by the Data Protection Act, and in relevant cases Financial Services requirements, which requires that data be kept secure and accurate. Companies and institutions are only too aware of the legal implications of security breaches and leaked data and are therefore implementing more rigid and pronounced computer security and management policies.

Both the UK and US governments have also identified the importance of such skilled professionals and launch competitions to identify new technologies/processes and individuals who will assist in the development of these areas.

Demand

These skills are much sought after within industry, where there is a high demand for cyber security expertise. Possible career paths include security positions: such as, security architect, malware analyst, security analyst, system/network/web/application penetration tester, security auditor, CISO/ISO, director of security, and incident responder. Security has wide reaching implications and these skills can benefit many other ICT roles such as software developers/engineers, system administrators, network administrators, and members of management.

Computer security plays an important role in enabling the protection and trust required for business and society to effectively operate. Organisations and individuals increasingly depend on information and communications technology (ICT) infrastructure, which frequently processes and stores large amounts of sensitive data. Consequently, there is significant security risk involved, and ICT systems need to be defended against many types of malicious attack. Every new ICT solution or system has the potential to introduce vulnerabilities, and be misused by attackers. Therefore, organisations require security expertise to assess, design, deploy, and maintain security solutions.

Preventing cyber-attacks and ensuring that digital systems, often the backbone of an organisation, are available and functioning correctly, is an incredibly complex challenge as the sophistication of the digital equipment used and the ability of attackers has grown rapidly in recent years.

The UK Cyber Security Strategy³ published by the UK Government (2011), states the objectives of the government, and sets out how the UK will support economic prosperity, protect national security, and safeguard the public's way of life by building a more trusted and resilient digital environment. Of the objectives, objective 4 states "The UK to have the cross-cutting knowledge, skills and capability it needs to underpin all our cyber security objectives". Within the document the Government states one of its principles to be "Seized the business opportunities – working with industry and academia to boost our share of the cyber security market and cemented the UK's status as a safe place to do business online."

There has been a major transformation in the role of cyber-security professionals and a sharp rise in the need for a larger and more dynamic cyber security workforce. Cyber security is now a prominent, highly regarded profession offering many varied career paths which together underpin the social, political and financial fabric of modern society. Whilst the need for a bright, dedicated, and quick-thinking cyber security workforce is growing, the number of skilled candidates is not. Recent statistics from Microsoft suggest that the IT industry will create 78,000 jobs in the UK in the next four years (<http://www.publictechnology.net/content/21568>) but research from the government body e-Skills confirms a 50% decline in young UK residents entering IT careers during the last five years⁴.

The current economic climate and drive from international governments to increase the security skills throughout their respective domains suggests there will be a high demand for this course. The fact that it will be offered through distance learning will appeal to the professional local and international markets allowing organisations to sponsor employees to develop internal skills.

³ <http://www.cabinetoffice.gov.uk/sites/default/files/resources/uk-cyber-security-strategy-final.pdf>

⁴ http://www.creativeskillset.org/uploads/pdf/asset_14618.pdf?1

Course Learning Outcomes

| | |
|---|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | A systematic understanding of key aspects of security, including acquisition of coherent and detailed knowledge, at least some of which is at, or informed by, the forefront of the discipline |
| 2 | An ability to deploy accurately established techniques of analysis and design that encompass internationally recognised standards |
| 3 | A wide breadth of understanding that enables students to devise and sustain arguments and solve problems using ideas and techniques, some of which are at the forefront of computer security practice, and describe and comment upon particular aspects of current research, or equivalent advanced scholarship |
| 4 | The skills and understanding to undertake projects to a professional industry recognised standards, within Computer Security, by the consistent application and review of development, management and evaluation methods and techniques |
| 5 | An ability to independently undertake research and critically evaluate arguments, assumptions, abstract concepts and data (that may be incomplete), to make judgements, and to frame appropriate questions to achieve a solution or identify a range of solutions to a problem. |

Level Learning Outcomes (adapt as appropriate)

| Level | No. | Learning Outcome |
|----------------|-----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Level 4 | | |
| | 1 | Explain fundamental concepts and principles of computer and security |
| | 2 | Convey technical information which is accurate and has clarity. |
| | 3 | Identify the application of principles of legal / ethical issues within the actual practice of self and/or others. |
| | 4 | Use specified ICT applications and strategies for a restricted range of given purposes and tasks |
| | 5 | Solve simple, defined problems by selecting an approach from those suggested. |
| Level 5 | | |
| | 1 | Select and explain key aspects which have some complexity and depth and are well-established within the computer forensics and security subject area |
| | 2 | Use academic conventions to produce concise work which is appropriate to the purpose, situation and audience within the context of computer forensics and security. |

| | | |
|----------------|---|--------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | 3 | Apply underlying concepts and principles of computer forensics and security in a novel situation, including, where appropriate, within an employment context |
| | 4 | Where appropriate, participate effectively in collaboration with people in a project context |
| | 5 | Select and use specified ICT applications and strategies as appropriate for guided purposes and tasks |
| | 6 | Solve straightforward problems by identifying, explaining and selecting appropriate approaches to use. |
| Level 6 | | |
| | 1 | Select and explain key aspects which are complex, coherent and detailed and are at, or informed by, the forefront of the computer security discipline |
| | 2 | To reflect on and evaluate own strengths, limitations and performance and the implications and their relevance for personal development |
| | 3 | Create, implement and monitor a plan to achieve a refined number of agreed objectives |
| | 4 | Analyse the potential influence of the ethical/legal issues within the computer security discipline |
| | 5 | Select, use and evaluate ICT applications and strategies which are appropriate for various purposes and tasks. |
| | 6 | Select, justify and use appropriate (straightforward and complex) approaches, including some at the forefront of the computer security discipline |

Course Structure

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|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|-----------------------------|------------|
| Level 4 | | | |
| At level 4 This level introduces students to the fundamentals of the core areas of computing whilst developing the student's study skills. Students will acquire knowledge of underpinning computing technologies and develop essential skills in the use of computer systems along with the associated security issues. Student's overall progress is monitored and supported by regular contact with their personal tutor. This level develops a student's general computing understanding for future years, allowing for further depth to be covered at Levels 5 and 6. Students will receive a basic introduction to Computer Security and the specific technical nuances they contain. | | | |
| Semester 1 | Core (Y/N) | Semester 2 | Core (Y/N) |
| Fundamentals of Computer Programming | Y | Object Oriented Programming | Y |
| Computer Communications | Y | Fundamentals of Databases | Y |

| | | | |
|---------------------|---|----------------------|---|
| Website Development | Y | Forensics & Security | Y |
|---------------------|---|----------------------|---|

NB - All option modules are indicative.

| Level 5 | | | | |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|------------|---------------------------|------------|
| <p>At level 5 students will be given the opportunity to build upon their underpinning knowledge of the core areas of computing and begin their specialisation in Computer Forensics and Security – over 50 % of this Level is given over to this. The field of Computer Security is contextualised within the Team Project which provides students with an opportunity for students to learn and apply project management techniques and to experience a development role within a realistic team environment. Employability skills such as team working, communication and presentation skills are also developed at this level. Personal Tutors also play a key role in encouraging and supporting students to prepare for work placement by assisting with career planning including CV writing. In addition to the course module delivery a number of employment related lectures are delivered to help the students to plan their future careers and in particular to help them undertake the work placement.</p> | | | | |
| Semester 1 | | Core (Y/N) | Semester 2 | Core (Y/N) |
| Computer Processing | Forensic | Y | Web and Network Security | Y |
| Digital Landscapes | Security | Y | Digital Forensic Analysis | Y |
| Software Development (Option) | Systems | N | Team Project | Y |
| Web Technologies (Option) | Application | N | | N |
| Database (Option) | Systems | N | | N |

NB - All option modules are indicative.

| Level 6 |
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| <p>At Level 6 all students undertake a minimum of three specialised modules in Computer Security, which allows the students to further progress their understanding of the process and analysis techniques. Students study a further two option modules. The option modules may be drawn from the module set. The choice of options allows students – who are studying on a specialist course – to diversify, adding extra avenues to their employability upon graduation. The range also allows students to develop areas that are of particular interest to them.</p> <p>Students also undertake a major project which encompasses research, planning and the production of a product followed by a critical evaluation. A series of lectures will be used to deliver general project guidance. Students will be assigned two project</p> |

supervisors who will approve and mark the project. The first supervisor will be available to see the student on a weekly basis if needed and will also act as the student's personal tutor. A range of employment related activities is scheduled and promoted to enable students to maximise their potential for gaining employment on completion of the course. In particular a showcase event in collaboration with the British Computer Society is scheduled at the end of the year to which students can offer to take part in by presenting their project work to an invited audience of BCS members, employers and other interested parties.

| Semester 1 | Core (Y/N) | Semester 2 | Core (Y/N) |
|----------------------------------------|------------|-----------------------------------------|------------|
| Incident Response & Investigation | Y | Advanced Digital Security | Y |
| Advanced Database Systems (option) | N | Developing Mobile Applications (option) | N |
| Advanced Web Engineering (option) | N | Green Computing (option) | N |
| Advanced Software Engineering (option) | N | Intelligent Systems (option) | N |
| Production Project (40 credits) | | | |

NB - All option modules are indicative.

Contained awards available:

| Award | Title | Level |
|--------|-------------------|-------|
| BSc. | Computer Security | 6 |
| DipHE | Computer Security | 5 |
| CertHE | Computer Security | 4 |

Length of programme, FT/PT and mode of study:

| Programme | Length (years) | FT/PT (please specify) | Mode (campus based/DL or other) |
|------------------------------|----------------|------------------------|---------------------------------|
| BSc (Hons) Computer Security | 3 | FT | Campus based |
| BSc (Hons) Computer Security | 4 | SW | Campus based |
| BSc (Hons) Computer Security | 6 | PT | Campus based |

Learning and Teaching (to include, as a minimum, the following topics)

- **Learning and Teaching Approaches**

The course employs a wide range of learning opportunities and teaching methods, informed by the curriculum review, pedagogic research and

continuous staff development. Particular methods for each module cohort are identified prior to delivery through the annual planning process. Innovative approaches to teaching, learning and assessment are encouraged, e.g. use of interactive technologies such as Elluminate and VLEs', use of open source technologies. The course seeks to expand the application of technology in the delivery of teaching and learning support wherever appropriate. Where possible students will undertake project based assignments and learning tasks that will require students to manage their own learning and skills development in situations that would be expected in industry – where this is not possible practically related tasks utilising similar tools to those in industry are used. Through the implementation of real-life tasks students are given the experience of industry that has been proven to encourage their engagement with the learning tasks. These tasks call upon the skills they have developed from other modules at the same, and prior, levels.

Scheduled sessions will include the use of lectures, seminars, tutorials and practical laboratory sessions. Advantage will be taken of both technology and supportive activities to ensure that effective learning takes place. These activities will include the use of simulations, role play, case studies, projects, practical work, work based learning, workshops, peer tutoring, peer group interaction, self-managed teams and learner managed learning. Students on this course will also be encouraged to be independent learners at each level using the resources available in the library, skills for learning website and any that are identified by the teaching team.

The University's Virtual Learning Environment (VLE) MyBeckett is at the heart of all modules. The faculty has moved beyond the use of the VLE as a repository and now the breadth of provision is used in collaborative work, 24/7 access, up to the minute communications and innovative learning and assessment activities. Many modules include self-assessment quizzes to enhance student engagement and to provide formative feedback.

- **Learning and Teaching Activities**

For each module students will normally receive a weekly lecture followed by a tutorial or practical lab based session(s). In addition some modules will be supplemented with optional drop-in workshop sessions. These are supplemented with a programme of guest speakers and industry led seminars. This structure is preferred within such a vocational award where students are learning specialised material for a specific career. This is a very hands-on subject area where theory alone would be unlikely to allow a student to achieve successful employment in this area. Practical exercises allow for students to implement their theoretical learning and see how it relates to industry. Practical solutions are achieved through the replication of exercises such as compromised computer systems and mobile devices that students

must analyse – similar to that as found in industry. Many of these examples are available through open source community projects but are also built in-house when suitable external material is not available.

The use of a team project at Level 5 allows students to develop communicative skills with their peers, this will include where possible, mixing with other cultures. Individuals they may not have originally chosen to work with as they are outside of their direct friendship group. Any issues that arise within group work such as difficulties with other group members are carefully managed through distanced support of the group where possible, so as to get the students to deal with the issues themselves. Where distance support is not possible tutors will directly resolve the issue working with the group to rectify and identify solutions.

Students are encouraged to debate within a variety of learning environments, including in-class and through the VLE discussion boards and Facebook groups – this helps to develop respectful appreciation of their peers. Through encouraging students to use industry forums and scholarly research students interact with a range of cultures and thinking that they are required to draw upon and evaluate within several modules.

The use of an induction session begins the process of welcoming students to the University and the course. Students are introduced to the support mechanisms in place, faculty and university wide, and begin to develop relationships with their peers.

- **Graduate Attributes**

The graduate attributes are developed throughout the BSc Computer Security course. The aim is to develop each of the attributes via practical exercises, discussions and assessment. Each attribute is addressed at each level with an intention of consolidating and enhancing the attribute further as the student progresses. By its nature, the course develops a very high level of digital literacy in all its students. Students are expected to demonstrate self-learning, problem solving ability, and global and digital awareness by the time they graduate.

Students are actively encouraged to engage with industry related forums to provide research in the subject area and/or learn from their potential industry peers. Students are also encouraged to engage with the University VLE for all course documentation and the course/level Facebook group that facilitates students discussions and allows for information to be given to students in a familiar technological situation. In particular throughout the course, at various stages, students are expected to undertake practical analysis work of unknown data using a variety of known and unknown tools and resources. Students will

be required to research and identify tools they have no prior experience of to complete tasks through exploratory processes.

The nature of the subject area allows students to develop sought after industrial skills. In particular great emphasis is placed on the use of real world activities to encourage students to engage with the industrial aspect of the course. These tasks are then summatively assessed ensuring students understand their current abilities against what is expected.

As part of the Level 5 project students are required to review the task and develop a process as to complete the task. They must produce documentation and manage themselves and their team with regular communication and dialogue.

The following learning activities illustrate some of the methods employed to develop the graduate attributes:

At Level 4 students are introduced to analysis and design methods which are globally recognised within the industry whilst looking at case studies that make them aware of the needs of business and the wider society. At Level 5 the Team Project allows students to work in small teams on an industry related project which prepares them for dealing with the reality of the future workplace. All the graduate attributes are developed: Enterprise – the students need to ‘own’ their role on the project and be creative in their team communication methods, organisation and problem solving. Global outlook – students are required to reflect and evaluate the project, with respect to the positioning of the project within the market. Digital awareness – students are required to evaluate and justify the technological decisions for the project.

Level 5 Work Placement – all students are given support in preparing for and finding an industry related placement to be taken on completion of level 5 study. The Level 5 team project also provides a vehicle for students to develop their enterprise skills and consider the global relevance of their project.

Level 6 Individual Project: Students select an industry based project with a tangible product to research, implement and evaluate. They are expected to select appropriate methodologies and technologies with respect to the project and client. All the graduate attributes are developed as for the L5 Group project, however as this is an individual project the student is required to ‘own’ the project, be self-directed and initiating. Also students will need to be able to put their final project into a professional context, reflecting upon what they have completed and the impact it has on their potentially diverse intended audience.

Many of the other modules employ problem based learning, research and reflecting tasks, these are indicated in detail on the MAT documentation.

- **Use of the Virtual Learning Environment**

All modules make use of the university VLE, this includes the availability of lecture slides and notes and the submission of all assessment material.

With most making extensive use by including a range of materials including copies of module guides, work books and assessments. In addition many provide additional support materials and self-assessment tests. In some cases videos of lectures are included along with videos showing how to utilise various software tools; for example Databases uses videos and self-assessment quizzes. Many assessments are uploaded to the VLE for marking and feedback. Students receive their module marks via the VLE. Elluminate web conferencing software is used to offer additional support in some modules.

- **Use of Blended Learning**

No modules are delivered wholly online. Online support is implemented through the VLE where students may access all of their material and further support documentation. This is not specifically online teaching. For example the L5 Team project VLE module contains a wide range of Project Management resources including formative online tests to check understanding of the essential topics.

Student Support (Standard text provided by Services for Students. You should also contact your Academic Librarian to discuss other resources available to students which you may wish to include here)

If you have any questions about life at our University, the first place to call, email or pop into is the Student Hub. The team can help with a broad range of enquiries and refer to specialist support services including: funding and money advice, being an international student, disability, counselling and wellbeing support, student cards, accommodation, fee payments, support from the Students' Union, how to access on-line services, getting help with your CV, preparing for an interview, careers guidance and getting a part-time job. Details of these and other services are available at www.leedsbeckett.ac.uk/studenthub.

There is a Student Hub on the ground floor of the Rose Bowl at City Campus and one also in Campus Central at Headingley. Their telephone number is 0113 812 3000 and their e-mail address is StudentHub@leedsbeckett.ac.uk.

They work closely with the course team, the Students' Union, all University Services and external organisations to make sure that if they don't have the answer to your question they will know who will.

As well as the Student Hubs, Student Liaison Officers (SLOs) are our recent graduates who are here to support you throughout your time here and to make sure you have access to and are aware of the support, opportunities and services our University provides. Each academic area has at least one SLO to offer confidential advice and help with:

- Personal problems & academic issues
- Advice on mitigation, appeals & complaints procedure
- Links to services that can assist with a variety of issues (International Student Advice, ~~Financial~~ Money Advice & Support, Disability Support, Course Administration, Accommodation, Wellbeing, Careers Advice, Students' Union, Skills for Learning, Volunteering and much more)
- Recruitment and co-ordination of faculty and course Student Academic Representatives (Course Reps) who they can put you in contact with
- Finding out what's going on at our University and how you can get involved

SLOs work in academic schools as well as at Student Hubs and if you're not sure who can help you, asking your SLO is a great place to start. Their contact details can be found at <http://www.leedsbeckett.ac.uk/studenthub/student-liaison-officers/>

You can also use 'my Hub' <https://myhub.leedsbeckett.ac.uk/students/login> which is an online resource available 24/7 where you can access information and guidance about a range of services, register and make appointments with Services, register for workshops and employability tutorials, search for job vacancies and use a range of careers resources.

Assessment Strategy

Assessments are planned on an annual basis to mitigate against bunching and to ensure a mix of assessment types. The course is designed with strong themes that run through the levels, assessment on modules within these themes builds on and re-enforces previous study. The assessment types reflect real world practice, where possible, therefore automatically implement a variety of methods.

Examinations are kept to a minimum as the practical nature of the course content does not lend itself to being assessed easily in time constrained examinations, the nature of many of the practical assessments is in keeping with industry practices e.g. client demonstrations and presentations. The course is designed with strong career themes that run through the levels, assessment on modules within these themes builds on and re-enforces previous study.

Assessments at Level 4 concentrate on ensuring students have acquired key concepts techniques. At level 5 students are expected to engage with the learning acquired and undertake more challenging assessments which usually involve applying the concepts learnt at Level 4. At level 6 assessments are designed to draw on knowledge and skills acquired both vertically and horizontally in particular in the Production Project.

The need for students to develop broader skills as demanded by employers, such as team working and formal report writing etc. is recognised as part of the annual planning; hence each level is considered as part of the annual review of assessment to ensure that there is progress made by students through the levels.

Feedback on Assessed Coursework

The practical nature of a Computing course often allows demonstration of work to be incorporated into the assessment. This promotes student presentation and communication skills, while providing an opportunity for immediate feedback and discussion with tutors. This presentation of work is particularly useful as a mechanism for providing formative feedback but also plays an important role in summative assessment as well. In particular through group work students are encouraged to feedback to their peers the level of effectiveness of their contributions and commitment to the assessment.

Students are encouraged to obtain formative feedback of assessments from their tutors during scheduled meetings and timetabled sessions. Written feedback is given against assessment criteria and in many cases this is provided via the VLE. Interim summative assessment is often used within individual modules to encourage engagement and build student confidence. Students will have the opportunity to submit drafts of their written assignments for formative feedback prior to submission. For practical assessments, sample practice tests will be provided where feasible.

Students will be encouraged to engage with the discussion forums and technology to facilitate discussions of assessments and peer-review of work. The use of a forum will allow communication even in different time zones/working hours.

Module Assessment Methods (core modules only, please tick all which apply)

| Module Titles | Written Examination | Written Assignment | Report | Dissertation | Portfolio | Project Output | Oral Assessment | Practical Skills Assessment | Set Exercises |
|-----------------------------------------------|---------------------|--------------------|--------|--------------|-----------|----------------|-----------------|-----------------------------|---------------|
| Fundamentals of Computer Programming, level 4 | Y | | | | | 40/60 | | | |
| Computer Communications, level 4 | Y | | | | | 50/50 | | | |
| Object Oriented Programming, level 4 | Y | | | | | 40/60 | | | |
| Forensics & Security, level 4 | Y | | 60 | | | 40 | | | |
| Fundamentals of Databases, level 4 | Y | | 40/ | | | | | | |
| Website Development, level 4 | Y | | 40 | | | 60 | | | |
| Database Systems, level 5 | | | 50 | | | 50 | | | |
| Web Applications and Technologies, level 5 | | | 30 | | | 70 | | | |
| Web and Network Security, level 5 | Y | | | 40 | | 60 | | | |
| Team Project, level 5 | Y | | | | | 30/70 | | | |
| Computer Forensic Processing, level 5 | Y | | 40 | | | 60 | | | |
| Software Systems Development (Option) level 5 | | 50 | | | | 50 | | | |
| Digital Security Landscapes, level 5 | Y | | 50 | 50 | | | | | |
| Digital Forensic Analysis, level 5 | Y | | 40 | | | 60 | | | |
| Production Project, level 6 | Y | | | | 10 | 40 | 50 | | |
| Incident Response & Investigation | | | | | | 100 | | | |
| Advanced Digital Security | Y | | 50 | | | 50 | | | |
| Advanced Web Engineering (option) level 6 | | | | | | 100 | | | |

| | | | | | | | | | |
|-------------------------------------------------|--|----|----|-----|--|-------|--|--|--|
| Advanced Software Engineering (option) level 6 | | | | | | 40/60 | | | |
| Advanced Database Systems (option) level 6 | | | 50 | | | 50 | | | |
| Intelligent Systems (option) level 6 | | 50 | | | | 50 | | | |
| Green Computing Technologies (option) level 6 | | 50 | | 50 | | | | | |
| Developing Mobile Applications (option) level 6 | | | | 40/ | | | | | |

Employability and Professional Context

The BSc Computer Security has a very high degree of potential employability; the course design is current and the content is in-line with industry expectations. The skills developed are much sought after within industry, where there is a high demand for cyber security expertise. Possible career paths include security positions: such as, security architect, malware analyst, security analyst, system/network/web/application penetration tester, security auditor, CISO/ISO, director of security, and incident responder. Security has wide reaching implications and these skills can benefit many other ICT roles such as software developers/engineers, system administrators, network administrators, and members of management.

The curriculum has been designed with the global scenario in mind, and developed alongside industry partners. Since this course will be attractive to a number of international students, the course ensures that students are able to put the concepts into context with regional companies where they work. Where possible, the course delivery team will endeavour to organise guest lectures and workshops to offer further support to students.

After the successful completion of the course, students will be able to embark on MRes, MPhil or a PhD further qualifications as well as entering industry.

Representatives from industry are invited to meet members from the Course team a number of times during each year; these are typically documented within employer forum record sheets. These meetings allow employers to advice upon, and influence, new course provision; reflect on and update current provision; and input into staff development and research. In addition the relationship with employers and sector practitioners is also enhanced by the appointment of visiting professors and lecturers, collaborative projects, showcasing events and research events. It is typically during these guest lectures and further industry conferences where discussions are held with employers regarding the content of the award.

Our Careers Advice Service also provides students with up-to-date knowledge and skills relevant to the needs of the sector. The school also has a placement office which might be able to help students find a suitable job.

The course has been designed to provide students with the skills to enter a career in computer forensics and/or security. Students will be dual skilled upon completion; broadening their potential job market. The skills for posts which are identified as suitable for graduates are reviewed to ensure the skills that are being developed are accurate and reflect industry requirements – this is also undertaken through employer engagement.

Due to the broad computing underpinning of the course students will be able to also to embark on a general computing career; with particular emphasis on: - web developers, database developers or administrators, network architects and technicians.

The course strongly encourages and supports students to undertake a supervised industrial placement following the second year of studies, to help develop their technical and employability skills. This placement year gives students invaluable experience in industry in, generally, a computing related area. It is noted that many students then return for their final year of study and achieve a higher classification than they were previously predicted. This is not necessary for students to complete, however it is desirable. Review of historic statistics for the various computing awards offered at Leeds Beckett, show that students who undertake a placement year are more likely to achieve a higher degree classification than they were predicted to achieve if they had simply continued into their final year. A student who is unable/unwilling to complete a placement opportunity will continue with their final year of study. The skills developed within the course are focused on those desired by employers; such as communication, team working and understanding of computers. This is in conjunction with the projects at Level 5 and Level 6, that allow students to undertake simulated work related tasks and roles that they would be anticipated to undertake if they successfully obtained a career in this sector. These projects include professional analysis of situations and communications with clients and peers as to the process that must be followed.

Work Related Activities

Part of the underpinning philosophy of the course is to provide students with an opportunity to develop industry standard skills alongside the development of cognitive and analytical capabilities. As such a significant number of assessment tasks are based on authentic case studies drawn from the industry experience and contact of staff members.

The course also takes advantage of direct interaction with employers through two strongly encouraged avenues:

1. Guest Lectures: employers present regular guest lectures throughout a year covering various aspects of forensics and security and what it is like to work in the industry. These sessions allow students to interact with potential employers and ask questions regarding projects, employment and to obtain contact for future assistance.
2. Digital Interaction: Students are encouraged to become active in digital forensic and security forums, mailing lists and Twitter, if nothing more than to simply read what is discussed. Some students use these same channels to find assistance for project work and future employment.

Whilst all modules aim to challenge students, the project modules at both Level 5 and Level 6 give students the flexibility to examine a problem from different perspectives.

At Level 5 students implement a project based on the specialist subject area. This involves the students following industrial project management to complete the given task. Students will conduct an investigation and detail their findings in a variety of communicative ways; as conducted within industry. This project is undertaken as a team which allows for the scenario being addressed to be explored in depth and the results to be evaluated and reflected upon thoroughly, in some instances the team will interact with employers. The 14 week Level 5 team project exceeds the requirement for a two week work experience and acts as a failsafe for those students who do not undertake a work placement. This is as would be expected of a student within industry through self-learning/management and implementation of skills in unknown situations.

At Level 6 the project activity stretches across the year and students are encouraged to work with clients on a real life problem or product related to Security. These clients are identified through contacts with staff and students. Those students that undertake a placement in the preceding year are often able to extend their links with work, by taking on a project derived from their placement year. To assist students with the projects they are encouraged to engage with potential employers and industry peers through forums and the regular guest lectures, run by industry experts, to ask questions and engage fully with the subject area.

All students are encouraged to access MyHub through the Leeds Beckett VLE, where details are contained in terms of placements and other employment and volunteering opportunities. Additionally students are encouraged to find their own placements too. Students are encouraged throughout the course to take up work related opportunities such as business projects, charity, volunteering work. Opportunities are made available by means of the faculty placement database, which holds industry, charity and volunteering opportunities. In addition the university has a volunteering programme of activities. The course team actively encourages students to take up such opportunities throughout the course.

- **Placement or Work Related Activity Level:**

Work related activity is embedded through the use of industry related case studies at all levels. The formal work placement that leads to a sandwich award is between level 5 and level 6.

- **Placement or Work Related Activity Length in Weeks:**

L5 Project – 12 weeks, Placement Year – 30 weeks, L6 Project – 24 weeks.

- **Type of Placement or work related activity:**

Level 5 Team Project module which is a simulation of a challenging and authentic commercial development project. This is supervised by the subject area context leader and a member of staff acting as senior project manager. There are two main summative assessments and in addition there are fortnightly formative project reviews.

The 30 week work placement is within an organisation offering a suitable computing related role. It is assessed on a pass/fail basis.

Reference Points used in course design and delivery (standard text provided below)

All our courses leading to Leeds Beckett University awards have been designed and approved in accordance with UK and European quality standards. Our courses utilise the Frameworks for Higher Education Qualifications (FHEQ) and where relevant subject benchmarks (where these are available) and professional, statutory and regulatory body requirements (for professionally accredited courses).

We review our courses annually and periodically, responding to student feedback and a range of information to enhance our courses. Our University is also subject to external review by the Quality Assurance Agency. Our latest report can be found on the QAA web site at <http://www.qaa.ac.uk/reviews-and-reports>

We appoint External Examiners to verify that our University sets and maintains standards for awards which adhere to relevant national subject benchmark statements and the Framework for Higher Education Qualifications (UK), ensure standards and student achievements are comparable with other Higher Education Institutions in the UK, with which they are familiar, and ensure that assessments measure achievement of course and module learning outcomes and reach the required standard. External Examiners may also provide feedback on areas of good practice or potential enhancement.

Staff Teaching on the Course

You can find details of our highly qualified permanent teaching staff on our website, who are involved in teaching, research and administration associated with the course.

Regulatory Exemption details:

For internal use only

Admissions criteria (for information only)

Undergraduate

120 UCAS tariff points of which 80 points must be from two A Levels or equivalent, excluding General Studies.

GCSE Mathematics (at Grade C minimum) or equivalent

GCSE English (at Grade C minimum) or equivalent

IELTS 6.0 with no skill below 5.5

Mature Students

Mature applicants (21 years old and over) do not have to satisfy the same certificated qualifications entry criteria as college and school leavers. If you have good professional or other qualifications and appropriate work experience you will be considered and are encouraged to apply. As will those wishing to formalise their experience, or to update skills, knowledge and understanding. In addition, we will be looking for evidence of the personal skills and qualities, through your personal statement and references. Any applications received through this route will be considered in line with the university's processes for Recognition of Prior Learning.

Overseas Applicants

Students whose first language is not English, with certificated qualifications, professional qualifications and or appropriate work experiences that are equivalent to those detailed above will be considered and encouraged to apply. In addition to these, you will also have to demonstrate that your standard of English is at IELTS 6.0 or better with no skill lower than IELTS 5.5. We will also be looking for evidence of personal skills and qualities through your personal statement and references. Applications received through this route may be considered in line with the university's processes for Recognition of Prior Learning, where appropriate.

Links to further information about RPL:

<http://www.leedsbeckett.ac.uk/postgraduate/entry-routes/#mature-students>

<https://www.leedsbeckett.ac.uk/partners/recognitionofpriorlearning.htm>

Evidence of Student Engagement in design and development

On 8 January 2016 at 12:19, Butterfield, Emlyn <E.Butterfield@leedsbeckett.ac.uk> wrote:

Hi all,

Thanks for offering to pass comment on our plans.

The real changes are:

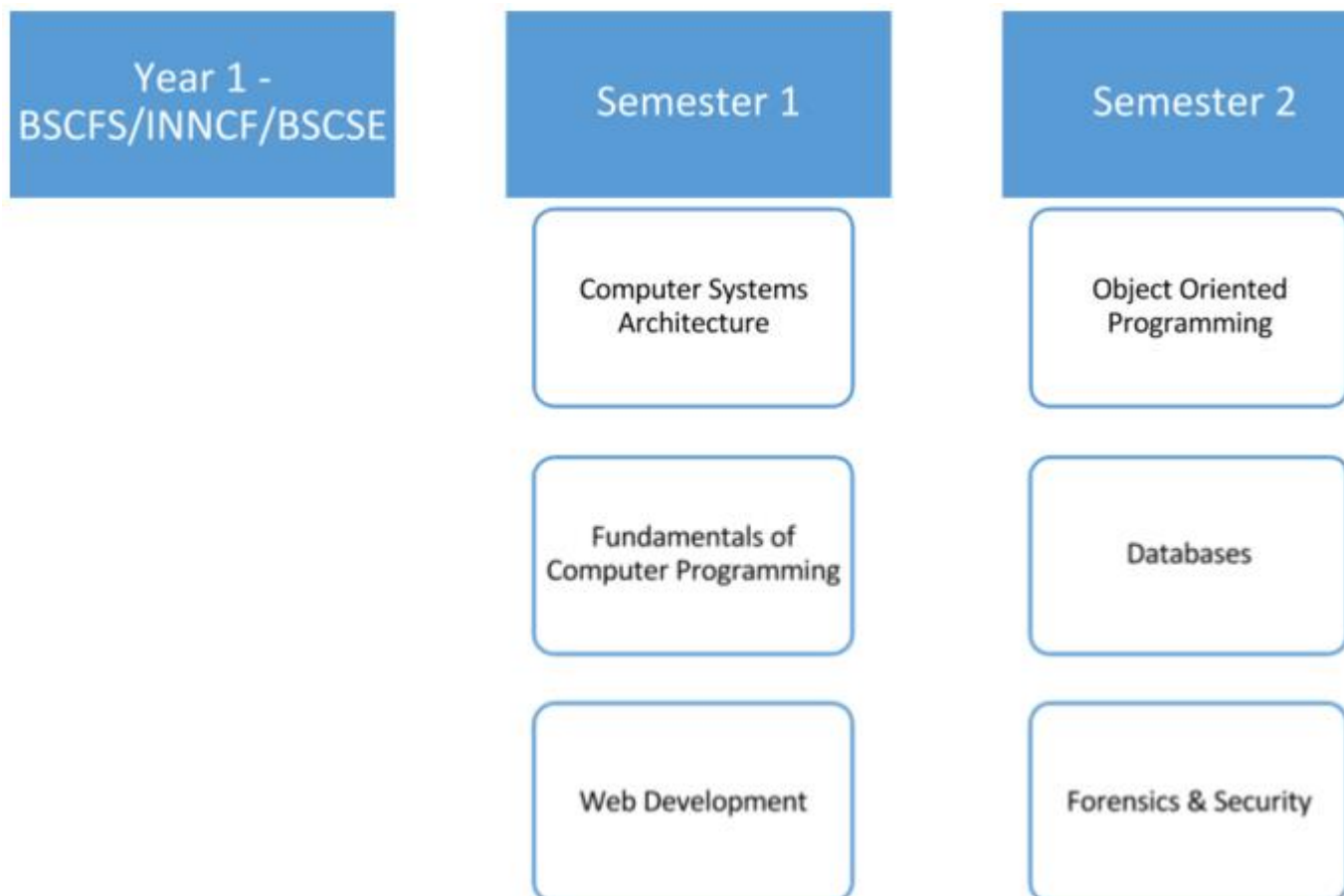
- Dropping of Systems development in the first year
- An additional programming module in the first year
- Electives for forensics/security students in the final year

What are your thoughts? Are other changes required/recommended?

Acronyms

BSCFS: BSc Computer Forensics & Security

INNCF: BSc Computer Forensics



Year 2 -
BSCFS/INNCF/BSCSE

Semester 1

Computer Forensic
Processing

Digital Security Landscapes

Elective:
Software Systems Development
/ Operating Systems Practice

Semester 2

Team Project

Network Forensics &
Security

Elective:

- Database Application Development
- Internet Systems Development

Year 3 - INNCF

Semester 1

Advanced Digital Forensics

Elective

- Web
- Networking
- Programming
- Databases

Production Project

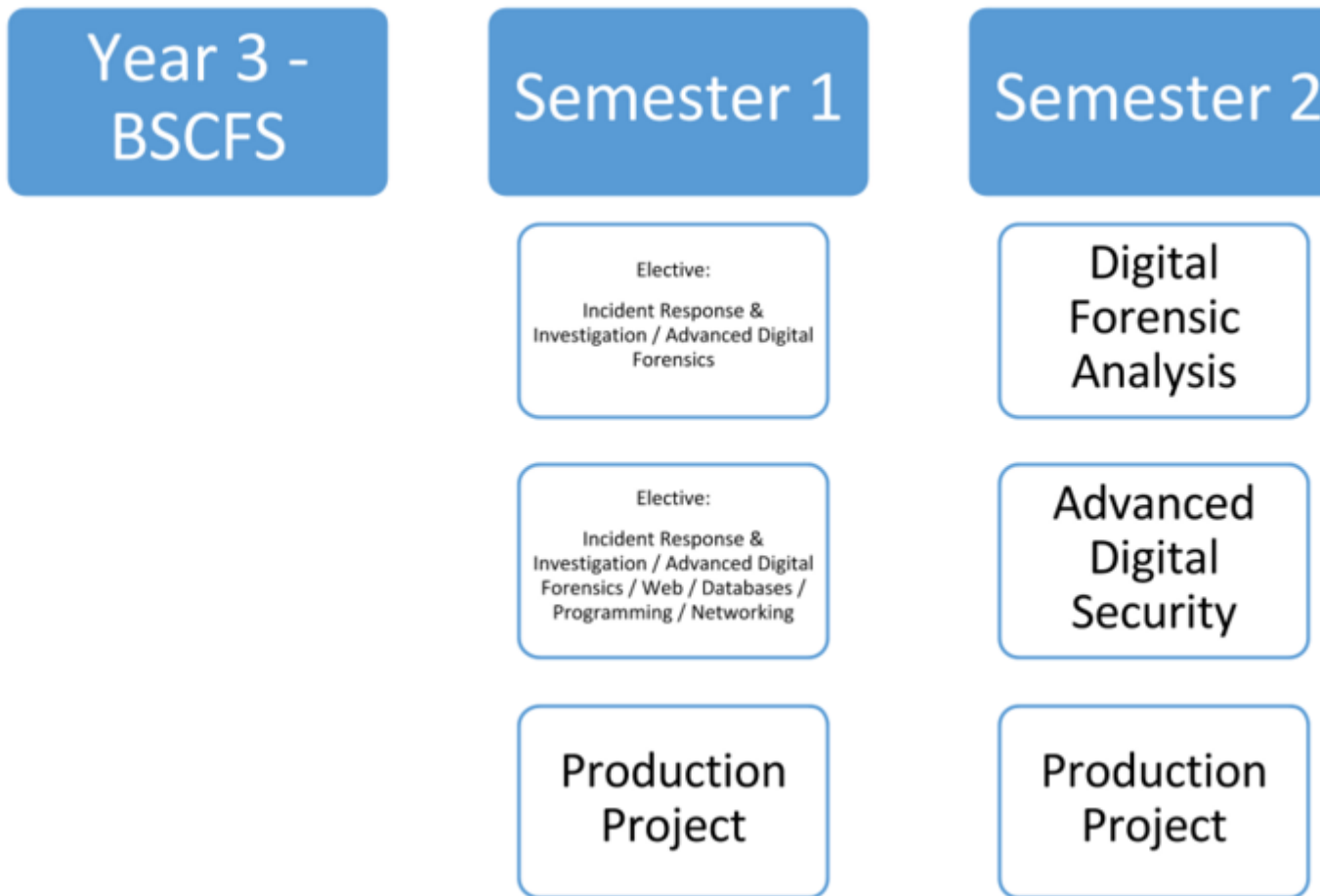
Semester 2

Digital Forensic Analysis

Elective

- Advanced Digital Security (required for MSci progression)
- Web
- Networking
- Programming
- Databases
- Mobile App Development

Production Project



Emlyn Butterfield, Course Leader Computer Forensics & Security
 School of Computing, Creative Technologies and Engineering

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 Leeds Beckett University, 115 Caedmon Hall, Headingley, Leeds, LS6 3QS, United Kingdom
 Tel: [+44 \(0\)113 812 4440](tel:+441138124440) | Mob: 07921 910939 | Email: e.butterfield@leedsbeckett.ac.uk

Responses from Students

Looks great! What will be taught in the web and programming electives in third year?

Connor Wilson
 BSc Computer Forensics and Security | Year 3

Hi Emlyn,

Firstly, I think as a whole this is a great idea.

First year looks really good. I like the inclusion of more programming skills in replace of the more redundant modules.

Second year looks very similar to the current version, but I like the inclusion of electives in both semesters. Some students may not want to take software, so making it elective rather than compulsory is a good idea.

The addition of an extra elective to final year for purely Forensics students is a good one. I think those that are not good at security but still want to learn more skills can take a lot away from the inclusion of that module.

Moving DFA to the second semester is quite useful as it gives students more time to find tools which some struggled with this year.

Giving electives to those in the final year of Forensics and Security sounds like a great idea. I had heard by some that IRI was very difficult and having at as an optional module might be easier for students. It also gives students a chance to do a module outside of Forensics and Security which some may want to do.

I can't think of any other changes that should be made or undone.

Overall, it looks very promising.

Kind Regards,

Ben Watkins

Hi Emlyn,

Overall, I agree with the more programming centred approach to Years 1 and 2. Year 3 for INNCF, looks more appealing, given the fact that a student has the option to further specialise into other modules including Adv. Security, without having to swap to BSCFS. However, Year 3 for BSCFS in my opinion should look more like this:-

Course Learning Outcomes Mapping (adapt as appropriate)

| Title and Level | Course LO1 | Course LO2 | Course LO3 | Course LO4 | Course LO5 | Course LO6 |
|---------------------------------------------------------------------------------------------------------------------------------|------------|------------|------------|------------|------------|------------|
| Level 4 LO1: Explain fundamental concepts and principles of computer forensics and security | | √ | √ | | | |
| Level 4 LO2: Convey technical information which is accurate and has clarity. | | √ | | | | |
| Level 4 LO3: Identify the application of principles of legal / ethical issues within the actual practice of self and/or others. | | √ | | √ | √ | |
| Level 4 LO4: Use specified ICT applications and strategies for a restricted range of given purposes and tasks | √ | | | √ | √ | |
| Level 4 LO5: Solve simple, defined problems by selecting an approach from those suggested. | √ | | | √ | | |
| Level 5 LO1: Select and explain key aspects which have some complexity and | | √ | √ | | | |

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| depth and are well-established within the computer forensics and security subject area | | | | | | |
| Level 5 LO2: Use academic conventions to produce concise work which is appropriate to the purpose, situation and audience within the context of computer forensics and security. | ✓ | | | | ✓ | |
| Level 5 LO3: Apply underlying concepts and principles of computer forensics and security in a novel situation, including, where appropriate, within an employment context | ✓ | | | ✓ | ✓ | |
| Level 5 LO4: Where appropriate, participate effectively in collaboration with people in a project context | | | ✓ | | | |
| Level 5 LO5: Select and use specified ICT applications and strategies as | ✓ | | | ✓ | ✓ | |

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| appropriate for guided purposes and tasks | | | | | | |
| Level 5 LO6: Solve straightforward problems by identifying, explaining and selecting appropriate approaches to use. | | | √ | √ | √ | |
| Level 6 LO1: Select and explain key aspects which are complex, coherent and detailed and are at, or informed by, the forefront of the computer security discipline | | √ | | √ | | |
| Level 6 LO2: To reflect on and evaluate own strengths, limitations and performance and the implications and their relevance for personal development | | | | √ | √ | |
| Level 6 LO3: Create, implement and monitor a plan to achieve a refined number of agreed objectives | | | | √ | √ | |
| Level 6 LO4: Analyse the potential influence of the ethical/legal | | √ | | √ | √ | |

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| issues within computer security discipline | | | | | | | |
| Level 6 LO5: Select, use and evaluate ICT applications and strategies which are appropriate for various purposes and tasks. | ✓ | | | ✓ | ✓ | | |
| Level 6 LO6: Select, justify and use appropriate (straightforward and complex) approaches, including some at the forefront of the computer security discipline | ✓ | ✓ | | ✓ | ✓ | | |

Level Learning Outcomes Mapping

| Level and Module Title | Core | Level LO1 | Level LO2 | Level LO3 | Level LO4 | Level LO5 | Level LO6 |
|----------------------------------------------|------|-----------|-----------|-----------|-----------|-----------|-----------|
| Fundamentals of Computer Programming Level 4 | Y | ✓ | | | ✓ | ✓ | |
| Computer Communications Level 4 | Y | ✓ | | | ✓ | ✓ | |
| Forensics & Security Level 4 | Y | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Object Oriented Programming Level 4 | Y | ✓ | | | ✓ | ✓ | |
| Fundamentals of Databases Level 4 | Y | ✓ | | | ✓ | ✓ | |

| | | | | | | | |
|----------------------------------------------------------|---|---|---|---|---|---|---|
| Website Development Level 4 | Y | ✓ | | | | ✓ | |
| Computer Forensic Processing (option) Level 5 | Y | ✓ | ✓ | ✓ | | ✓ | ✓ |
| Database Systems (option) Level 5 | Y | | | | | ✓ | ✓ |
| Web Applications and Technologies (option) Level 5 | Y | | | | | ✓ | ✓ |
| Web and Network Security Level 5 | Y | ✓ | ✓ | ✓ | | ✓ | ✓ |
| Team Project Level 5 | Y | ✓ | | ✓ | ✓ | | ✓ |
| Digital Security Landscapes Level 5 | Y | ✓ | ✓ | ✓ | | ✓ | ✓ |
| Software Systems Development (option) Level 5 | Y | ✓ | | ✓ | ✓ | ✓ | ✓ |
| Digital Forensic Analysis Level 5 | | ✓ | ✓ | ✓ | | ✓ | ✓ |
| Production Project Level 6 | Y | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Advanced Database Systems (optional) Level 6 | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Advanced Web Engineering (option) Level 6 | | ✓ | | ✓ | | ✓ | |
| Developing Mobile Applications (option) Level 6 | | ✓ | ✓ | | ✓ | | ✓ |
| Incident Response & Investigation Level 6 | | ✓ | | | ✓ | ✓ | ✓ |
| Advanced Digital Security Level 6 | | ✓ | | ✓ | ✓ | ✓ | ✓ |
| Intelligent Systems (option) Level 6 | | ✓ | | ✓ | | | ✓ |
| Green Computing Technologies (option) | | ✓ | | | ✓ | | ✓ |

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| Level 6 | | | | | | | | |
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Assessment Methods (Please enter % weighting for summative assessment per module, core and options. Add additional rows as necessary)


| Module Titles | Core (Y/N) | Written Examination | Written Assignment | Report | Dissertation | Portfolio | Project Output | Oral Assessment | Practical Skills Assessment | Set Exercises |
|-----------------------------------------------|------------|---------------------|--------------------|--------|--------------|-----------|----------------|-----------------|-----------------------------|---------------|
| Fundamentals of Computer Programming, level 4 | | Y | | | | | 40/60 | | | |
| Computer Communications, level 4 | | Y | | | | | 50/50 | | | |
| Object Oriented Programming, level 4 | | Y | | | | | 40/60 | | | |
| Forensics & Security, level 4 | | Y | | 60 | | | 40 | | | |
| Fundamentals of Databases, level 4 | | Y | | 40/60 | | | | | | |
| Website Development, level 4 | | Y | | 40 | | | 60 | | | |
| Database Systems, level 5 | | | | 50 | | | 50 | | | |

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|------------------------------------------------|--|---|----|----|----|----|-------|----|--|--|
| Web Applications and Technologies, level 5 | | | | 30 | | | 70 | | | |
| Web and Network Security, level 5 | | Y | | | 40 | | 60 | | | |
| Team Project, level 5 | | Y | | | | | 30/70 | | | |
| Computer Forensic Processing, level 5 | | Y | | 40 | | | 60 | | | |
| Software Systems Development (Option) level 5 | | | 50 | | | | 50 | | | |
| Digital Security Landscapes, level 5 | | Y | | 50 | 50 | | | | | |
| Digital Forensic Analysis, level 5 | | Y | | 40 | | | 60 | | | |
| Production Project, level 6 | | Y | | | | 10 | 40 | 50 | | |
| Incident Response & Investigation | | | | | | | 100 | | | |
| Advanced Digital Security | | Y | | 50 | | | 50 | | | |
| Advanced Web Engineering (option) level 6 | | | | | | | 100 | | | |
| Advanced Software Engineering (option) level 6 | | | | | | | 40/60 | | | |
| Advanced Database Systems (option) level 6 | | | | | 50 | | 50 | | | |
| Intelligent Systems (option) level 6 | | | 50 | | | | 50 | | | |

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|-------------------------------------------------|--|--|----|--|-------|--|--|--|--|--|
| Green Computing Technologies (option) level 6 | | | 50 | | 50 | | | | | |
| Developing Mobile Applications (option) level 6 | | | | | 40/60 | | | | | |

Scheduled Non-Modular Contact Hours (KIS requirement)

Resources (Please attach a printout of your Learning Resources List to this document, for the Panel to review.)

| | |
|---------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|
| <p>FINAL SIGN OFF</p> <p>To be used for:</p> <ul style="list-style-type: none"> • Validation • Re-validation |  <p>LEEDS BECKETT UNIVERSITY</p> |
|---------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|

This must be completed and returned to Quality Assurance Services with definitive validation documentation consisting of:

1. Course Information Form
2. Course Specification
3. Module Specification(s)

| | |
|-------------------------------------------|---------|
| Approved by Validation Panel | Yes/ No |
| Date | |
| Conditions to Approval | Yes/ No |
| Date conditions to be met | |
| Conditions Approved | Yes/ No |
| Date | |
| If No, please specify action taken | |
| Signed (Dean of School or nominee) | |

| | |
|----------------------------|--|
| Final sign off date | |
|----------------------------|--|