PROGRAMME SPECIFICATION

Awarding body/institution	Glyndŵr University
Teaching institution (if different from above)	N/A
Details of accreditation by a professional, statutory or regulatory body (including link to relevant website)	N/A
What type of accreditation does this programme lead to?	N/A
Is accreditation in some way dependent on choices made by students?	N/A
Final award/s available eg BSc/DipHe/CertHE	BSc (Hons), BSc Ordinary, DipHE, CertHE
Award title	BSc (Hons) Computing BSc (Hons) Computer Networks & Security BSc (Hons) Cyber Security BSc (Hons) Computer Game Development BSc (Hons) Immersive Technology BSc (Hons) Creative Computing BSc (Hons) Artificial Intelligence BSc (Hons) Computing Philosophy BSc (Hons) Computer Science
JACS 3 code	I100
UCAS code	I674 BSc (Hons) Computing I567 BSc (Hons) Computer Networks & Security 8L6D BSc (Hons) Cyber Security G451 BSc (Hons) Computer Game Development OL87 BSc (Hons) Immersive Technology I478 BSc (Hons) Creative Computing 5H8T BSc (Hons) Artificial Intelligence 9K4V BSc (Hons) Computing Philosophy 4R9B BSc (Hons) Computer Science With kick start/Foundation Year (see Admissions section for more details on this): I908 BSc (Hons) Computing I566 BSc (Hons) Computer Networks & Security H098 BSc (Hons Cyber Security I620 BSc (Hons) Computer Game Development J823 BSc (Hons) Immersive Technology I477 BSc (Hons) Creative Computing I538 BSc (Hons Artificial Intelligence I573 BSc (Hons) Computing Philosophy

	I345 BSc (Hons) Computer Science
Relevant QAA subject benchmark statement/s	Computing
Other external and internal reference points used to inform the programme outcomes	The following reference points were used in designing the programme: QAA Framework for Higher Education Qualifications in England, Wales and Northern Ireland QAA guidelines for programme specifications QAA Code of Practice for the assurance of academic quality and standards in HE University's Regulations BCS Guidelines on Course Accreditation
Mode/s of study *(p/t, f/t, distance learning)*	Full time & Part time
Language of study	English
Date at which the programme specification was written or revised	September 2014 Updated July 2016

Criteria for admission to the programme

Entry requirements are in accordance with the University regulations.

Entry requirements:

- Five GCSE passes at grades A, B or C including Mathematics and English/Welsh.

In addition one of the following is normally required:

- A minimum of 240 UCAS tariff points at GCE A Level or equivalent;
- Appropriate AS-Level and Level 3 Key Skills qualifications will also be taken into account
- Equivalent qualifications from an overseas country;

Applicants, who do not meet the criteria above, will be assessed on an individual basis by interview.

In addition to the academic entry requirements, overseas students require an IELTS score of 6.0 (with no sub-part less than 5.5): this should have been achieved within the two years prior to application.

Level 5 and Level 6 entry
Students may enter the programme at various levels with Recognition of Prior Learning (RPL) or Recognition of Prior Experiential learning (RPEL) in accordance with the University regulations.

For programmes offered at Glyndŵr University London (GUL):
GUL is responsible for admitting students to the programme in accordance with the Programme Specification and Glyndŵr University Admissions Regulations.

All of the programmes validated as part of this suite will also be offered as a four year kick-start degree. The kick-start will be offered where an applicant does not meet the entry requirements for the three year honours degree or where the department / applicant feel they would benefit from an additional year to gain some additional experience before progression to the full three year degree. Upon successful completion the student will automatically progress to their chosen degree course. Entry to the four year kick-start programme will be conditional on interview and review of applications to confirm that students are able to satisfactorily complete the programme. The principal criteria for entry will be based on the academic judgement of the admissions tutor and members of the programme team in the relevant subject area that the applicant will be able to satisfactorily complete the programme. All applicants however must be able to demonstrate a minimum level of competence in English /Welsh Language and in Mathematics, with a pass at Grade C or above in GCSE or an equivalent qualification. Therefore, this route is aimed at:

- Those who don't meet the entry requirements for a full degree
- Those who have been out of education for a while and feel they would benefit from the extra year of preparation
- Those looking to undertake a degree in an entirely new subject area and do not have the subject specific experience necessary to go straight to a degree.

Where an overseas applicant does not meet the entry requirements for the three year honours degree or where the department / applicant feel they would benefit from an additional year to gain some additional experience, the International Foundation Year will be offered. As with the kick-start route, upon successful completion the student will automatically progress to their chosen degree course. Entry application to the International Foundation Year programme will be subject to academic consideration.

Overview and Aims of the programme

The department of Computing has reviewed its existing portfolio and has restructured this provision recognising that for a strong and viable future, responsiveness to market demand and effective delivery are vital. This suite of nine new programmes is designed to build an increasingly dynamic and sustainable future for Computing.

The programme team has met and liaised with employers, partners, students and other key stakeholders over the last few months to produce this proposal for the validation panel.
The proposal offers a wide and varied range of titles that achieve a more efficient use of staff resource for programme delivery, management and research. This efficient use of staff will allow for research, third stream income, and other aspects of their jobs.

The proposal has a very high level of module reuse at every level. This means that the marginal cost of each programme is low. Conversely, any reduction of the proposed range of programmes automatically reduces the efficiency of the suite.

The suite of programmes is based around three themes but the overlap of modules within a theme and across themes gives students significantly more choice. The programme structures enable students to make an informed choice as to their final choice of degree award. The three general themes range from the more technical aspects with:

Computing	Combining the core principles of the discipline with a forward-looking approach to embracing new developments in the fast-moving world of computer technology

Computer Networks and Security	A technology-infused course that includes a mix of technology, security and networking modules with many hands-on practical opportunities
Cyber Security	Intended to address the advances in cyber security through an in-depth understanding of IP security and the future and emerging technologies associated with this area.

To the more creative aspects of computing with:

Computer Game Development	Computer game design and development skills required to fully engage with game industry practices, technologies and methodologies.
Immersive Technology	Gesture controls, 360 3D (full dome development) displays, augmented reality, virtual worlds, simulation and electronic prototyping.
Creative Computing	Designed to give an insight into creative applications, developing an understanding of visual and audio digital representations, techniques and interactive applications

And finally to three programmes that address some of the wider issues of computing and the future of computing with:

Artificial Intelligence	Computing methods and techniques based on classical artificial intelligence as well as evolutionary computing.
Computing Philosophy	Interests in algorithms, cognition, intelligence, language, social, legal, ethical and environmental issues.
Computer Science	A scientific and practical approach to computation and its applications.

Recent changes to the school curriculum have introduced the teaching of computer science at GCSE and A-level. The new curriculum will have a strong emphasis on the principles of computer science and practical programming, including algorithms, coding and hardware. Ensuring that school pupils have a strong technical understanding of computer science, and the ability to program and develop computer systems, will mean that the computing programmes will have a much stronger pool of talent to draw upon. Consequently, the new programmes will provide degree-level education that is dynamic and challenging in order to meet the future needs of the IT industry.

Computing is an exciting, challenging and dynamic discipline. Computers form an integral part of every aspect of society and modern life. New computing technologies are introduced at an enormous rate and the Computer Science field develops and changes continually and rapidly.

Students studying these programmes will be exposed to an education and learning experience that aims to instil knowledge and develops critical and intellectual abilities applicable to problem solving and solution specifying in technologically and socially diverse environments. Students will have opportunities to apply their knowledge on real life projects. This will help ensure that students acquire the necessary knowledge and skills to cope with the astonishing rate of change and to ensure that the programme produces graduates who operate on graduation as autonomous computing professionals.

Graduates from a computing discipline are sometimes perceived as not having useful business skills, as lacking experience in the latest technologies and being deficient in social

skills. Our new programmes put an even greater emphasis on employability skills and the skills required to work as a member of a team. The use of current technology pervades the programmes at all levels.

The programmes have been developed in accordance with British Computer Society (BCS) accreditation criteria in preparation for the Department's intention to submit for accreditation in the near future.

The overall aims of the programme suite are:

- To provide students with knowledge and understanding of the fundamental principles and technologies which underpin the discipline of computing;
- develop competence, adaptability, self-confidence and critical self-reflection through critical enquiry and independent judgement;
- develop capability in the exploration, critical analysis and evaluation of technical and business issues and concepts including an awareness of ethical and environmental issues;
- Provide a rigorous and scientifically-based course of study, informed by research, which successfully balances practical vocational skills with theoretical understanding.
- Equip students with independent learning skills, prepare students for employment or to prepare students for continued study at an advanced level, either in formal postgraduate study or as continued professional development
- Produce versatile and resourceful practitioners fostering innovation, enterprise and enthusiasm for excellence in the discipline of computing
- To provide students with sound knowledge and expertise of software engineering principles across the whole software development lifecycle
- Provide students with an awareness of the roles and responsibilities of a professional working within the computing profession

The full suite of programmes will be available at the University's main campus in Wrexham with the BSc (Hons) Computing also approved for delivery at Glyndŵr University London (GUL).

Composition of Awards

The Certificate of Higher Education in Computing is an exit award available for a student who has completed 120 credits at level 4 or above and who is unable or chooses not to continue on the programme.

The Diploma of Higher Education in [programme title] is an exit award available for a student who has completed 240 credits of which 120 credits were studied at level 5 or above and who is unable or chooses not to continue on the programme.

The Ordinary Degree in [programme title] is an exit award available for a student who has completed 300 credits, of which 120 credits were studied at level 5 or above and 60 credits at level 6.

The Honours Degree in [programme title] is an award available for a student who has completed 360 credits, of which 120 credits were studied at level 5 or above and 120 credits at level 6.

Programme Learning Outcomes Common to All Programmes

The following reference points were used to inform the development of the programme and its learning outcomes:

- the University's vision and core strategic aims, teaching and learning strategy and policies;
- the QAA subject benchmark statement for Computing;
- the Framework for Higher Education Qualifications in England, Wales and Northern Ireland;
- the Credit and Qualification Framework for Wales (CQFW);
- current needs of the local, national and international computing industry;
- current research and other scholarship carried out by academic staff;
- requirements of the BCS;

The programme suite provides opportunities for students to develop and demonstrate knowledge and understanding, intellectual and other important transferable and employability skills. The following section identifies the Programme Learning Outcomes common to all programmes in the computing suite.

Graduates will be able to demonstrate the following:

A. Knowledge and understanding	
A1	A critical appreciation of the facts, concepts, principles and theories relating to computing and computer applications as appropriate to the programme of study.
A2	The range of tools necessary to develop computational solution
A3	Industry standards for software confirmation, operation and testing
A4	Recognition of professional considerations involved in the sustainable exploitation of computer technology and is guided by the adoption of appropriate professional, ethical and legal practices.
A5	Working in collaborative teams, partnerships and industry networks

B. Intellectual skills	
B1	Identify, select and apply appropriate computational system development models and processes
B2	Develop cognitive skills of critical thinking, analysis and synthesis
B3	Select and apply suitable software development models and processes
B4	Apply industrial standards to software performance, interoperability and evaluation.
B5	Critically appraise the environment, industry and work place; identifying opportunities and threats.

C. Subject specific skills	
C1	Utilise appropriate research methods for presentation, analysis and interpretation of both qualitative and quantitative data, relevant to the discipline.
C2	Work collaboratively in teams and with potential partners in industry.

D. Practical, Professional and Employability skills	
D1	Written communication skills: Research, analyse and interpret information from a variety of sources and synthesise and communicate ideas effectively both orally and in writing
D2	Numeracy

D3	Multidisciplinary teamwork skills: actively participate in groups and also be capable of independent work.
D4	Information and communications technology skills
D5	Cognitive skills: Critically assess the relevance and importance of ideas of others
D6	Managing own learning: evaluate own performance and working standards and manage own learning and continuing professional development and develop lifelong learning skills

A. Knowledge and understanding

		Level 4 Cert He	Level 5 Dip He	Level 6 Degree	Level 6 Honours Degree
A1	A critical appreciation of the facts, concepts, principles and theories relating to computing and computer applications as appropriate to the programme of study.	Demonstrates a working understanding of some essential facts, concepts, principles and theories relating to computing and computer applications. Shows competence in basic IT and communication skills, workshop practice and laboratory investigations	Demonstrates a widening appreciation of the significance of key concepts, principles, theories and practices that underpin computing as an academic discipline and explores its extent and boundaries through practical work, design exercises and case studies.	Shows confident familiarity with the broad areas of the knowledge bases of the discipline, including the management and an appreciation of the principles, theories and practices that underpin computing as an academic discipline. Reveals a working understanding of current technology and of its limits	Demonstrates confidence and reveals a clear understanding of the boundaries of existing and emerging technology and the limits of its application, and of the range of conventional design methods and the types of judgement employed by computing professionals.
A2	The range of tools necessary to develop computational solution	Evaluate the appropriateness of a range of development tools for the creation of software applications.	Demonstrate an ability to apply a range of programming tools and techniques in new contexts from that in which they were first studied at level 4, in the design of applications.	Select and deploy accurately established techniques and tools to develop applications for selected business problems, and choose appropriate theory for analysis, with only general guidance.	Increasingly independent, confident and flexible in applying a range of programming tools for the creation of applications for selected business problems, and in the application of knowledge and skills appropriate to their solution.
A3	Industry standards for software confirmation, operation and testing	Demonstrate a working knowledge of some of the tools, practices and methodologies used in	Demonstrates a widening appreciation of	Select and deploy accurately established techniques and methods used in	Increasingly independent, confident and flexible in applying a range of methods

		the specification, design, implementation and testing of computer software systems; understand some of the risks of software implementation	of some of the tools, practices and methodologies used in the specification, design, implementation and testing of computer software systems; understand the risks of software implementation, Demonstrate a working of the general rules and best practices adopted and knowledge of software testing techniques	defining and assessing criteria for measuring the extent to which a computer system is appropriate for its current deployment; understand the risks of software implementation and apply risk-based strategies and policies for software testing.	used in defining and assessing criteria for measuring the extent to which a computer system is appropriate for its current deployment and future evolution; understand the risks of software implementation and apply risk-based strategies and policies for software testing.
A4	Recognition of professional considerations involved in the sustainable exploitation of computer technology and is guided by the adoption of appropriate professional, ethical and legal practices.	a basic knowledge and understanding of the professional, economic, social, environmental, moral and ethical issues involved in the sustainable exploitation of computer technology	knowledge and understanding of the professional, economic, social, environmental, moral and ethical issues involved in the sustainable exploitation of computer technology	knowledge and a comprehensive understanding of the legal, professional, economic, social, environmental, moral and ethical issues involved in the sustainable exploitation of computer technology	Demonstrates confidence and reveals a comprehensive understanding of the legal, professional, economic, social, environmental, moral and ethical issues involved in the sustainable exploitation of computer technology
A5	Working in collaborative teams, partnerships and industry networks	The ability to work effectively with tutors and fellow students; participates in clearly defined group situations.	Demonstrates more advanced interactive and group skills, including effective participation with others on a common task or group project.	The ability to work effectively with others on a common task; demonstrates basic negotiating skills in line with team objectives.	The ability to work effectively with others on a common task; taking actions which respect the needs and contributions of others; contributing to and accepting the

					consensus; negotiating to achieve the objectives of the team

B. Intellectual skills

		Level 4 Cert He	Level 5 Dip He	Level 6 Degree	Level 6 Honours Degree
B1	Identify, select and apply appropriate computational system development models and processes	Based on classifications presented by tutors, demonstrates some ability to apply basic concepts, principles, theories when analysing case study examples with the help of detailed guidance from Tutors.	Demonstrates increasing ability to apply the key concepts, principles, theories and practices to relatively simple situations, still with some guidance provided.	Recognises familiar ideas or principles in new contexts or situations; apply the key concepts, principles, theories and practices, systematically and effectively with minimal guidance.	Identifies and classifies principles and ideas in new contexts and situations; creatively apply the key concepts, principles, theories and practices, systematically, effectively and critically, working autonomously.
B2	Develop cognitive skills of critical thinking, analysis and synthesis.	Using the tutor as a facilitator, the student begins to analyse basic problems, identify requirements and propose alternative solutions for computer software systems.	Starts to develop an understanding of the limits of their knowledge, and how this influences analysis and interpretations based on that knowledge; identify requirements and propose and compare alternative solutions for computer software systems	develops self-reliance and confidence in the analysis of problems, identify requirements and propose and critically evaluate alternative solutions for computer software systems	Integrates learned theory and techniques with practical experience to analyse problems, identify requirements and propose and critically evaluate alternative solutions for computer software systems with informed understanding.
B3	Select and apply suitable software development models and processes	Carries out rote application of basic computing principles and procedures to	Applies standard computing principles and procedures to somewhat more	Demonstrates ability to select and use principles and procedures appropriate	Carries out confident and accurate selection and application of principles and

		standard, simple situations, with considerable guidance provided by tutors.	demanding situations, still with some guidance provided.	to the situation or problem in hand, with minimal guidance provided.	procedures to the solution of a range of computing situations and problems, working autonomously.
B4	Apply industrial standards to software performance, interoperability and evaluation	Starts to form own value judgements of software development etc., based on criteria provided, albeit very reliant on tutors' evaluative opinions.	Starts to develop own criteria and develops ability to form independent judgements, although still dependent on guidance from tutors.	Identifies a range of valid alternative solutions; begins to discriminate and evaluate in a reasoned, systematic and increasingly independent way.	Integrates theory with good computing practice; autonomously evaluates theory, process, solutions and outcomes critically and effectively.
B5	Critically appraise the environment, industry and work place; identifying opportunities and threats .	Develops an ability to explore and recognise any risks or safety aspects that may be involved in their work and to the relevance of selected professional, legal, moral, social and ethical issues; communicate the results of their study/work accurately and reliably, and with structured and coherent arguments.	Uses a range of established techniques within tutorials, for example, using experiential learning exercises, to explore and recognise the relevance of selected professional, legal, moral, social and ethical issues in their work and to communicate the results of their study/work accurately and reliably, and with structured and coherent arguments.	Demonstrates technology industry acumen, with minimum supervision, recognising the relevance of legal, professional, moral, social and ethical issues in the work place and the wider environment. Able to inform and adapt their work to satisfy these issues	Effective self-management in terms of time; ability to conduct research independently or as a team, into legal, professional, moral, social and ethical issues. Able to inform and adapt their work to satisfy these issues Demonstrates an ability to carry out research and critical thinking

C. Subject specific skills

		Level 4 Cert He	Level 5 Dip He	Level 6 Degree	Level 6 Honours Degree
C1	Utilise appropriate research methods for presentation, analysis and interpretation of both qualitative and quantitative data, relevant to the discipline.	Systematically relates a limited number of facts/ideas/elements in an imitative manner, with considerable guidance provided by tutors.	Demonstrates appreciation of need for the relating and collecting of a range of facts/ideas/elements in an argued case; produces new ideas in closely-defined situations with some guidance provided as appropriate.	The ability to apply research methods to relate and collect facts/ ideas/ elements in an argued case; produces new ideas in a wider range of situations, with minimal guidance.	The ability to apply appropriate research methods to collate facts/ ideas/ elements in support of a well-structured argument; design solutions to problems and evolve new concepts, working autonomously.
C2	Work collaboratively in teams and with potential partners in industry.	The ability to work effectively with tutors and fellow students; participates in clearly defined group situations.	Demonstrates more advanced interactive and group skills, including effective participation with others on a common task or group project.	The ability to work effectively with others on a common task; demonstrates basic negotiating skills in line with team objectives.	The ability to work effectively with others on a common task; taking actions which respect the needs and contributions of others; contributing to and accepting the consensus; negotiating to achieve the objectives of the team

D. Practical, Professional and Employability skills

		Level 4 Cert He	Level 5 Dip He	Level 6 Degree	Level 6 Honours Degree
D1	Written communication skills: Research, analyse and interpret information	Communicates in a clear and concise way, in writing and orally, in	Communicates in a clear, systematic and concise way, in writing	Engages effectively in a variety of roles; debates; produces	Engages effectively in independent roles; debates in a

	from a variety of sources and synthesise and communicate ideas effectively both orally and in writing	relatively informal and limited-length pieces of work. In particular written communication demonstrates competence in technical reporting.	and orally, in more formal academic and professional styles, and in longer pieces of work of a technical nature.	clear, well-structured technical reports and other extended pieces of work; gives clear, subject-specific presentations in a variety of contexts.	professional manner; produces detailed critiques and coherent technical and project reports; gives confident oral and other presentations in a wide range of contexts.
D2	Numeracy	Demonstrates basic numeracy and algebraic competence; ability to manipulate data related to simple business problems	Demonstrates more advanced standard numerical/ mathematical skills as appropriate to their chosen specialist subject.	Applies a range of more specialist numerical/ mathematical skills as appropriate to their specialist subject.	Confidently applies a range of specialist numerical/ mathematical skills as appropriate to the specialist subject area.
D3	Multidisciplinary teamwork skills: actively participate in groups and also be capable of independent work	Interacts effectively with tutors and fellow students; participates in clearly defined group situations	Demonstrates more advanced interactive and group skills, including effective participation in more demanding group tasks, including a group project.	Interacts effectively within a learning or subject-specific group, including a work-experience group; demonstrates basic negotiating, role, leadership and group-support skills.	Interacts effectively within learning or professional groups; demonstrates appropriate negotiating, role, leadership and group-support skills to an advanced level.
D4	Information and communications technology skills	Select under guidance and use relevant sources of information to identify potential computing resources for a specific purpose. Demonstrates basic skill in using the Internet and designing web pages.	Demonstrates more advanced IT skills; Demonstrates competent use and application of business databases, additional specialist subject packages and produce reports to business standard.	Demonstrates, uses and accesses a limited selection of more specialist IT skills related to subject specific software. Conducts effective searches for information to identify potential computing resources for a specific	Uses and accesses a limited selection of more specialist IT skills related to subject specific software for analysing business data. Conducts effective searches for information to identify potential computing

			Use of online databases effectively to gain information.	purpose and critically evaluate their merit	resources for a specific purpose and critically evaluate their merit
D5	Cognitive skills: Critically assess the relevance and importance of ideas of others	Shows an understanding of the opinions of other people; flexibility in considering alternatives and opinions	Demonstrates the ability to take the perspective of others; identifying the similarities and differences between two approaches to the solution of a given problem	Demonstrates the ability to take the perspective of others; comparing the strengths and weaknesses of alternative interpretations determining the credibility of a source of information.	Demonstrates the ability to take the perspective of others; articulate the strengths and weaknesses of the suggestions of arguments posed; recognize the underlying agendas and motivations of individuals and groups involved in a given situation
D6	Managing own learning: evaluate own performance and working standards and manage own learning and continuing professional development and develop lifelong learning skills	Studies in a systematic, directed way with the aid of appropriate Tutor guidance.	Learns in an increasingly effective and purposeful way, with beginnings of development as an autonomous learner.	Adopts a broad-ranging and flexible approach to study; identifies learning needs; pursues activities designed to meet these needs in increasingly autonomous ways.	With minimal guidance, manages own learning using a wide range of resources appropriate to the IT profession; seeks and makes effective use of feedback. Self-reflection and criticality including self - awareness, openness and sensitivity to diversity in terms of people, cultures, business, management and marketing issues.

Additional programme outcomes are identified and documented in each programme structure.

Programme Suite module structure										
		Computing	Computer Networks &	Cyber Security	Computer Game Development	Immersive Technology	Creative Computing	Artificial Intelligence	Computing Philosophy	Computer Science
Module Title	**Module Code**									
LEVEL SIX										
Project (40 credits)	COM625	C	C	C	C	C	C	C	C	C
Singularities and Society	COM626	O							C	C
Computability and Optimisation	COM627	O						C	C	
Applied Data Mining	COM628	O						C		
Advanced Web Technology	COM629	O					C			
Advanced Mobile Development	COM630	O			C	C	O			
Collaborative Technology	COM631	O			C	C				
Advanced 3D Modelling & Animation	COM632	O			C	C	C			
Telecommunications Management	COM633	O								
Ethical Hacking	COM638	O		C						
Applied Network Security	COM634	O	C	C						
Network Management	COM635	O	C							
Distributed Data	COM636	C								C
21st Century Computing	COM623	C	C	C	C	C	C	C	C	C
IT Project Management	COM614	C	C	C			O	C	C	C
Windows & Web based Application Development	COM616	O								
LEVEL FIVE										
Artificial Intelligence	COM521	O	O					C	C	C
Serious Games Technology	COM522	O			C	C				
3D Modelling & Animation	COM505	O			C	C	C			
Audio Technology for Games	COM503				C					
Internet & Mobile App Development	COM502	O	O	O	C	C	O	O	O	O
Server Technology	COM523	O	C	C				O	O	O
Data Communications and Networks	COM524	O	C	C				O	O	O
Student Initiated Module (SIM5)	COM525	O	O	O				O	O	O

		Computing	Computer Networks & Security	Cyber Security	Computer Game Development	Immersive Technology	Creative Computing	Artificial Intelligence	Computing Philosophy	Computer Science
Applied Programming	COM526	C	O					C	O	C
Human Computer Relationships	COM527	C	O			C	C	O	C	O
Cybersecurity and Forensics	COM534	O	O	C				O	O	O
Responsible Computing	COM528	C	C	C			C	C	C	C
Group Project Implementation	COM530	C	C	C	C	C	C	C	C	C
Group Project Design	COM529	C	C	C	C	C	C	C	C	C
CCNA Routing and Switching: Connecting Networks	COM531	O	O	O				O	O	O
CCNA R&S Scaling Networks	COM532	O	O	O				O	O	O
Databases and Web-based Information Systems	COM533	O	O	O			O	O	O	O
Agile Application Development	COM518	O	O	O				O	O	O
Database Administration and Optimisation	COM519	O	O	O				O	O	O
LEVEL FOUR										
Computational Thinking	COM418	O	O					C	C	C
Interactive Design	COM419	O			C	C				
Computing Maths	COM420	O	O	C	C	C		O	O	O
Digital Media Principles	COM405	O	O	O	C	C	C	O	O	O
Network Technologies	COM421	O	C	C				O	O	O
Student Initiated Module (SIM4)	COM422	O	O	O				O	O	O
Web Technologies	COM423	C	O	O			C	O	O	O
Computer Systems	COM424	C	C	C	C	C	C	C	C	C
Managing Data	COM425	C	C	C			C	C	C	C
Problem Solving with Programming	COM426	C	C	C	C	C	C	C	C	C
Professional Development in Computing: Information Engineering	COM427	C	C	C	C	C	C	C	C	C
CCNA R&S - Routing and Switching Essentials	COM429	O	O	O				O	O	O
CCNA R&S Introduction to Networks	COM428	O	O	O				O	O	O

		Computing	Computer Networks & Security	Cyber Security	Computer Game Development	Immersive Technology	Creative Computing	Artificial Intelligence	Computing Philosophy	Computer Science
Intro to JavaScript programming and DOM scripting	COM417	O	O	O				O	O	O
IT Business Graphics	COM430	O	O	O				O	O	O
IT for Information Analysis	COM431	O	O	O				O	O	O

All modules are 20 credits apart from the Level 6 honours Project module (40 credits).

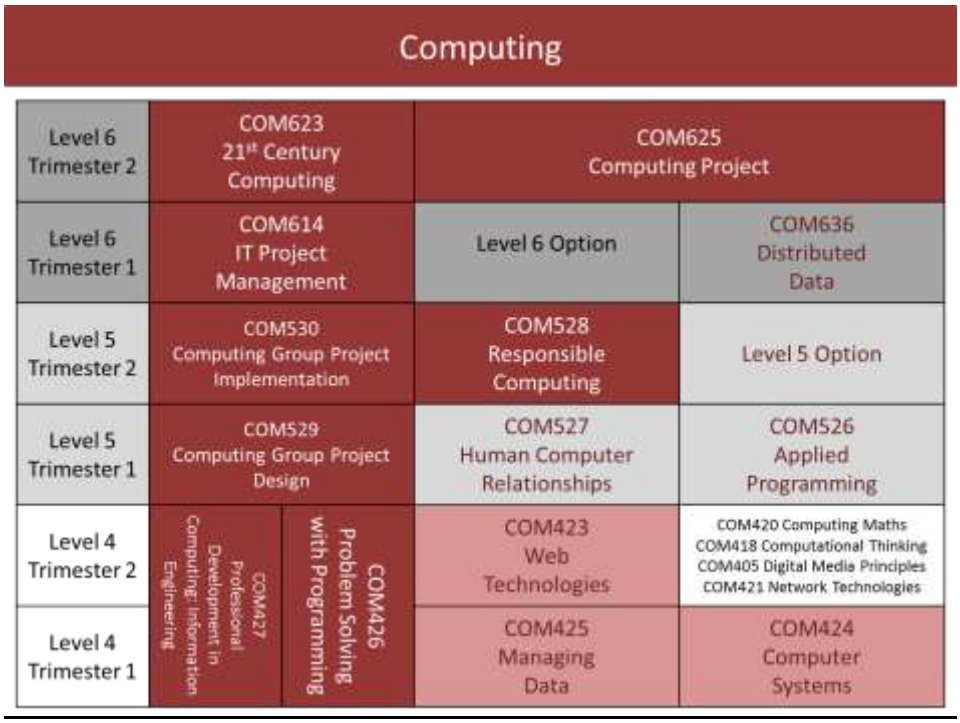
The BSc programmes are normally studied over three years full-time at both Wrexham and London. The Wrexham campus also offers BSc (Hons) Computing part-time over five years. Part-time students will initially study HND Computing before commencing the BSc top-up programme. The academic year runs from September to May and the proposal is initially for one intake per year at Wrexham and three intakes per year in London. However, the possibility of two intakes per year in Wrexham will be considered with sufficient demand.

The course is divided into modular study units, each of 20 credits apart from the Project which is 40 credits. Students complete 120 credits at each level 4, 5 and 6. Each 20 credit module represents 200 hours of student learning and assessment.

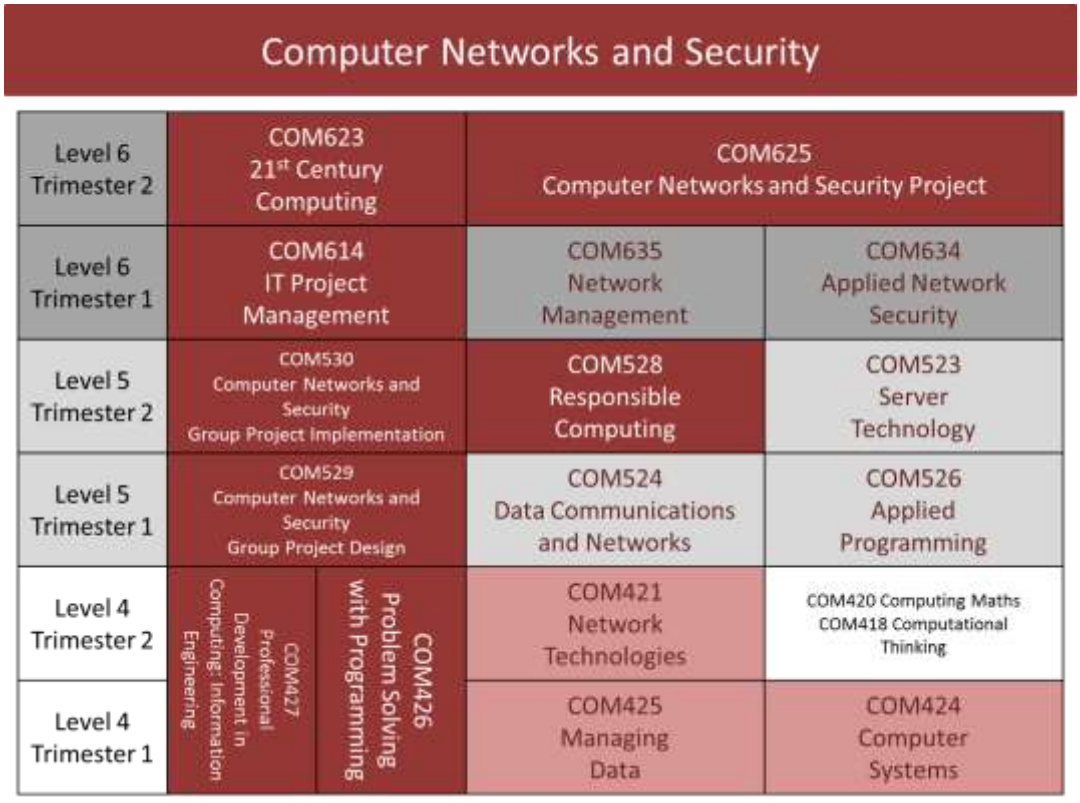
Indicative Delivery Schedule

The following programme structure diagrams show the various delivery models for both fulltime and part-time study.

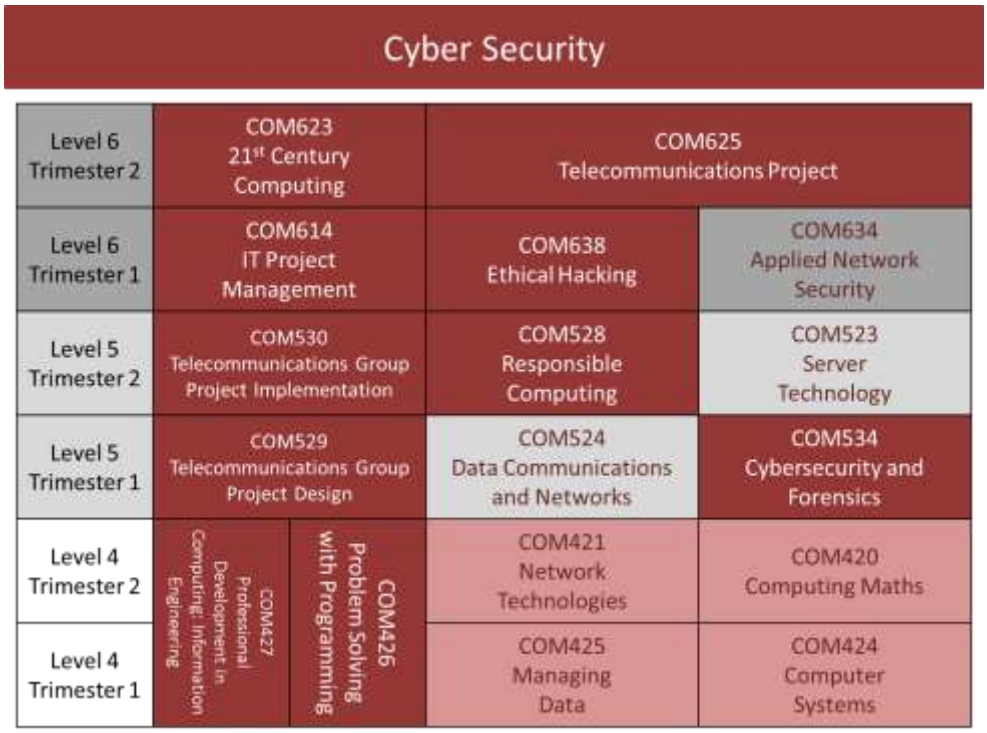
BSc Computing



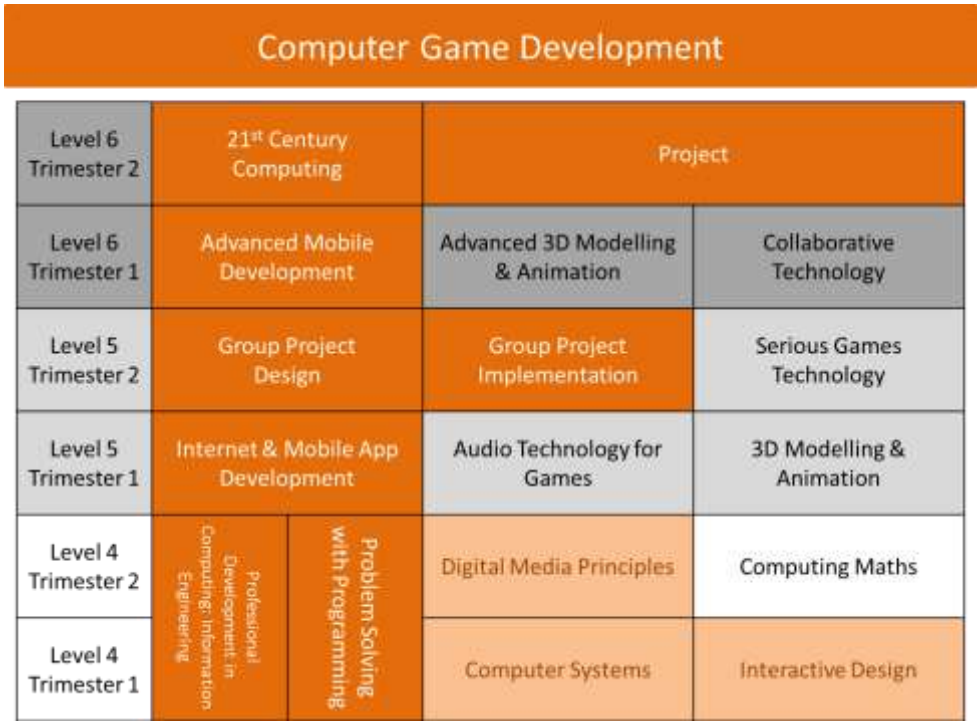
BSC Computer Networks and Security



BSc Cyber Security



BSC Computer Game Development



BSC Immersive Technology

Immersive Technology

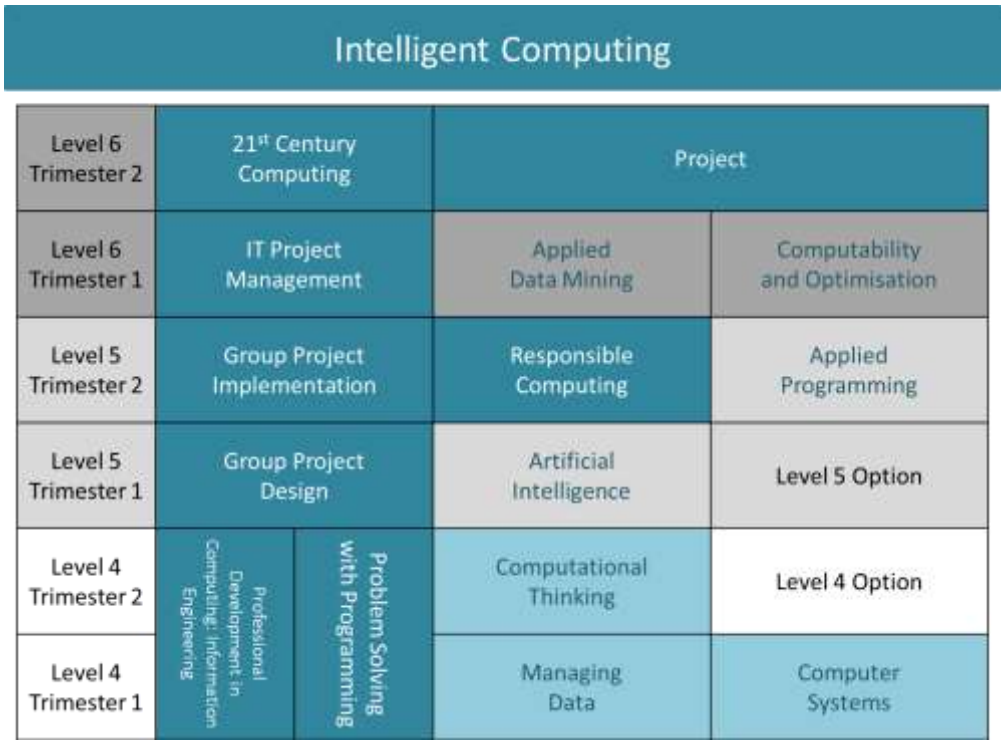
Level 6 Trimester 2	21st Century Computing	Project	
Level 6 Trimester 1	Advanced Mobile Development	Advanced 3D Modelling & Animation	Collaborative Technology
Level 5 Trimester 2	Group Project Design	Group Project Implementation	Serious Games Technology
Level 5 Trimester 1	Internet & Mobile App Development	Human Computer Relationships	3D Modelling & Animation
Level 4 Trimester 2	Professional Development in Computing: Information Engineering / Problem Solving with Programming	Digital Media Principles	Computing Maths
Level 4 Trimester 1		Computer Systems	Interactive Design

BSC Creative Computing

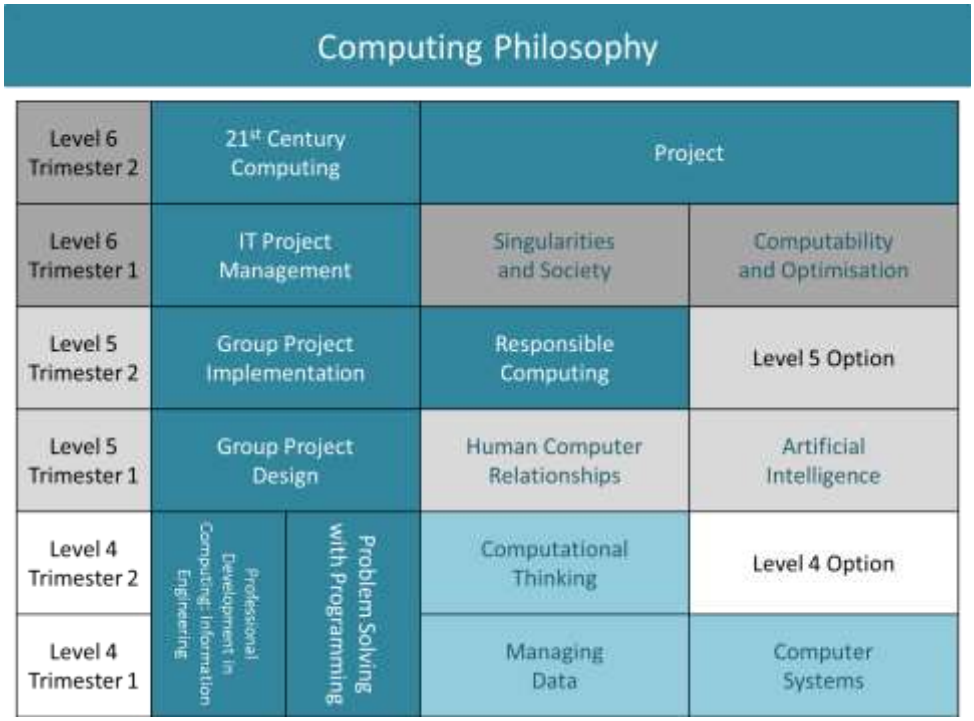
Creative Computing

Level 6 Trimester 2	COM623 21st Century Computing	COM625 Creative Computing Project	
Level 6 Trimester 1	COM630 Advance Mobile Development COM614 IT Project Management	COM632 Advanced 3D Modelling & Animation	COM629 Advanced Web Technologies
Level 5 Trimester 2	COM530 Creative Computing Group Project Implementation	COM533 Databases and Web Systems COM502 Internet & Mobile App Dev	COM528 Responsible Computing
Level 5 Trimester 1	COM529 Creative Computing Group Project Design	COM527 Human Computer Relationships	COM505 3D Modelling & Animation
Level 4 Trimester 2	COM427 Professional Development in Computing: Information Engineering / COM426 Problem Solving with Programming	COM423 Web Technologies	COM405 Digital Media Principles
Level 4 Trimester 1		COM424 Computer Systems	COM425 Managing Data

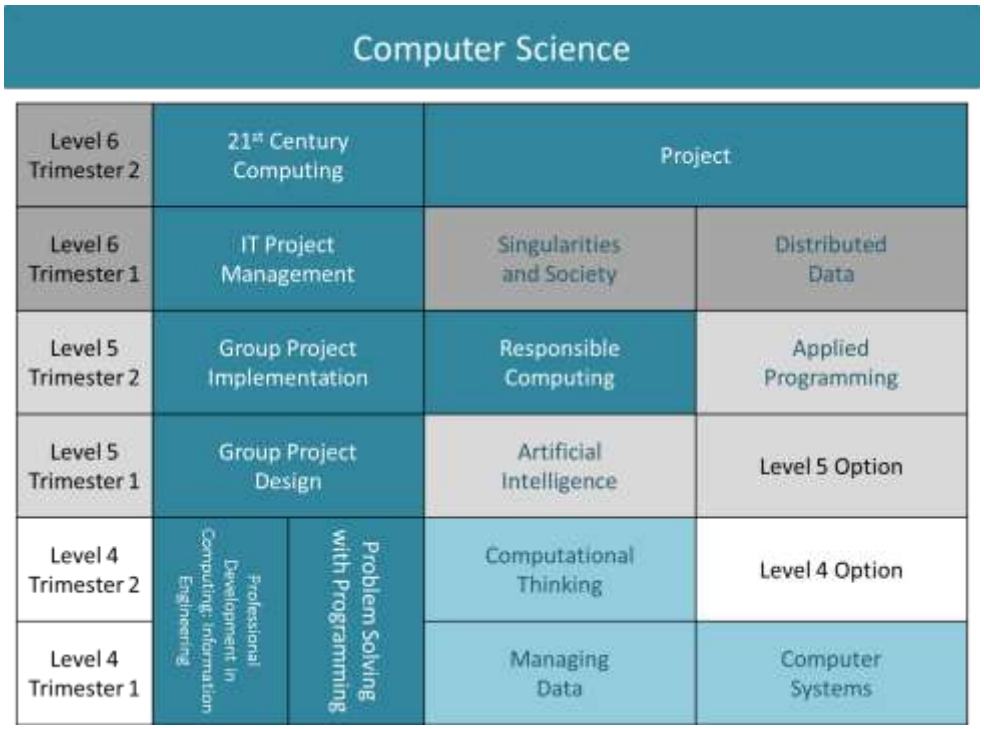
BSC Artificial Intelligence



BSC Computing Philosophy



BSC Computer Science



Options are available to provide/market specific/visible content but kept to a minimum to maximise the accredited core

Part Time delivery

On successful completion of the University's part time HND Computing programme (or equivalent programme), students may progress onto BSc (Hons) Computing at Level 6 which will either be offered on a single day release basis or on two afternoons / evenings per week. The IT Project Management module will support the 40 credit Project module. The diagram below gives an indicative part time delivery structure for the BSc (Hons) Computing programme

Year 1 BSc (Hons) Computing (P/T)

Trimester 1		Trimester 2	
IT Project Management	Distributed Data	21st Century Computing	Project

Year 2 BSc (Hons) Computing (P/T)

Trimester 1		Trimester 2
Level 6 Option	Project	Project

Certificate of Higher Education in Computing (Cert HE)

The first stage of all courses in the undergraduate programme suite provide students with core modules designed to provide students with the basic knowledge needed to undertake a degree in Computing. All students are introduced to: basic concepts of object-oriented software development; Systems analysis and design techniques; basic knowledge of computer architecture and principles of hardware and operating systems; the fundamentals of web and multimedia applications. Students are expected to demonstrate basic understanding of these fundamental areas and display basic skills through a combination of written and computational work.

Module tutors

Module Title	Level	Module Leader
21st Century Computing	6	Vic Grout
Advanced 3D Modelling & Animation	6	Nathan Roberts
Advanced Mobile Development	6	Jason Matthews
Applied Data Mining	6	Bindu Jose
Applied Network Security	6	Stephen Caulder
Collaborative Technology	6	Richard Hebblewhite
Computability and Optimisation	6	Bo Liu
Distributed Data	6	Bindu Jose
Network Management	6	Nigel Houlden
Project	6	Vic Grout
IT Project Management	6	Denise Oram
Singularities and Society	6	Denise Oram
Telecommunications Management	6	Nigel Houlden
Advanced Web Technology	6	Jason Matthews
Windows & Web based Application Development	6	John Worden
Ethical Hacking	6	Vic Grout
Cybersecurity and Forensics	5	Stuart Cunningham
3D Modelling & Animation	5	Nathan Roberts
Applied Programming	5	John Worden
Artificial Intelligence	5	Bo Liu
Audio Technology for Games	5	Stuart Cunningham
Data Communications and Networks	5	Nigel Houlden
Group Project Design	5	John Worden
Group Project Implementation	5	John Worden
Human Computer Relationships	5	Rich Picking
Internet & Mobile App Development	5	Jason Matthews
Responsible Computing	5	Denise Oram
Serious Games Technology	5	Nathan Roberts
Server Technology	5	Nigel Houlden
SIM5	5	John Worden
CCNA Routing and Switching: Connecting Networks	5	Nigel Houlden
CCNA R&S Scaling Networks	5	Nigel Houlden
Databases and Web-based Information Systems	5	John Worden
Agile Application Development	5	John Worden

Database Administration and Optimisation	5	Bindu Jose
Computational Thinking	4	Vic Grout
Computer Systems	4	Stuart Cunningham
Computing Maths	4	Vic Grout
Digital Media Principles	4	Nathan Roberts
Interactive Design	4	Richard Hebblewhite
Managing Data	4	Bindu Jose
Network Technologies	4	Nigel Houlden
Problem Solving with Programming	4	Rich Picking
Professional Development in Computing: Information Engineering	4	Denise Oram
Web Technologies	4	John Worden
SIM4	4	John Worden
CCNA R&S - Routing and Switching Essentials	4	Nigel Houlden
CCNA R&S Introduction to Networks	4	Nigel Houlden
Intro to JavaScript programming and DOM scripting	4	John Worden
IT Business Graphics	4	Julie Mayers
IT for Information Analysis	4	Julie Mayers
IT Skills	4	Julie Mayers

There may be additional deliverers but those individuals listed above are identified as the Module leaders.

Employability

The Computing suite of programmes is designed to produce capable and career focused individuals. The programmes offer a comprehensive degree level education in the ever expanding and technologically challenging world of computing. Students gain practical experience using current and emerging tools, techniques, and technologies, underpinned with principles, protocols, standards and ethics. Graduates will be able to integrate well with industry by having a range of practical design skills, development skills, and also key transferrable skills that will open doors to a very wide range of careers options such as systems analysis, systems design, database design, network management, software development, and also research-based roles in both academia and industry.

Industry links

The computing department has strong links with industry and our programmes are informed by our industrial liaison group. In addition, many of our visiting lecturers come directly from industry and are therefore in a position to expose students to industrial and commercially relevant knowledge, tools, and techniques.

Group Project

All of the programmes in the computing suite offer two group project modules at level 5; Group project design and group project implementation. This allows for the students to work as part of a peer group within the university or as part of a team in their place of work or other industry.

Learning and teaching strategy used to enable outcomes to be achieved and demonstrated

The Computing department recognise the need to develop more flexible programmes that meet the needs of a more diverse student body. These programmes are designed to offer a wider variety of provision for students with different demands and commitments.

The Department of Computing is known for its flexible approach with a Learning, Teaching and Assessment implementation plan aligned to wider University developments. However, the core of our strategy seeks to assist the student to become an independent learner whilst still supporting the students in their transition to higher education. The curriculum is designed to encourage an appreciation for learning. Learning is enriched by appropriate underpinning, current research, industrial applications and the development of transferable skills.

This flexible approach introduces the concept of a SIM (Student Initiated Module) to a number of the programmes. The SIM aims to provide students with an opportunity to develop a supervised programme of study in a field of inquiry pertinent to the main themes of their programme of study at Levels four and five. This allows the student to negotiate the aims of the study with the module tutor and undertake an area of study, which is of specific interest to them and is related to their degree. The Learning outcomes for the SIM will be assessed using criteria established in a learning agreement between the tutor and student.

The learning and teaching strategy deployed will be suitable to maximise opportunities for attainment of the programme aims. The strategy aims to:

1. have a continued emphasis on student-centred learning;
2. employ teaching methods that promote effective student learning, self-development and reflection;
3. promote active learning throughout the course, e.g. theoretical concepts being delivered in a framework of lectures, practical demonstrations and workshops applying theory to practice using activity based assignments;
4. deploy a variety of learning and teaching methods including:
    - Lectures - This is usually a formal discourse for the purposes of dissemination of information, the demonstration of techniques and the discussion of supporting ideas and consequences. The lecture is supported by a full range of equipment including blackboard, whiteboard, video and computer projection facilities where appropriate. Although this type of presentation is suitable for a one-sided discourse ample opportunity exists for questions, interaction and discussion.

    - Seminar and Tutorials - These activities encompass a wide range of activities, each suited to the particular module. On the one hand, some tutorials will consist of the staff supporting students engaged in problem solving. On the other hand a tutorial may involve group exercises where each group is encouraged to allocate responsibilities, allocate tasks, etc. Generally, this type of teaching is used to support the lecture, clarify the material and experiment with the techniques and skills required.

    - Laboratory – The nature of the computing elements of all courses requires students to gain practical skills in the use of a personal computer. This activity takes place in one of the Computing Department's four computer laboratories and consists of the student, supported by a staff member, practising skills in the use of sophisticated software applications and including software development and systems analysis and design tools.

- Group Work – specifically with the group project but also on other modules, students are encouraged to work in groups to achieve set objectives. Assessment of these activities includes both group and individual elements. In this way, students learn to work as a team to achieve a common goal whilst at the same time individual contribution is recognised and evaluated.

- Group Project – All students participate in two twenty credit modules; Group Project Design and Group Project Implementation, at level 5. Teamwork (group work) has been identified as one of the fundamental skills sought by employers. The modules are designed to develop communication and other interpersonal skills such as negotiation, influence, advising, interpreting and planning to work efficiently within a group. The group may comprise peers across a cohort of students but in the case of working students, could equally comprise a work based group (team) working on a commercial project.

- Project - All students complete a 40 credit individual project at level 6. This project will include practical as well as academic components enabling students to further improve their employability as well as academic writing.

  The project is designed to enable students to demonstrate their ability to present sustained rational arguments and independent conclusions based on a body of personal research. The Project serves the primary purpose of integrating technological and research strands, which are developed throughout the programme, and does so in the context of a research or computer systems development project. Where possible, students are encouraged to complete the project for a real client.

  The project is a core component of the programme and is aligned to the students own idea which is developed with a project supervisor. The Computing project typically involves the development and evaluation of the solution to a problem, which occurs within a relatively unstructured domain. The problem is original to the student and its solution therefore requires the application of knowledge and techniques either studied in the programme or acquired through independent research of recent and relevant literature. The Project provides a vehicle for integrating specialist knowledge with analytic, problem solving, managerial and communication skills. All of these are exercised and evidenced through the execution and outcomes of the project.

This approach is intended to:

1. strike a balance between ‘class’ activity and directed study ‘out of class’;
2. provide sound feedback to students and attempt to involve them in identifying their own learning needs;
3. use directed and supported group work for sharing experience and knowledge and developing interpersonal skills;
4. provide realistic and relevant learning activities;
5. make use of a variety of assessment methods to allow students the opportunity to demonstrate their own particular capabilities.

Full use of Moodle will be made as a way of helping to manage teaching and learning, and to keep in contact with students. Each programme and module within a programme has its own space on Moodle. A wide range of information is placed within each of these areas for students to access. General information such as the module handbook will be placed into the

programme area, and lecture notes together with activities for completion such as directed reading and worksheets will be placed into module spaces. Lecture notes will be either posted 24hours prior to the lecture or immediately after, dependent on the preference of the member of staff.

Moodle will be also an effective way of keeping in contact with students by posting messages, for example informing students on arrangements for guest speaker visits.

See overleaf for Trimester Delivery Schedule – Single intake programmes – GU Wrexham

2014/15 Academic Year Calendar -Framework				
Timetable week number	*Date*	*trimester teaching weeks*	*single intake programmes - students*	*single intake programmes - staff**
1	28-Jul-14			
2	04-Aug-14			
3	11-Aug-14			
4	18-Aug-14			
5	25-Aug-14			
6	01-Sep-14			
7	08-Sep-14			
8	15-Sep-14			
9	22-Sep-14	1	Teaching/induction	Teaching/induction
10	29-Sep-14	2	Teaching	Teaching
11	06-Oct-14	3	Teaching	Teaching
12	13-Oct-14	4	Teaching	Teaching
13	20-Oct-14	5	Teaching	Teaching
14	27-Oct-14	6	Teaching	Teaching
15	03-Nov-14	7	Teaching	Teaching
16	10-Nov-14	8	Teaching	Teaching
17	17-Nov-14	9	Teaching	Teaching
18	24-Nov-14	10	Teaching	Teaching
19	01-Dec-14	11	Teaching	Teaching
20	08-Dec-14	12	Teaching	Teaching
21	15-Dec-14	13	Teaching	Teaching
22	22-Dec-14		Christmas vacation	Christmas
23	29-Dec-14		Christmas vacation	Christmas
24	05-Jan-15	1	Teaching	Teaching
25	12-Jan-15		University Exams	University Exams
26	19-Jan-15	2	Teaching	Teaching
27	26-Jan-15	3	Teaching	Teaching
28	02-Feb-15	4	Teaching	Teaching
29	09-Feb-15	5	Teaching	Teaching
30	16-Feb-15	6	Teaching	Teaching
31	23-Feb-15	7	Teaching	Teaching
32	02-Mar-15	8	Teaching	Teaching
33	09-Mar-15	9	Teaching	Teaching
34	16-Mar-15	10	Teaching	Teaching
35	23-Mar-15	11	Teaching	Teaching
36	30-Mar-15		Spring Vacation	Spring Vacation
37	06-Apr-15		Spring Vacation	Spring Vacation
38	13-Apr-15	12	Teaching	Teaching
39	20-Apr-15	13	Teaching	Teaching
40	27-Apr-15		University Exams inc Saturday	University Exams inc Saturday
41	04-May-15		University Exams Tues/Wed Marking Thur/Fri	University Exams Tues/Wed Marking Thur/Fri
42	11-May-15		Additional Study weeks*	*Marking /Pre board*
43	18-May-15		Additional Study weeks*	*Module board*
44	25-May-15		Additional Study weeks*	*Progression & Award Board*

The university's adoption of a trimester system divides the academic year into three periods of 13 teaching weeks. Typically, a 20 credit module specification will specify the module duration as 200 hours, of which the scheduled learning and teaching hours total 60 hours and the independent study hours total 140 hours. This delivery pattern is recognised by the department as being appropriate for modules that are both academically and technically demanding and challenging. However, the GU Wrexham, programme team has discussed contact hours in detail and feels that in order to provide our students with the best opportunity the department will deliver modules with the following contact hours. The delivery is based on a delivery schedule of 12 weeks, allowing for a study break.

Level 4 = up to 6 hours per week per module
Level 5 = up to 5 hours per week per module
Level 6 = up to 4 hours per week per module

The Department also recognises that some modules such as the project, are more students focused and directed and therefore do not require the same level of staff contact.

See overleaf for Trimester Delivery Schedule – Multiple intake programmes – GU London

2014/15 Academic Year Calendar -Framework			
Timetable week number	Date	Trimester teaching weeks	2 0r 3 intake programmes
1	28-Jul-14		
2	4-Aug-14		
3	11-Aug-14		
4	18-Aug-14		
5	25-Aug-14		
6	1-Sep-14		
7	8-Sep-14		
8	15-Sep-14		
9	22-Sep-14	0	induction - new intake only
10	29-Sep-14	1	teaching
11	6-Oct-14	2	Teaching
12	13-Oct-14	3	Teaching
13	20-Oct-14	4	Teaching
14	27-Oct-14	5	Teaching
15	3-Nov-14	6	Teaching
16	10-Nov-14	7	Teaching
17	17-Nov-14	8	Teaching
18	24-Nov-14	9	Teaching
19	1-Dec-14	10	Teaching
20	8-Dec-14	11	Teaching
21	15-Dec-14	12	Teaching*
22	22-Dec-14		Christmas
23	29-Dec-14		Christmas
24	5-Jan-15		Marking/Pre board
25	12-Jan-15		Module board
26	19-Jan-15	0	Progression & Award Board & induction for new intake only
27	26-Jan-15	1	Teaching
28	2-Feb-15	2	Teaching
29	9-Feb-15	3	Teaching
30	16-Feb-15	4	Teaching
31	23-Feb-15	5	Teaching
32	2-Mar-15	6	Teaching
33	9-Mar-15	7	Teaching
34	16-Mar-15	8	Teaching
35	23-Mar-15	9	Teaching
36	30-Mar-15		Spring Vacation
37	6-Apr-15		Spring Vacation
38	13-Apr-15	10	Teaching
39	20-Apr-15	11	Teaching
40	27-Apr-15	12	Teaching*
41	4-May-15		Marking
42	11-May-15		Marking /Pre board
43	18-May-15		Module board
44	25-May-15	0	Progression & Award Board & induction for new intake only
45	1-Jun-15	1	Teaching
46	8-Jun-15	2	Teaching
47	15-Jun-15	3	Teaching
48	22-Jun-15	4	Teaching
49	29-Jun-15	5	Teaching
50	6-Jul-15	6	Teaching
51	13-Jul-15	7	Teaching
52	20-Jul-15	8	Teaching
1	27-Jul-15	9	Teaching
2	3-Aug-15	10	Teaching
3	10-Aug-15	11	Teaching
4	17-Aug-15	12	Teaching*
5	24-Aug-15		Marking
6	31-Aug-15		Marking /Pre board

In GUL all modules will be taught over 12 week cycles, including 10 weeks for lectures and 2 weeks for assessment. Cycles will commence in time for the assessment boards to be held at Glyndŵr University Wrexham in February, June and September.

Indicative delivery structure for GUL follows.

Term	Oct 14 intake						
Oct 14	Professional Development L(4)						
	Managing Data (L4)						
	Computer Systems (L4)						
			Feb 15 intake				
Feb 15	Problem -solving Programming (L4)		Professional Development L(4)				
	Web Technologies (L4)		Managing Data (L4)				
	Option (L4)		Computer Systems (L4)				
June 15	Resit/Holiday	June 15	Problem -solving Programming (L4)				
			Web Technologies (L4)				
			Option (L4)				
					Oct 15 Intake		
Oct 15	Group Project Design(L5)	Oct 15	Resit/Holiday	Oct 15	Professional Development L(4)		
	Human Computer Relationships (L5)				Managing Data (L4)		
	Option (L5)				Computer Systems (L4)		
							Feb 16 Intake
Feb 16	Group Project Implementation (L5)	Feb 16	Group Project Design(L5)	Feb 16	Problem -solving Programming (L4)	Feb 16	Professional Development L(4)
	Responsible Computing (L5)		Human Computer Relationships (L5)		Web Technologies (L4)		Managing Data (L4)
	Applied Programming (L5)		Option (L5)		Option (L4)		Computer Systems (L4
June16	Resit/Holiday	June16	Group Project Implementation (L5)	June16	Resit/Holiday	June16	Problem -solving Programming (L4)
			Responsible Computing (L5)				Web Technologies (L4
			Applied Programming (L5)				Option (L4)
Oct 16	IT Project Management (L6)	Oct 16	Resit/Holiday	Oct 16	Group Project Design(L5)	Oct 16	Resit/Holiday
	Distributed Data (L6)				Human Computer Relationships (L5)		
	Option (L6)				Option (L5)		
Feb17	21st Century Computing (L6)	Feb17	IT Project Management (L6)	Feb17	Group Project Implementation (L5)	Feb17	Group Project Design(L5)
	Project (40c) (L6)		Distributed Data (L6)		Responsible Computing (L5)		Human Computer Relationships (L5)
			Option (L6)		Applied Programming (L5)		Option (L5)
June 17		June 17	21st Century Computing (L6)	June 17	Resit/Holiday	June 17	Group Project Implementation(L5)
			Project (40c) (L6)				Responsible Computing(L5)
							Applied Programming (L5)
		Oct 17		Oct 17	IT Project Management (L6)	Oct 17	Resit/Holiday
					Distributed Data (L6)		
					Option (L6)		

Welsh Medium Provision

All students have the opportunity to submit assessment in Welsh, in line the University's Welsh Language Policy. Currently, 0% of the programme can be delivered in Welsh.

Assessment strategy used to enable outcomes to be achieved and demonstrated

The approach to assessment has been guided by the QAA Code of Practice for the assurance of academic quality and standards in Higher Education (2006) (Section 6: Assessment of students) and Glyndŵr University Assessment Guidelines.

Students will be bound by the general assessment regulations of the University. The University regulations provide a framework for the assessment of students' competence, knowledge and understanding, and the grading of students for progression and the conferring of awards. It allows staff to give feedback to students and to evaluate the effectiveness of their own teaching.

Students will receive formative assessment, particularly during the practical and self-study elements of the programme to ensure they can keep track of their progress and development. This will also be a key factor in ensuring student engagement and retention on the programme of study. In the case of practical assessment, this may be a final summative assessment, so more frequent formative assessment provides academic rigour and increases student awareness and confidence in the subject.

The practical nature of the programme is reinforced through the importance of coursework as part of the learning process and assessment. Despite the importance of their theoretical basis, many of the concepts can often best be grasped by practical exercises and assignments. The coursework of a module typically carries 50% weight of the assessment, although this varies with modules assessed entirely by coursework.

Practical coursework includes:

- exercises for private study or in practical/tutorial classes
- exercises in computing laboratories
- programming exercises and projects
- team and individual projects

In the process of formulating the proposed assessment strategy, the programme team discussed at length, the number of, and the types of assessment most appropriate for the programmes. The general view of the team is that where it is appropriate to do so, the learning outcomes may be assessed with each element of assessment. The module learning outcomes indicate to the student what they are expected to know and how they are expected to demonstrate that knowledge in their assessment tasks. The programme team recognise that when determining the types of assessment tasks that will align with the modules learning outcome statements they consider that one task can cover more than one learning outcome and a learning outcome can be assessed more than once. Assessing a learning outcome more than once provides an opportunity for feedback and further learning (such as in an assessment task during the trimester, and then again, in a different way, in a final test or assignment). This approach is also supported by the fact that the Programme Team intends to apply for full British Computer Society (BCS) accreditation for the main suite of programmes once validated and populated with students. Guidance given to BCS accreditation assessors (of which the Computing's Head of Department is one) suggests that key criteria from the BCS required lists should be 'embedded' in each programme rather than 'included superficially'. Also these terms are not precisely defined; unofficial guidance to assessors is that this should mean that a number of key criteria, when traced down through module specifications into assignments, should be seen to be assessed at least twice.

There will be emphasis placed upon students to undertake independent study and research activities, in particular when completing the Project element of the course. This Project will be facilitated by a traditional summative assessment approach at the culmination of the work, however, there will be extensive use of formative feedback, milestones, and guidance from staff during this, and other, independent-study and research-based assessment undertaken by students.

Feedback is provided continuously to students through informal contact with subject lecturers and tutors in the seminar/tutorial and laboratory settings. In accordance with University

Guidance, feedback is provided on assessed practical work normally within three weeks of submission of the work.

An overview of the assessment details will be provided in the Student Handbook and full details of the assessment criteria for each module is provided in the module descriptor which forms part of the module pack available to students.

Module Assessment

Level	Module Title	Credit	Assessment Type	Weighting	fulltime Submission
6	21st Century Computing	20 Core	Presentation Report	30% 70%	Trimester 1 - Mid Trimester 1 - End
6	Advanced 3D Modelling & Animation	20 Core	Coursework	100%	Trimester 1 - End
6	Advanced Mobile Development	20 Core	Coursework Coursework	50% 50%	Trimester 1 - Mid Trimester 1 - End
6	Applied Data Mining	20 Core	Group Project In-class test	50% 50%	Trimester 1 - Mid Trimester 1 - End
6	Applied Network Security	20 Core	Examination Coursework	50% 50%	Trimester 1 - Mid Trimester 1 - End
6	Collaborative Technology	20 Core	Coursework Coursework	50% 50%	Trimester 1 - Mid Trimester 1 - End
6	Computability and Optimisation	20 Core	Examination Project Presentation	40% 50% 10%	Trimester 1 - Mid Trimester 1 – End Trimester 1 - End
6	Distributed Data	20 Core	Coursework	100%	Trimester 1 - End
6	Network Management	20 Core	In-class test Coursework	50% 50%	Trimester 1 - Mid Trimester 1 - End
6	Project	40 Core	Coursework	100%	Trimester 2 - End
6	IT Project Management	20 Core	Coursework	100%	Trimester 1 - End
6	Singularities and Society	20 Core	Case Study Reflective Practice	40% 60%	Trimester 1 - Mid Trimester 1 - End
6	Telecommunications Management	20 Core	Coursework Report	60% 40%	Trimester 1 - Mid Trimester 1 - End
6	Advanced Web Technology	20 Core	Coursework Coursework	50% 50%	Trimester 1 - Mid Trimester 1 - End
6	Windows & Web based Application Development	20 Option	Practical	100%	Trimester 1 - End
6	Ethical Hacking	20 Core	Report Practical	40% 60%	Trimester 1 - Mid Trimester 1 - End
5	Cybersecurity and Forensics	20 Core	In-class test	30%	Trimester 1 - Mid

			Practical	70%	Trimester 1 - End
5	3D Modelling & Animation	20 Core	Coursework	100%	Trimester 1 - End
5	Applied Programming	20 Core	Coursework	100%	Trimester 2 - End

5	Artificial Intelligence	20 Core	Group Project Group Project	50% 50%	Trimester 1 - Mid Trimester 1 - End
5	Audio Technology for Games	20 Core	Coursework Coursework	50% 50%	Trimester 1 - Mid Trimester 1 - End
5	Data Communications and Networks	20 Core	Coursework Examination	60% 40%	Trimester 1 - Mid Trimester 1 - End
5	Group Project Design	20 Core	Group Project	100%	Trimester 1 - End
5	Group Project Implementation	20 Core	Group Project	100%	Trimester 2 - End
5	Human Computer Relationships	20 Core	Report	100%	Trimester 1 - End
5	Internet & Mobile App Development	20 Core	Coursework Coursework	50% 50%	Trimester 2 - Mid Trimester 2 - End
5	Responsible Computing	20 Core	Coursework	100%	Trimester 1 - End
5	Serious Games Technology	20 Core	Coursework Coursework	50% 50%	Trimester 2 - Mid Trimester 2 - End
5	Server Technology	20 Core	Case Study	100%	Trimester 2 - End
5	SIM5	20 Option	Coursework	100%	Trimester 1 or 2 - End
5	CCNA Routing and Switching: Connecting Networks	20 Option	In-class test In-class test Coursework	40% 40% 20%	Trimester 2 - Mid Trimester 2 - End Trimester 2 - End
5	CCNA Routing and Switching: Scaling Networks	20 Option	In-class test In-class test Coursework	40% 40% 20%	Trimester 2 - Mid Trimester 2 - End Trimester 2 - End
5	Databases and Web-based Information Systems	20 Option	Coursework Group Project	50% 50%	Trimester 2 - Mid Trimester 2 - End
5	Agile Application Development	20 Option	Coursework	100%	Trimester 2 - End
5	Database Administration and Optimisation	20 Option	Coursework Coursework	50% 50%	Trimester 2 - Mid Trimester 2 - End
4	Computational Thinking	20 Core	Group Project In-class test	50% 50%	Trimester 2 - Mid Trimester 2 - End
4	Computer Systems	20 Core	Essay	50%	Trimester 1 - Mid

			In-class test	50%	Trimester 1 - End
4	Computing Maths	20 Core	Coursework In-class test	50% 50%	Trimester 2 - Mid Trimester 2 - End
4	Digital Media Principles	20 Core	Portfolio	100%	Trimester 2 - End
4	Interactive Design	20 Core	Group Project Portfolio	50% 50%	Trimester 1 - Mid Trimester 1 - End
4	Managing Data	20 Core	Coursework In-class test	70% 30%	Trimester 1 - Mid Trimester 1 - End
4	Network Technologies	20 Core	Coursework In-class test	50% 50%	Trimester 2 - Mid Trimester 2 - End
4	Problem Solving with Programming	20 Core	Report	100%	Trimester 1 & 2 - End
4	Professional Development in Computing: Information Engineering	20 Core	Portfolio	100%	Trimester 1 & 2 - End
4	Web Technologies	20 Core	Coursework	100%	Trimester 2 - End
4	SIM4	20 Option	Coursework	100%	Trimester - End
4	Intro to JavaScript programming and DOM scripting	20 Option	Coursework	100%	Trimester - End
4	CCNA Routing and Switching: Introduction to Networks	20 Option	In-class test In-class test Coursework	40% 40% 20%	Trimester - Mid Trimester - End Trimester - End
4	CCNA Routing and Switching: Routing and Switching Essentials	20 Option	In-class test In-class test Coursework	40% 40% 20%	Trimester - Mid Trimester - End Trimester - End
4	IT Business Graphics	20 Option	In-class test In-class test	50% 50%	Trimester - Mid Trimester - End
4	IT for Information Analysis	20 Option	In-class test In-class test	50% 50%	Trimester - Mid Trimester - End
4	IT Skills	20 Option	Coursework In-class test	80% 20%	Trimester - Mid Trimester - End

Assessment regulations that apply to the programme

Academic Regulations for Bachelor Degrees, Diplomas and Certificates apply to this programme.

In considering borderline cases the Assessment Board shall raise the classification to the next level if all of the following criteria are met:

- At least 50% of the credits at level 6 fall within the higher classification;
- All level 6 modules must have been passed at the first attempt;
- The mark achieved for the 40 credit Project module is within the higher classification.

Programme Management

Glyndŵr University Wrexham (GUW) retains overall responsibility for the management of all the programmes including BSc (Hons) Computing at Glyndŵr University London. The full suite of programmes will be managed by the Undergraduate Programme Leader within the Computing department at GUW. The programme leader at GUL, Module tutors at GUW and GUL, the Undergraduate School Office at GUW and the Programme Co-ordinator at GUL will provide additional support. The management team in GUL will share in the responsibility for the planning, management and quality control of the programme delivered there. It is to be stressed that the quality of provision is actually the responsibility of all managerial, academic, administrative and technical staff associated with the programme.

It is essential to the success of the programmes that the quality standards of the University are maintained. The role of the GUW Programme Leader is vitally important in providing continuity of contact and advice between the two institutions. A responsibility of the GUW Programme Leader is to maintain regular contact with the Programme Leader at GUL and to share information and records with relevant administrative colleagues who hold responsibility for the academic administration of the partnership.

Department student performance and monitoring meetings will take place where required and the programme team will be invited to attend the appropriate programme board meetings scheduled during each semester.

The GUW Programme Leader will visit GUL at least once each trimester for a formal programme team meeting. The main aims of visits are to maintain and develop links with colleagues at GUL; to monitor the quality assurance arrangements for the programme; to discuss the management and operation of the programme; and to address any other issues identified by the University.

Programme team GUW:
Prof Vic Grout – Head of Computing
John Worden – Undergraduate Programme Leader
John Davies
Denise Oram
Rich Hebblewhite
Nathan Roberts
Bindu Jose
Stuart Cunningham
Nigel Houlden

Rich Picking
Bo Liu
Jason Matthews
Stephen Caulder
Clive Buckley

Programme team GUL:
TBC – Programme Leader
Roberta Cavalho - Programme Co-ordinator

The Undergraduate Programme Leader (GUW) will have overall responsibility for the operation and development of the course. He will work closely with other programme leaders, Module Leaders, Module Tutors, Personal Tutors and Administrative Support personnel to provide the day to day general academic support to students. He will also meet regularly with the Academic Head of Computing.

The Undergraduate Programme Leader will be responsible for the day-to-day running of the programme, including the following:

- The management and development of curriculum and the course portfolio
- Student tracking and student records
- Collation of assessment data, presentation of data at assessment boards
- Management/co-ordination of overall assessment activities across the programme
- Liaison with external bodies and agencies
- Quality assurance and annual monitoring, including compilation of the Annual Monitoring Report
- Co-ordination of admissions activities and other recruitment activities, including relevant publicity activities

At module level there is devolved responsibility for the following:

- The maintenance and development of teaching and learning materials for all students enrolled on the module,
- The publishing and updating of module timetables, which shall include a weekly schedule of module sessions and required reading, to be distributed to students at the start of all modules
- The setting, marking and collation of marks for all module assessments and examination papers, including resit assessments, and submission of student results to the Programme Leader
- Tutorial support for students taking the module which they are responsible
- Quality monitoring, including processing of annual student feedback questionnaires and, where appropriate, student feedback for individual modules
- The corresponding module leaders at Wrexham and GUL should liaise on a regular basis by e-mail to ensure that all information is fully shared and that any problems are quickly identified and resolved. All communication must take place in conjunction with the Programme Leader.
- Liaison with part-time members of staff involved in module teaching

The control of quality will conform to the procedures set out by Glyndŵr University's requirements for academic quality assurance, monitoring and review. The primary indicators of quality come through regular student feedback, module reviews, external examiners' reports, annual and periodic programme reviews and student surveys.

Methods for evaluating and enhancing the quality of learning opportunities:

- Subject / Programme committees with student representation
- Module evaluations by students
- Students surveys, e.g. National Student Survey (NSS)
- Annual quality monitoring and action planning through the AMR process
- Peer review/observation of teaching
- The moderation of assessed coursework
- Student Representatives and Staff Student Consultative Committees
- Module, Progression and Award Boards
- External Examiners - External examiners are appointed for all programmes of study. They oversee the assessment process and their duties include: approving assessment tasks, reviewing assessment marks, attending assessment boards and reporting to the University on the assessment process.

Mechanisms for gaining student feedback:

- Student Representation on Subject Board
- Staff Student Consultative Committees
- Module and Programme level student questionnaires

Staff Development Priorities:

- Academic staff undertake activities related to research, scholarship, teaching and learning and student support and guidance
- Annual staff appraisals match development to needs
- New academic staff required to undertake PgCert in Professional Development in Higher Education.
- All academic staff are encouraged to seek Higher Education Academy membership

The Department believes that students learn best in a research oriented environment taught by people working at the forefront of their disciplines. The skills and expertise in the School are augmented by the presence of the Centre for Applied Internet Computing (CAIR) which has now been encompassed into the Creative and Applied Research for the Digital Society (CARDS) research Centre, where staff are researching in the areas of Computer Programming and Software Engineering, Science and Internet Technologies, Mobile Communications, Web systems, Security and Computer Forensics, Computer Graphics, Media Technologies, E-Commerce and business impact. Current research projects include:

- Computer Music and Audio
- Metrics for determining network stability
- Social and Behavioural Algorithms
- Computational mathematics
- Combinatorial optimisation and network algorithms
- Information Systems Failure
- Intelligent user interface design and adaptive tutoring systems
- Games Technology
- Routing algorithms and protocols
- Database optimisation
- Search engines
- Holistic visualisation of distributed knowledge
- Security and security visualization
- Complex decision analysis
- Wireless network optimisation
- Standardisation of reusable interface components
- Computing and Internet Ethics
- e-Learning/Business/Commerce
- Teaching and learning in IT

- Domotics and Remote-Controlled Home Automation Systems
- Document compression and transmission.

Staff on the programme team are very active in undertaking research, scholarship and professional activities, as reflected in an expanding published output, a significant grant-funded research project (and bids for new examples), growing numbers of Knowledge Transfer Partnerships, and the very successful conference series organised within the Research Centre. Staff are encouraged to undertake regular publication of academic papers and attendance of specialised conferences.

Particular support for learning

Support and guidance is available to students throughout the programme. Students have access to a great deal of guidance for students through the virtual learning environment (Moodle). In addition, they can also get help and guidance from their Programme Leader, Personal Tutor and Year Tutor. They can also get module specific advice from the Module Leader and any of the staff teaching on the relevant module.
Additional support mechanisms include:

- Extensive induction programme introduces the student to the University and their course. The programme will include course related issues, student support, library induction, study skills, career development etc.
- Each student has a personal tutor, responsible for pastoral support and guidance.
- University support services include - careers, financial advice, housing, study skills, counselling etc.
- Excellent library and Internet facilities.
- Student handbook provides information about course structures, University regulations etc.
- Transferable skills / Key Skills are usually incorporated into all modules.
- Written feedback is provided for all assessments usually within three weeks of the hand-in date.
- Open door policy throughout the departments.

Student Feedback

Both Glyndŵr University Wrexham and Glyndŵr University London is committed to receiving and responding to student feedback in order to improve the quality of the student experience and development of learning and teaching. The core principle is that all students should have the opportunity to contribute to and enhance their experience. Student representation therefore, is crucial to ensure the opinions and concerns of the student body are communicated to staff. This is also key to ensure an efficient flow of communication from staff back to students.

Feedback from students plays a critical part in informing the programme team's strategic thinking. It also allows GUW and GUL to evaluate how its service provision is viewed by its most important group of stakeholders, its students.

Students can provide feedback in a number of ways:

- The Staff-Student Consultative Committee (SSCC) chaired by the Programme Leader will be held at least once per trimester and involves elected student representatives from each cohort of study. The Chair will minute student feedback for action/response

by the Programme Leader. Minutes of the SSCCs and the response from the Programme Coordinator are posted on the programme pages of Moodle.

- Student Evaluation of Module (SEM) – Students are encouraged to complete an on-line SEM midway and at the end of each module through Moodle. A summary of the analysis of the SEM, along with any other feedback, will be available to the Programme Leader for action/response. Student feedback is collected and reported as part of the Annual Monitoring Report (AMR) process.

Equality and Diversity

Glyndŵr University is committed to providing access to all students and promotes an equal opportunities statement including equal treatment for all applicants and students. This programme fully complies with the university's policy on Equality and Diversity.

DETAILS SPECIFIC TO EACH PROGRAMME

BSc (HONOURS) COMPUTING

Distinctive features of the programme

This is the only programme within the suite of programmes that is offered at both Glyndŵr University Wrexham and Glyndŵr University London. It has been designed to fulfil a recognised need for more computer specialists who can develop computer software and design or maintain computer systems.

The course aims to prepare you for a career in the computing and information technology industries where you will gain highly sought-after skills in computer programming, database development, networking, website development and information systems design. These are vital skills for gaining entry into organisations which demand confident and technically equipped computing graduates.

The course will also provide you with an awareness of professional standards of conduct and practice; and provide you with the ability to apply your skills, knowledge and understanding to a variety of computing problems and contexts.

The degree focuses on a foundation of 'core computing', software development and database design with elements of communication networks and the Internet. This broad base of knowledge is supported by robust professional skills that are vital to teamwork, problem-solving and career development. In the later stages, you will develop more specialised abilities in areas that best fit your career aspirations.

The degree programme is designed to provide you with current in-demand industry skills and has an emphasis on practical techniques underpinned by theory and informed by research and knowledge transfer activity. As such the programme has great employability potential - either as an employee within a company or as a means to empower students to progress entrepreneurially. It is anticipated that demand will be from both UK and international markets.

The Computing department has close contacts with industry through research, knowledge transfer programmes and consultancy. Wherever possible, industry specialists and invited to give guest lectures, conduct workshops and meet with students in order to impart their knowledge of real-life issues and opportunities. The programme will benefit from these established links by setting real world problems and using real data in practical projects and coursework - both individually and in groups.

key facts

- This course responds to identified skills gaps. It will provide students with the critical understanding, knowledge and skills needed for successful employment
- Personal Development Planning is integrated throughout the course to develop the skills framework necessary for effective personal, academic and career management

The course is practical in nature and its general aims are to:

- Provide the knowledge of the concepts, principles and practice from a range of discipline areas within the computing field.

- Develop the student's creative abilities through practice and evaluation of that practice, while also developing their critical understanding in the area of their choice
- Stimulate an enquiring, creative, and reflective approach that encourages independent judgement and critical awareness
- Provide students with transferable skills, such as oral and written communication, time management and group working, to assist students in subsequent employment or further study
- Ensure that students have the basis for both future personal development and for continuing professional development

Programme structure
(BSc (Hons) Computing)

Year 1 Full Time structure (Level 4) GUW

Tri 1	Professional Development in Computing: Information Engineering 20 Credits - Core	Problem - solving Programming 20 Credits - Core	Managing Data 20 Credits - Core	Computer Systems 20 Credits - Core
Tri 2			Web Technologies 20 Credits - Core	Option 20 Credits
Tri 3				

Year 1 Full Time structure (Level 4) GUL

Tri 1	Professional Development in Computing: Information Engineering 20 Credits - Core	Managing Data 20 Credits - Core	Computer Systems 20 Credits - Core
Tri 2	Problem -solving Programming 20 Credits - Core	Web Technologies 20 Credits - Core	Option 20 Credits
Tri 3			

Year 2 Full Time structure (Level 5) GUW & GUL

Tri 1	Group Project Design 20 Credits - Core	Human Computer Relationships 20 Credits - Core	Option 20 credits
Tri 2	Group Project Implementation 20 Credits - Core	Responsible Computing 20 Credits - Core	Applied Programming 20 Credits - Core
Tri 3			

Year 3 Full Time structure (Level 6) GUW & GUL

Tri 1	IT Project Management 20 Credits - Core	Option 20 credits	Distributed Data 20 Credits - Core
Tri 2	21st Century Computing 20 Credits - Core	Project 40 Credits - Core	
Tri 3			

Level four options:
Interactive Design
Student Initiated Module (SIM4)
Computing Maths
Digital Media principles
Network Technologies
Computational Thinking
CCNA R&S - Routing and Switching Essentials
CCNA R&S Introduction to Networks
Intro to JavaScript programming and DOM scripting
IT Business Graphics
IT for Information Analysis

Level five options:
Serious Games Technology
Internet & Mobile App Development
Student Initiated Module (SIM5)
Data Communications and Networks
3D Modelling & Animation
Artificial Intelligence
CCNA Routing and Switching: Connecting Networks
CCNA R&S Scaling Networks
Databases and Web-based Information Systems
Agile Application Development
Database Administration and Optimisation

Level six options:
Network Management
Advanced Mobile Development
Applied Network Security
Telecommunications Management
Advanced 3D Modelling & Animation
Collaborative Technology
Advanced Web Technology
Applied Data Mining
Computability and Optimisation
Singularities and Society
Windows & Web based Application Development

Intended learning outcomes of the programme

The following additional outcomes are fully compatible with the benchmark statements of Computing and are met through the overall design and selection of modules.

In addition to the generic programme learning outcomes identified earlier, graduates of the BSc (Hons) Computing programme will also be able to demonstrate the following:

C. Subject specific skills	
C3	Students are required to develop technical skills. This involves the students engaging in practical and project work throughout the course. This work is actively integrated to ensure that students relate theory and analysis to the design, operation and maintenance of computer software systems and networks

C. Subject specific skills

		Level 4 Cert He	Level 5 Dip He	Level 6 Degree	Level 6 Honours Degree
C3	Students are required to develop technical skills. This involves the students engaging in practical and project work throughout the course. This work is actively integrated to ensure that students relate theory and analysis to the design, operation and maintenance of computer software systems and networks	On successful completion of this level, the student will be able to: Demonstrates basic skills that underpin good practice in the field of computers and networking, e.g. laboratory tasks involving the creation of simple programs and the use of operating systems. Demonstrates skills in IT (e.g. word processing, spreadsheets) and web techniques (e.g. web searching, web page creation). Demonstrate an understanding of hardware issues, including interfacing and data communications, and their impact on the overall design and performance of computer based systems. Undertake the conceptual design of a database system using an established data modelling technique and	Students will deepen their knowledge of programming concepts and approaches as well as being introduced to systems development techniques, information structure, and web applications. At this level, students will also be introduced to professional, legal and ethical issues relevant to the computing and IT industry. On successful completion of this level, the student will be able to: Undertake the requirement specification and design of a computing/I.T. system using a variety of tools and techniques. Design and implement object oriented software for interactive systems that require a windows or web-based graphical user interface. Co-operate in an effective manner with colleagues	Students will learn key skills of cooperation, organisation, communication, negotiation and teamwork. On successful completion of this stage, the student will be able to: Design and implement interactive systems that manage information in a variety of media types. Utilise a range of tools and techniques to develop information systems that make effective use of internet technologies.	Students will achieve effective use of investigative and design strategies, and the integration of these strategies with other tools and methodologies. These skills will be particularly demonstrated in the students' management of an individual project. The final year practical and project work will require the type of evaluation of technical and non-technical factors and the management of methodologies and progress which IT professionals exercise early in their careers. On successful completion of this stage, the student will be able to: Analyse and critically appraise current and emerging technologies.

		demonstrate critical judgement in selecting a proprietary database management system for any given application. Apply object oriented software development methods and make an informed selection of algorithms and/or data representatives for solving a range of standard problems. Demonstrate an awareness and understanding of the concepts, techniques, design process and context of computer graphics	and other professionals through the development of interpersonal and communication skills, within in a project and business context. Display knowledge and understanding of programming and professional issues.		Propose, plan, undertake and report a self-directed individual programme of investigation, design and implementation which will enable the effective use of self-directed investigative, design and other technical skills to be demonstrated through the management of an individual computing project. Demonstrate knowledge and understanding of project management techniques Develop effective and secure applications and systems that utilise and integrate Intranet and multimedia technologies. Assume an active role in the planning and control of small computer applications, both as an individual and as an effective member of a project team.

CURRICULUM MATRIX (Computing) demonstrating how the overall programme outcomes are achieved and where skills are developed and assessed within individual modules.

			Knowledge and understanding, intellectual skills, subject skills, and practical, professional and employability skills																	
	Module Title	Core/ Opt	**A1**	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**C1**	**C2**	**C3**	**D1**	**D2**	**D3**	**D4**	**D5**	
L4	Professional Development in Computing: Information Engineering	C				X			X			X				X		X	X	X	X
	Problem Solving with Programming	C	X	X	X			X	X	X					X		X		X		X
	Web Technologies	C	X	X	X	X		X	X	X	X				X	X			X	X	X
	Managing Data	C	X	X	X			X	X	X	X					X	X		X		
	Computer Systems	C	X		X	X		X	X		X	X				X	X		X	X	
	Level 4 Option	O																			
	Module Title	Core/ Opt	**A1**	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**C1**	**C2**	**C3**	**D1**	**D2**	**D3**	**D4**	**D5**	**D6**
L5	Group Project Design	C	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Group Project Implementation	C	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Responsible Computing	C	X	X	X	X	X	X	X			X	X		X	X			X	X	X
	Human Computer Relationships	C	X	X		X		X	X	X	X		X		X	X			X	X	
	Applied Programming	C	X	X	X			X	X	X	X				X	X	X		X	X	
	Level 5 Option	O																			

	Module Title	Core/ Opt	**A1**	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**C1**	**C2**	**C3**	**D1**	**D2**	**D3**	**D4**	**D5**	**D6**
L6	IT Project Management	C	X	X	X	X		X	X	X	X	X	X		X	X	X	X	X	X	X
	Distributed Data	C	X	X	X	X		X	X	X	X	X	X		X	X	X	X	X	X	X
	21st Century Computing	C	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Project	C	X	X	X	X		X	X	X	X	X	X		X	X	X	X	X	X	X

BSc (HONOURS) COMPUTER NETWORKS AND SECURITY

Distinctive features of the programme

This new technology-infused programme with many hands-on opportunities allows students to develop a wide range of networking abilities highly valued and sought-after by the international network sector. These abilities will equip you with the essential skills not only to be able to design and implement systems, but to also manage them effectively and ensure that the people using them benefit from their full potential. There is an emphasis on the installation, operation security, and maintenance of computer systems and networks used in business and industry. You will learn the fundamentals of data communications and how to apply theory / practice to manage, design, implement, configure and operate secure networks on a professional footing and how to identify a range of significant threats to network security and formulate and implement defence strategies and mechanisms.

The primary aim is to produce graduates fully prepared for a range of careers in networking technology, network deployment and network security. The programme has been designed to enable progression to postgraduate study in computer networks.

Graduates will possess an understanding of fundamental aspects of current networked systems and appreciate the significance of new and emergent developments within the area and the professional standards required of a network practitioner.

During their study students have the opportunity of working on work based projects in order to gain experience within their chosen field. In addition to this they will also develop transferable skills such as; the ability to manage their own learning and personal and professional development; communicate effectively using a variety of communication methods; present and interpret numerical calculations appropriately; effective information retrieval skills; deploy IT facilities effectively and efficiently; to work independently and as part of a team with minimum guidance.

key facts

- The computing subject area is a recognised Cisco Academy. Students have the opportunity to complete the Cisco Certified Network Associate (CCNA) qualification whilst studying for their degree
- Cisco Systems state-of-the-art equipment is used in practical sessions
- This course responds to identified skills gaps. Students develop the critical understanding, knowledge and skills needed for successful employment
- The computing department is recognised for its world-leading research in Networks
- The computing department is home to Creative and Applied Research of the Digital Society (CARDS) which brings together expertise in both the creative and applied elements of the University's digital society research

The course is practical in nature and its general aims are to:

- Provide knowledge of the concepts and principles of network technology
- Apply the concepts and principles of network oriented computing and apply management techniques to the specification and installation of networked computers
- Provide a critical understanding integrating security into computer systems from a hardware and software point of view including networking, Web integration, systems integration, and wireless systems;

- Stimulate an enquiring, analytical, and creative approach encouraging independent judgement and critical awareness
- Develop abilities to reason logically, work effectively in a team, communicate clearly and read critically
- Ensure that the student has the basis for both future personal development and for continuing professional development
- Develop the student's critical ability in applying network computing technology innovatively to open ended problems

Programme structure
(BSc (Hons) Computer Networks and Security)

Year 1 Full Time structure (Level 4)

Tri 1	Professional Development in Computing: Information Engineering 20 Credits - Core	Problem - solving Programming 20 Credits - Core	Managing Data 20 Credits - Core	Computer Systems 20 Credits - Core
Tri 2			Network Technologies 20 Credits - Core	Option 20 credits
Tri 3				

Year 2 Full Time structure (Level 5)

Tri 1	Group Project Design 20 Credits - Core	Data Communications and Networks 20 Credits - Core	Option 20 credits
Tri 2	Group Project Implementation 20 Credits - Core	Responsible Computing 20 Credits - Core	Server Technologies 20 Credits - Core
Tri 3			

Year 3 Full Time structure (Level 6)

Tri 1	IT Project Management 20 Credits - Core	Network Management 20 Credits - Option	Applied Network Security 20 Credits - Core
Tri 2	21st Century Computing 20 Credits - Core	Project 40 Credits - Core	
Tri 3			

Level four options:
Student Initiated Module (SIM4)
Computing Maths
Digital Media principles
Web Technologies
Computational Thinking
CCNA R&S - Routing and Switching Essentials
CCNA R&S Introduction to Networks

Intro to JavaScript programming and DOM scripting
IT Business Graphics
IT for Information Analysis

Level five options:
Student Initiated Module (SIM5)
Human Computer Relationships
Internet & Mobile App Development
Applied Programming
Artificial Intelligence
CCNA Routing and Switching: Connecting Networks
CCNA R&S Scaling Networks
Databases and Web-based Information Systems
Agile Application Development
Database Administration and Optimisation

Intended learning outcomes of the programme

The following additional outcomes are fully compatible with the benchmark statements of Computing and are met through the overall design and selection of modules.

In addition to the generic programme learning outcomes identified earlier, graduates of the BSc (Hons) Computer Networks and Security programme will also be able to demonstrate the following:

C. Subject specific skills	
C3	Students are required to develop technical skills. This involves the students engaging in practical and project work throughout the course. This work is actively integrated to ensure that students relate theory and analysis to the design, operation and maintenance of computer networks.

C. Subject specific skills

		Level 4 Cert He	Level 5 Dip He	Level 6 Degree	Level 6 Honours Degree
C3	Students are required to develop technical skills. This involves the students engaging in practical and project work throughout the course. This work is actively integrated to ensure that students relate theory and analysis to the design, operation and maintenance of computer networks.	On successful completion of this level, the student will be able to: Demonstrates basic skills that underpin good practice in the field of computers and networking, e.g. laboratory tasks involving the creation of simple programs and the use of operating systems. Demonstrates skills in IT (e.g. word processing, spreadsheets) and web techniques (e.g. web searching, web page creation). Demonstrate an understanding of hardware issues, including interfacing and data communications, and their impact on the overall design and performance of computer based systems. Undertake the conceptual design of a database system using an established data modelling technique and demonstrate critical	Students will deepen their knowledge of networking concepts and approaches as well as being introduced to systems development techniques and information structure At this level, students will also be introduced to professional, legal and ethical issues relevant to the computing and IT industry. Enhancement of basic computing and investigative skills by applying them in laboratory and practical work to areas such as network design. The students will undertake a group project, incorporating a feasibility study, to design, produce and test a prototype of a network system or product. On successful completion of this level, the student will be able to: Undertake the requirement specification and design of a computing/I.T. system	The technical skills acquired include the techniques used in the design of high-speed data networks, management of computer networks, and project management skills, which will enable students to commence careers as IT professionals. On successful completion of this award, the student will be able to: Demonstrate specialist knowledge, understanding and skills within key areas of the discipline, as applied to the development of computer and networking systems and services using current technology. Demonstrate a responsible and self-critical approach to problem solving and decision-making in a professional computing context.	Students will achieve effective use of investigative and design strategies, and the integration of these strategies with other tools and methodologies, including the use of analytical and simulation software. These skills will be particularly demonstrated in the students' management of an individual project. The final year practical and project work will require the type of evaluation of technical and non-technical factors and the management of methodologies and progress which IT professionals and network managers exercise early in their careers. On successful completion of this award, the student will be able to:

		judgement in selecting a proprietary database management system for any given application. Apply object oriented software development methods and make an informed selection of algorithms and/or data representatives for solving a range of standard problems. Demonstrate an awareness and understanding of the concepts, techniques, design process and context of computer networks	using a variety of tools and techniques. Demonstrate awareness and knowledge, understanding and skills relevant to the discipline of computer network management and design. Demonstrate the fundamental interpersonal, organisational and study skills needed for undergraduate study and for lifelong learning in a career as a professional networking engineer. Demonstrate an awareness of the industrial and commercial environment in which the network professional operates and demonstrate investigative skills through group project and practical work.		Analyse and critically appraise current and emerging technologies. Propose, plan, undertake and report a self-directed individual programme of investigation, design and implementation which will enable the effective use of self-directed investigative, design and other technical skills to be demonstrated through the management of an individual computing project. Demonstrate knowledge and understanding of project management techniques Demonstrate in-depth specialist knowledge, understanding and practical skills within key areas of the discipline, as applied to the development of networking systems and services using current technology. Analyse the specification, installation, maintenance and support of networked services in relation to a range of technologies

CURRICULUM MATRIX (Computer Networks and Security) demonstrating how the overall programme outcomes are achieved and where skills are developed and assessed within individual modules.

			Knowledge and understanding, intellectual skills, subject skills, and practical, professional and employability skills																	
	Module Title	Core/ Opt	**A1**	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**C1**	**C2**	**C3**	**D1**	**D2**	**D3**	**D4**	**D5**	**D6**
L4	Professional Development in Computing: Information Engineering	C				X			X			X				X			X	X	X
	Problem Solving with Programming	C	X	X	X			X	X	X					X		X		X		X
	Network Technologies	C	X	X	X		X	X	X		X		X	X	X	X	X		X	X	X
	Managing Data	C	X	X	X			X	X	X	X					X	X		X		
	Computer Systems	C	X		X	X		X	X		X	X				X	X		X	X	
	SIM4	O																			
	Module Title	Core/ Opt	**A1**	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**C1**	**C2**	**C3**	**D1**	**D2**	**D3**	**D4**	**D5**	**D6**
L5	Group Project Design	C	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Group Project Implementation	C	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Responsible Computing	C	X	X	X	X	X	X	X			X	X		X	X			X	X	X
	Data Communications and Networks	C	X	X	X		X	X	X		X		X	X	X	X	X		X	X	X
	Server Technologies	C	X	X	X	X	X	X	X		X		X	X	X	X	X	X	X	X	X
	SIM5	O																			

	Module Title	Core/ Opt	**A1**	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**C1**	**C2**	**C3**	**D1**	**D2**	**D3**	**D4**	**D5**	**D6**
L6	IT Project Management	C	X	X	X	X		X	X	X	X	X	X		X	X	X	X	X	X	X
	Network Management	C	X	X	X	X	X	X	X		X		X	X	X	X	X		X	X	X
	Applied Network Security	C	X	X	X	X	X	X	X		X		X	X	X	X	X		X	X	X
	21st Century Computing	C	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Project	C	X	X	X	X		X	X	X	X	X	X		X	X	X	X	X	X	X

BSc (HONOURS) CYBER SECURITY

Distinctive features of the programme

The computing industry is predicted to grow nearly five times faster than the UK average (e-skills UK) with more than half a million new entrants required by 2017. This degree combines aspects of computer networks, computer science, computer programming and software development with some elements of electrical/electronic engineering. Students gain an understanding of the theory, threats and risks associated with cyber security, along with new techniques and future developments and learn through practical tasks enabling them to become versatile and knowledgeable practitioners/managers.

The need for Cyber Security skills expertise has become a significant issue in recent years, both in the UK and globally. The Frost and Sullivan 2015 (ISC)2 Global Information Security Workforce Study, indicates that the shortfall of technology security skills requirements increased between 2013 to 2015 from 56% to 62% and this gap is predicted to continue to grow to 75% by 2019. In terms of people on the ground, this equates to a global employment gap of 1.5 million people. The research also reveals that the major security concerns for organisations relate to a broad spectrum of threats, including software; hardware; and social/espionage, requiring a broad range of security skills to be available in industry. Another important finding from this report is that employment opportunities in the security sector are excellent, particularly in terms of salary, with the average salary of security personnel hitting £67,000 in 2015. In short, the report demonstrates that demand for cyber security personnel is outstripping supply and that jobs in the sector are extremely well paid.

Developed to be in line with our research strengths within the computer science department, the course provides a good combination of theory and practice. Students have ample opportunity to undertake real life projects in the second and third year of study, focused around the appropriate use and misuse of digital technology, along with the skills needed to investigate them.

Cyber-attacks have become more frequent over the last few years and increased in their sophistication and use of technology. All businesses and institutions, large or small, are potentially under threat from malicious activity through the internet and other electronic means. As such, the Computing team is actively engaged with the North Wales Police Cyber Crime Panel and the North Wales Cyber Security Trust Group. Students on this programme are encouraged to collaborate with the group and industry and participate in discussions tackling security issues.

Studying this degree will provide a deep understanding of cyber security knowledge, skills and capabilities associated with cyber-attacks and the future of emerging and technologies associated with this area. Opportunities are provided to build and configure robust secure systems as well as the necessary support systems to enable them to work in a commercial environment. Additionally, the course explores the issues associated with managing these types of systems and in particular the necessary aspects of network security.

Key facts:

- Opportunities for work experience relevant to your degree
- Research active department in future and emerging technologies.
- Award-winning Computing department – judged ‘world leading’ in the last UK research assessment (RAE 2008).

- Applied Research in Computing Laboratories (ARCLAb) which brings together expertise in both the creative and applied elements of the University's digital society research

The course is practical in nature and its general aims are to:

- Provide knowledge of the concepts and principles of cyber security
- Apply the concepts and principles of computer network oriented security and apply management techniques to the specification and installation of IP based systems
- Provide a critical understanding of how to integrate security into computer networks from a hardware and software perspective. Stimulate an enquiring, analytical, and creative approach encouraging independent judgement and critical awareness
- Develop abilities to reason logically, work effectively in a team, communicate clearly and read critically
- Ensure that the student has the basis for both future personal development and for continuing professional development
- Develop the student's critical ability in applying technology innovatively to open ended problems

Programme structure

(BSc (Hons) Cyber Security)

Year 1 Full Time structure (Level 4)

Tri 1	Professional Development in Computing: Information Engineering 20 Credits - Core	Problem - solving Programming 20 Credits - Core	Managing Data 20 Credits - Core	Computer Systems 20 Credits - Core
Tri 2			Network Technologies 20 Credits - Core	Option 20 credits
Tri 3				

Year 2 Full Time structure (Level 5)

Tri 1	Group Project Design 20 Credits - Core	Data Communications and Networks 20 Credits - Core	–Option 20 credits
Tri 2	Group Project Implementation 20 Credits - Core	Responsible Computing 20 Credits - Core	Server Technologies 20 Credits - Core
Tri 3			

Year 3 Full Time structure (Level 6)

Tri 1	IT Project Management 20 Credits - Core	Telecommunications Management 20 Credits - Option	Applied Network Security 20 Credits - Core
Tri 2	21st Century Computing	Project	

	20 Credits - Core	40 Credits - Core	
Tri 3			

Level four options:
Student Initiated Module (SIM4)
Computing Maths
Digital Media principles
Web Technologies
Computational Thinking
CCNA R&S - Routing and Switching Essentials
CCNA R&S Introduction to Networks
Intro to JavaScript programming and DOM scripting
IT Business Graphics
IT for Information Analysis

Level five options:
Student Initiated Module (SIM5)
Human Computer Relationships
Internet & Mobile App Development
Artificial Intelligence
CCNA Routing and Switching: Connecting Networks
CCNA R&S Scaling Networks
Databases and Web-based Information Systems
Agile Application Development
Database Administration and Optimisation

Intended learning outcomes of the programme

The following additional outcomes are fully compatible with the benchmark statements of Computing and are met through the overall design and selection of modules.

In addition to the generic programme learning outcomes identified earlier, graduates of the BSc (Hons) Cyber Security programme will also be able to demonstrate the following:

C. Subject specific skills	
C3	*Students are required to develop both managerial and technical skills in the area of **cyber security**. This involves the students engaging in practical and project work throughout the course. This work is actively integrated to ensure that students relate theory and analysis to the **practical application of cyber security threat detection and mitigation as well as forensic investigation.***

C. Subject specific skills

		Level 4 Cert He	Level 5 Dip He	Level 6 Degree	Level 6 Honours Degree
C3	*Students are required to develop both managerial and technical skills in the area of **cyber security**. This involves the students engaging in practical and project work throughout the course. This work is actively integrated to ensure that students relate theory and analysis to the **practical application of cyber security threat detection and mitigation as well as forensic investigation.***	On successful completion of this level, the student will be able to: Demonstrates basic skills that underpin good practice in the field of computers and networking, e.g. laboratory tasks involving the creation of simple programs and the use of operating systems. Demonstrates skills in IT (e.g. word processing, spreadsheets) and web techniques (e.g. web searching, web page creation). Demonstrate an understanding of hardware issues, including interfacing and data communications, and their impact on the overall design and performance of computer based systems. Undertake the conceptual design of a database system using an established data modelling technique and demonstrate critical	Students will deepen their knowledge of networking and security concepts and approaches as well as being introduced to systems development techniques and information structure At this level, students will also be introduced to professional, legal and ethical issues relevant to the computing and IT industry. Enhancement of basic computing and investigative skills by applying them in laboratory and practical work to areas such as network design. The students will undertake a group project, incorporating a feasibility study, to design, produce and test a prototype of a network system or product. On successful completion of this level, the student will be able to: Undertake the requirement specification and design of a computing/I.T. system	The technical skills acquired include the techniques used in the design of security policies and systems and high-speed data networks, management of computer networks, and project management skills, which will enable students to commence careers as IT professionals. On successful completion of this award, the student will be able to: Demonstrate specialist knowledge, understanding and skills within key areas of the discipline, as applied to the development of cyber security and computer networking systems and services using current technology. Demonstrate a responsible and self-critical approach to problem solving and decision-making in a professional computing context.	Students will achieve effective use of investigative and design strategies, and the integration of these strategies with other tools and methodologies, including the use of analytical and simulation software. These skills will be particularly demonstrated in the students' management of an individual project. The final year practical and project work will require the type of evaluation of technical and non-technical factors and the management of methodologies and progress which IT professionals and network managers exercise early in their careers. On successful completion of this award, the student will be able to: Analyse and critically appraise current and

		judgement in selecting a proprietary database management system for any given application. Apply object oriented software development methods and make an informed selection of algorithms and/or data representatives for solving a range of standard problems. Demonstrate an awareness and understanding of the concepts, techniques, design process and context of computer networks ***Display competence in mathematical techniques that underpin theories and principles of computer security***	using a variety of tools and techniques. Demonstrate awareness and knowledge, understanding and skills relevant to the discipline of network security and computer forensics and computer network management and design. Demonstrate the fundamental interpersonal, organisational and study skills needed for undergraduate study and for lifelong learning in a career as a cyber-security professional. Demonstrate an awareness of the industrial and commercial environment in which the security network professional operates and demonstrate investigative skills through group project and practical work.		emerging technologies both in cyber security and computer systems in general. Propose, plan, undertake and report a self-directed individual programme of investigation, design and implementation which will enable the effective use of self-directed investigative, design and other technical skills to be demonstrated through the management of an individual computing project. Demonstrate knowledge and understanding of project management techniques Demonstrate in-depth specialist knowledge, understanding and practical skills within key areas of the discipline, as applied to the development of cyber security strategies systems and services using current technology. ***Analyse a range of computer hardware, software and networked systems in order to determine the extent of security vulnerabilities***

					and compare and contrast appropriate countermeasures.

CURRICULUM MATRIX (Cyber Security) demonstrating how the overall programme outcomes are achieved and where skills are developed and assessed within individual modules.

			Knowledge and understanding, intellectual skills, subject skills, and practical, professional and employability skills																	
	Module Title	Core/ Opt	**A1**	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**C1**	**C2**	**C3**	**D1**	**D2**	**D3**	**D4**	**D5**	**D6**
L4	Professional Development in Computing: Information Engineering	C				X			X			X				X			X	X	X
	Problem Solving with Programming	C	X	X	X			X	X	X					X		X		X		X
	Network Technologies	C	X	X	X		X	X	X		X		X	X	X	X	X		X	X	X
	Managing Data	C	X	X	X			X	X	X	X					X	X		X		
	Computer Systems	C	X		X	X		X	X		X	X				X	X		X	X	
	SIM4	O																			
	Module Title	Core/ Opt	**A1**	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**C1**	**C2**	**C3**	**D1**	**D2**	**D3**	**D4**	**D5**	**D6**
L5	Group Project Design	C	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Group Project Implementation	C	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Responsible Computing	C	X	X	X	X	X	X	X			X	X		X	X			X	X	X
	Data Communications and Networks	C	X	X	X		X	X	X		X		X	X	X	X	X		X	X	X
	Server Technologies	C	X	X	X	X	X	X	X		X		X	X	X	X	X	X	X	X	X

	SIM5	O																		

	Module Title	Core/ Opt	**A1**	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**C1**	**C2**	**C3**	**D1**	**D2**	**D3**	**D4**	**D5**	**D6**
L6	IT Project Management	C	X	X	X	X		X	X	X	X	X	X		X	X	X	X	X	X	X
	Telecommunications Management	C	X	X	X	X	X	X	X		X		X	X	X	X	X		X	X	X
	Applied Network Security	C	X	X	X	X	X	X	X		X		X	X	X	X	X		X	X	X
	21st Century Computing	C	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Project	C	X	X	X	X		X	X	X	X	X	X		X	X	X	X	X	X	X

BSc (HONOURS) COMPUTER GAME DEVELOPMENT

Distinctive features of the programme

Computer game development remains one of the fastest growing industries in the digital technology sector, and is extremely diverse in terms of potential career paths. Students with an interest in computer games will build strong design and development skills and learn to engage with actual game industry practices and methodologies.

The course is designed with employability in mind, and benefits from strong industry links with regular visits and guest speakers. A key element of this course is its emphasis on industry standard theory and practice allowing students to gain valuable experience through live projects and seminars. In addition, students develop an extensive portfolio of personal work that we will help you tailor to best suit the career you have in mind.

At the heart of the Computer Game Development degree are the principles of design and technical development. In the first year students are introduced to the fundamentals of computer programming, mathematics, digital audio, graphical rendering and the workings of cutting-edge gaming hardware and software technology. In addition, there is a strong element of creative design and production where students will engage with industry standard software and hardware to develop ideas and concepts as a member of a team and as an individual.

As the degree progresses students are presented with opportunities to work with industry standard tools to develop game narratives, characters and scenarios. By building on the foundations of concepts, theory and practice, students will expand their knowledge to work with multiple platforms such as smart phones, mobile devices, multiplayer game environments, artificial intelligence systems and advanced 3D modelling and animation for games.

Throughout the course, students develop a number of practical skills which are useful in any field of business or working environment such as self-motivation, time management, problem solving and the application of management methodologies, personal development and critical reflection. In addition, other critical skills including research, analysis and presentation will be developed along with knowledge of specialised software skills.

Key facts:

- A specialist computer game development studio dedicated to the design and production of digital media and game development applications
- Access to state-of-the-art Centre for the Creative Industries and its fully integrated creative media suite, television production studios and Apple accredited facilities
- Regular contact with games and media industry representatives through guest lectures, seminars and Game Dev North Wales events
- Access to our professional audio post-production suite and radio station
- This course is designed to give you the skills and knowledge needed for employment in the digital media and game development industries
- Personal Development Planning is integrated throughout the course to develop the skills framework necessary for effective personal, academic and career management

The programme will provide students with a comprehensive education, skills and learning experience in all aspects of computer games design, programming and related technologies.

The programme is distinctive in that it provides a strong conceptual and methodological grounding and seeks to develop a rich and up-to-date set of practices and techniques which students can exploit in state-of the art computer game software design and implementation.

The specific aims of the programme are as follows:

- To provide students with an understanding of current and developing computer games technologies.
- To facilitate students in the development of their expertise and interest in topic areas which will have direct and complementary relevance to gaining employment.
- To support and guide students in becoming autonomous learners.
- To provide students with an understanding of current Computer Game Development research issues.
- To develop students' analytical, creative, problem-solving and evaluation skills.
- To provide a platform for career development, innovation and/or further postgraduate study.

Programme structure

(BSc (Hons) Computer Game Development)

Year 1 Full Time structure (Level 4)

Tri 1	Professional Development in Computing: Information Engineering 20 Credits - Core	Problem - solving Programming 20 Credits - Core	Interactive Design 20 Credits - Core	Computer Systems 20 Credits - Core
Tri 2			Digital Media Principles 20 Credits - Core	Computing Maths COM4XX 20 Credits - Core
Tri 3				

Year 2 Full Time structure (Level 5)

Tri 1	Group Project Design 20 Credits - Core	Audio Technology for Games 20 Credits - Core	3D Modelling & Animation 20 Credits - Core
Tri 2	Group Project Implementation 20 Credits - Core	Internet & Mobile App Development 20 Credits - Core	Serious Games Technology 20 Credits - Core
Tri 3			

Year 3 Full Time structure (Level 6)

Tri 1	Advanced Mobile Development 20 Credits - Core	Advanced 3D Modelling & Animation 20 Credits - Core	Collaborative Technology 20 Credits - Core
Tri 2	21st Century Computing 20 Credits - Core	Project 40 Credits - Core	
Tri 3			

Intended learning outcomes of the programme

The following additional outcomes are fully compatible with the benchmark statements of Computing. The guidance provided by IGDA and Skillset has also been addressed. In particular, the programme aims to ensure that students have considered all of the elements appropriate to Computer Game Development that are included in the "Core Topics" identified by IGDA.

In addition to the generic programme learning outcomes identified earlier, graduates of the BSc (Hons) Computer Game Development programme will also be able to demonstrate the following:

C. Subject specific skills	
C3	Students are required to develop technical design, development and agile management skills. This involves the students engaging in practical and project work throughout the course, that is balanced between individual and group based scenarios. This work is actively integrated to ensure that students relate theory and analysis to the design, development and deployment of computer game related applications and tools.

C. Subject specific skills

		Level 4 Cert He	Level 5 Dip He	Level 6 Degree	Level 6 Honours Degree
C3	Students are required to develop technical design, development and agile management skills. This involves the students engaging in practical and project work throughout the course, that is balanced between individual and group based scenarios. This work is actively integrated to ensure that students relate theory and analysis to the design, development and deployment of computer game related applications and tools.	On successful completion of this level, the student will be able to: Demonstrate basic skills that underpin good practice in the field of computing and game technology, e.g. laboratory tasks involving the design and creation of simple game applications, interfaces and the use of computer systems. Demonstrate skills in IT (e.g. word processing, spreadsheets) and web techniques (e.g. web searching, web page creation) through applied problem solving. Demonstrate an understanding of hardware issues, including interfacing, graphical rendering, and their impact on the overall design and performance of computer based systems. Demonstrate an awareness and	Students will deepen their knowledge of game design & programming concepts and approaches as well as serious game application techniques, agile methods, and mobile applications. At this level, students will also be introduced to 3D modelling & animation and professional, legal & ethical issues relevant to the computing and games & IT industry. On successful completion of this level, the student will be able to: Demonstrate good practice in the development, management and utilisation of 3D models and animation techniques using industry standard software tools. Design and implement object oriented software for interactive game systems that require a windows, mobile or next generation console interface.	Students will demonstrate key skills in cooperation, organisation, communication, negotiation and teamwork. In addition, they will further expand their knowledge of design, programming and distributed systems. On successful completion of this stage, the student will be able to: Design and implement interactive game systems that utilise a variety of media types to a professional standard. Design intricate 3D models and animation techniques that incorporate sophisticated production pipelines. Compare and contrast current industry trends and identify potential opportunities for the deployment of collaborative technology.	Students will achieve professional use of investigative and design strategies, and the integration of these strategies within other tools and agile methodologies. These skills will be particularly demonstrated in the students' management and engagement of a substantial team project. The final year practical and project work will require the type of evaluation of technical and non-technical factors and the management of methodologies and progress which game development and IT professionals exercise in their careers. On successful completion of this stage, the student will be able to: Analyse and critically appraise current and

		understanding of the concepts, techniques, and processes involved within an agile methodology such as scrum. Apply these techniques to a small development project. Apply object oriented software development methods and make an informed selection of algorithms and/or data representatives for solving a range of standard problems including that of game development. Demonstrate an awareness and understanding of the concepts, techniques, design process and context of computer graphics.	Co-operate in an effective manner with colleagues and other professionals through the development of interpersonal and communication skills, within in a project and business context using a recognised agile methodology and support tool (such as JIRA). Develop and maintain a detailed set of production documentation that includes design, technical, testing and performance indication.	Demonstrate an in depth understanding of the characteristics and limitations of mobile hardware devices and the importance of usability in mobile applications	emerging technologies within the field of game development and IT. Propose, plan, undertake and report a self-directed individual programme of investigation, design and implementation which will enable the effective use of self-directed investigative, design and other technical skills to be demonstrated through the management and development of a large team project. Demonstrate knowledge and understanding of agile project management techniques and the ability to analyse their effectiveness. Develop effective and efficient game applications and systems that utilise and integrate a variety of media technologies and conform to a specific target market.

CURRICULUM MATRIX (Computer Game Development) demonstrating how the overall programme outcomes are achieved and where skills are developed and assessed within individual modules.

			Knowledge and understanding, intellectual skills, subject skills, and practical, professional and employability skills																	
	Module Title	Core/ Opt	**A1**	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**C1**	**C2**	**C3**	**D1**	**D2**	**D3**	**D4**	**D5**	**D6**
L4	Professional Development in Computing: Information Engineering	C				X			X			X				X			X	X	X
	Problem Solving with Programming	C	X	X	X			X	X	X					X		X		X		X
	Digital Media Principles	C		X	X			X		X	X			X					X	X	
	Computing Maths	C		X					X				X		X	X	X			X	
	Computer Systems	C	X		X	X		X	X		X	X				X	X		X	X	
	Interactive Design	C	X	X	X			X	X		X	X		X		X		X	X	X	X
	Module Title	Core/ Opt	**A1**	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**C1**	**C2**	**C3**	**D1**	**D2**	**D3**	**D4**	**D5**	**D6**
L5	Group Project Design	C	X	X	X	X	X	X	X	X-	X	X	X	X	X	X	X	X	X	X	X
	Group Project Implementation	C	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Audio Technology for Games	C		X	X	X			X	X			X			X			X	X	
	3D Modelling & Animation	C	X	X	X		X	X		X	X			X					X	X	X
	Internet & Mobile App Development	C		X	X	X		X	X	X	X		X				X		X		X
	Serious Games Technology	C	X	X	X	X	X	X	X		X	X		X				X	X	X	X

	Module Title	Core/ Opt	**A1**	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**C1**	**C2**	**C3**	**D1**	**D2**	**D3**	**D4**	**D5**	**D6**
L6	Advanced Mobile Development	C		X	X	X		X	X	X	X		X			X	X		X		X
	Advanced 3D Modelling & Animation	C	X	X	X		X	X		X	X			X					X	X	X
	Collaborative Technology	C		X	X	X	X		X	X	X	X		X		X		X	X	X	
	21st Century Computing	C	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Project	C	X	X	X	X		X	X	X	X	X	X		X	X	X	X	X	X	X

BSc (HONOURS) IMMERSIVE TECHNOLOGY

Distinctive features of the programme

Immersive Technology is the use of technology to simulate the real world; it can be used to define the difference in the spectrum of reality and involves the development and utilisation of media content driven through the application of technology (such as full-dome, virtual reality and serious games) to provide dynamic interactive and immersive applications.

Immersive technology promotes the development of content that provides unique ways for engagement on both a personal and collaborative level through the deployment of different forms of media, application of hardware and development techniques. Its application is applied within several industries, including entertainment, education, business, health and military. Highly adaptable, immersive technology is increasingly pervading a variety of industries as a tool offering innovative forms of communicating, acquiring and interacting with interactive information.

Consistent advancements in technology and increasing accessibility have further enhanced the delivery of immersive content to embody actual sensory and physical feedback blurring the boundaries between physical and virtual realities.

The degree introduces students to a variety of visual and auditory development practices that utilise industry leading software packages for the creation of 2D and 3D graphics, audio processing, 360 degree video capturing and development methodologies. The techniques taught will investigate the processes associated with asset development and include the creation of media content that incorporates the use of full-dome (360 projections), second screen, 3d projections, virtual simulation, head mounted displays and computer game development techniques.

The technical components of the course are designed to further enhance media development approaches to encourage innovative development opportunities and promotion of dynamic content. This involves programming and the utilisation of electronic prototyping (Arduino) for input/output devices, game engine utilisation and the implementation of immersive peripheral devices to enhance the delivery and interaction of media within virtual/physical simulations. Expansion of this will include the use of technology to introduce perceptually-real sensations to incorporate visual, auditory, tactile and olfactory user feedback.

Students are encouraged to explore the use of immersive content and enhance its delivery using the innovative application of technology, through the use of software applications and the modification of hardware components. This will include the development of both linear and dynamic content to support the use of leading-edge technology applications. The application of ethical considerations is also incorporated within the course structure to help provide a moral stance on the creation of specific content as well as management practices for both small and large scale project design.

Key facts:

- Access to various hardware and software technologies relating to human-computer interaction, used to develop intelligent interfaces for games with particular emphasis on products for people with physical disabilities or learning disabilities
- Diverse application of computing skills that demonstrate the versatility of technology and computing practices within other departmental disciplines through collaboration of real-world projects
- Strong links with local companies and employers

- Development of media content through the use of industry leading software (Adobe Creative Cloud and Autodesk Suite) for the creation of 2D and 3D projection and auditory content
- Unique development approaches for different user immersive environments, such as the Full-Dome (Collaborative), Oculus Rift (Individual) and Flight Simulators (Force-Feedback)
- The implementation of game engine coding to provide dynamic environments that incorporate interaction through peripherals such as an Omni-Directional Treadmills and Motion Sensors

The programme is distinctive in that it provides a strong conceptual and methodological grounding and seeks to develop a rich and up-to-date set of practices and techniques which students can exploit in different user immersive environments.

The specific aims of the programme are as follows:

- To provide students with an understanding of current and developing user immersive environments
- To facilitate students in the development of their expertise and interest in topic areas which will have direct and complementary relevance to gaining employment.
- To support and guide students in becoming autonomous learners.
- To provide students with an understanding of the development and utilisation of media content driven through the application of technology
- To develop students' analytical, creative, problem-solving and evaluation skills.
- To provide a platform for career development, innovation and/or further postgraduate study.

Programme structure

(BSc (Hons) Immersive Technology)

Year 1 Full Time structure (Level 4)

<table>
<tr><td>Tri 1</td><td rowspan="2">Professional Development in Computing: Information Engineering
20 Credits - Core</td><td rowspan="2">Problem - solving Programming
20 Credits - Core</td><td>Interactive Design
20 Credits - Core</td><td>Computer Systems
20 Credits - Core</td></tr>
<tr><td>Tri 2</td><td>Digital Media Principles
20 Credits - Core</td><td>Computing Maths
20 Credits - Core</td></tr>
<tr><td>Tri 3</td><td colspan="2"></td><td></td><td></td></tr>
</table>

Year 2 Full Time structure (Level 5)

Tri 1	Group Project Design 20 Credits – Core	Human Computer Relationships 20 Credits - Core	3D Modelling & Animation 20 Credits - Core
Tri 2	Group Project Implementation 20 Credits – Core	Internet & Mobile App Development 20 Credits - Core	Serious Games Technology 20 Credits - Core
Tri 3			

Year 3 Full Time structure (Level 6)

Tri 1	Advanced Mobile Development 20 Credits - Core	Advanced 3D Modelling & Animation 20 Credits - Core	Collaborative Technology 20 Credits - Core
Tri 2	21st Century Computing 20 Credits - Core	Project 40 Credits - Core	
Tri 3			

Intended learning outcomes of the programme

The following additional outcomes are fully compatible with the benchmark statements of Computing and are met through the overall design and selection of modules.

In addition to the generic programme learning outcomes identified earlier, graduates of the BSc (Hons) Immersive Technology programme will also be able to demonstrate the following:

C. Subject specific skills	
C3	Students are required to develop technical design, development and agile management skills. This involves the students engaging in practical and project work throughout the course, that is balanced between individual and group based scenarios. This work is actively integrated to ensure that students relate theory and analysis to the design, development and deployment of computer game related applications and tools.

C. Subject specific skills

		Level 4 Cert He	Level 5 Dip He	Level 6 Degree	Level 6 Honours Degree
C3	Students are required to develop technical design, development and agile management skills. This involves the students engaging in practical and project work throughout the course, that is balanced between individual and group based scenarios. This work is actively integrated to ensure that students relate theory and analysis to the design, development and deployment of computer game related applications and tools.	On successful completion of this level, the student will be able to: Demonstrate basic skills that underpin good practice in the field of computing and game technology, e.g. laboratory tasks involving the design and creation of simple game applications, interfaces and the use of computer systems. Demonstrate skills in IT (e.g. word processing, spreadsheets) and web techniques (e.g. web searching, web page creation) through applied problem solving. Demonstrate an understanding of hardware issues, including interfacing, graphical rendering, and their impact on the overall design and performance of computer based systems. Demonstrate an awareness and	Students will deepen their knowledge of game design & programming concepts and approaches as well as serious game application techniques, agile methods, and mobile applications. At this level, students will also be introduced to 3D modelling & animation and professional, legal & ethical issues relevant to the computing and games & IT industry. On successful completion of this level, the student will be able to: Demonstrate good practice in the development, management and utilisation of 3D models and animation techniques using industry standard software tools. Design and implement object oriented software for interactive game systems that require a windows, mobile or next generation console interface.	Students will demonstrate key skills in cooperation, organisation, communication, negotiation and teamwork. In addition, they will further expand their knowledge of design, programming and distributed systems. On successful completion of this stage, the student will be able to: Design and implement interactive game systems that utilise a variety of media types to a professional standard. Design intricate 3D models and animation techniques that incorporate sophisticated production pipelines. Compare and contrast current industry trends and identify potential opportunities for the deployment of collaborative technology.	Students will achieve professional use of investigative and design strategies, and the integration of these strategies within other tools and agile methodologies. These skills will be particularly demonstrated in the students' management and engagement of a substantial team project. The final year practical and project work will require the type of evaluation of technical and non-technical factors and the management of methodologies and progress which game development and IT professionals exercise in their careers. On successful completion of this stage, the student will be able to: Analyse and critically appraise current and

		understanding of the concepts, techniques, and processes involved within an agile methodology such as scrum. Apply these techniques to a small development project. Apply object oriented software development methods and make an informed selection of algorithms and/or data representatives for solving a range of standard problems including that of game development. Demonstrate an awareness and understanding of the concepts, techniques, design process and context of computer graphics.	Co-operate in an effective manner with colleagues and other professionals through the development of interpersonal and communication skills, within in a project and business context using a recognised agile methodology and support tool (such as JIRA). Develop and maintain a detailed set of production documentation that includes design, technical, testing and performance indication.	Demonstrate an in depth understanding of the characteristics and limitations of mobile hardware devices and the importance of usability in mobile applications	emerging technologies within the field of game development and IT. Propose, plan, undertake and report a self-directed individual programme of investigation, design and implementation which will enable the effective use of self-directed investigative, design and other technical skills to be demonstrated through the management and development of a large team project. Demonstrate knowledge and understanding of agile project management techniques and the ability to analyse their effectiveness. Develop effective and efficient game applications and systems that utilise and integrate a variety of media technologies and conform to a specific target market.

CURRICULUM MATRIX (Immersive Technology) demonstrating how the overall programme outcomes are achieved and where skills are developed and assessed within individual modules.

			Knowledge and understanding, intellectual skills, subject skills, and practical, professional and employability skills																	
	Module Title	Core/ Opt	**A1**	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**C1**	**C2**	**C3**	**D1**	**D2**	**D3**	**D4**	**D5**	**D6**
L4	Professional Development in Computing: Information Engineering	C				X			X			X				X			X	X	X
	Problem Solving with Programming	C	X	X	X			X	X	X					X		X		X		X
	Digital Media Principles	C		X	X			X		X	X			X					X	X	
	Computing Maths	C		X					X				X		X	X	X			X	
	Computer Systems	C	X		X	X		X	X		X	X				X	X		X	X	
	Interactive Design	C	X	X	X			X	X		X	X		X		X		X	X	X	X
	Module Title	Core/ Opt	**A1**	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**C1**	**C2**	**C3**	**D1**	**D2**	**D3**	**D4**	**D5**	**D6**
L5	Group Project Design	C	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Group Project Implementation	C	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Human Computer Relationships	C	X	X		X		X	X	X	X		X		X	X			X	X	
	3D Modelling & Animation	C	X	X	X		X	X		X	X			X					X	X	X
	Internet & Mobile App Development	C		X	X	X		X	X	X	X		X				X		X		X
	Serious Games Technology	C	X	X	X	X	X	X	X		X	X		X				X	X	X	X

	Module Title	Core/ Opt	**A1**	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**C1**	**C2**	**C3**	**D1**	**D2**	**D3**	**D4**	**D5**	**D6**
L6	Advanced Mobile Development	C		X	X	X		X	X	X	X		X			X	X		X		X
	Advanced 3D Modelling & Animation	C	X	X	X		X	X		X	X			X					X	X	X
	Collaborative Technology	C		X	X	X	X		X	X	X	X		X		X		X	X	X	
	21st Century Computing	C	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Project	C	X	X	X	X		X	X	X	X	X	X		X	X	X	X	X	X	X

BSc (HONOURS) CREATIVE COMPUTING

Distinctive features of the programme

The creative computing degree is designed to give an insight into creative applications for web, mobile and media, developing an understanding of visual and audio representations, techniques and applications, as well as interactive systems.

This is a multi-disciplinary course covering all aspects of current and emerging multimedia technologies, principles of information design for effective communication and approaches to software development and its management. It emphasises creative problem solving and project management skills as well as the aesthetic and technical aspects of the medium.

The course raises awareness of current and emerging multimedia technologies, principles of information design for effective communication and approaches to software construction and its management. Through this awareness, students are able to author multimedia applications by selecting and creating appropriate content. Some of these systems will be for stand-alone use whilst others will be for web deployment. The degree also includes audio and graphical computing, computer animation through to games programming principles and techniques as well as considering areas of suitable application.

Key facts:

- develop industry-relevant vocational skills and gain the experience required for employment in the digital media industries
- Specialist computer laboratory dedicated to computer games application and multimedia systems development
- The course responds to identified skills gaps by developing knowledge, skills and critical understanding, for successful employment
- Research active department in future and emerging technologies. The department has been successful in achieving funding for developing a range of intelligent kitchen appliances for use by elderly or disabled people and continues to develop research projects

The programme is practical in nature and its general aims are to:

- Provide students with the knowledge and skills required to pursue a career in the development of practical multimedia and interactive systems
- Provide students with the ability to apply professional standards to the analysis, design, testing, evaluation and modification of reliable and maintainable software
- Develop the students' critical, analytical and problem solving skills in relation to multimedia issues
- Stimulate an enquiring, analytical, and creative approach to multimedia systems development that will encourage independent judgement and critical awareness
- Develop the students' skills in learning that will underpin their ability to ensure that their technical skills can kept up-to-date in a fast changing discipline and that they appreciate the need for continuing professional development
- Provide students with practical and transferable skills, such as oral and written communication, time management and group working, to assist them in subsequent employment or further study.

Programme structure

(BSc (Hons) Creative Computing)

Year 1 Full Time structure (Level 4)

<table>
<tr><td>Tri 1</td><td rowspan="2">Professional Development in Computing: Information Engineering
20 Credits - Core</td><td rowspan="2">Problem - solving Programming
20 Credits - Core</td><td>Computer Systems
20 Credits - Core</td><td>Managing Data
20 Credits - Core</td></tr>
<tr><td>Tri 2</td><td>Web Technologies
20 Credits - Core</td><td>Digital Media Principles
20 Credits - Core</td></tr>
<tr><td>Tri 3</td><td colspan="2"></td><td></td><td></td></tr>
</table>

Year 2 Full Time structure (Level 5)

<table>
<tr><td>Tri 1</td><td>Group Project Design
20 Credits - Core</td><td>Human Computer Relationships
20 Credits - Core</td><td>3D Modelling & Animation
20 Credits - Core</td></tr>
<tr><td rowspan="2">Tri 2</td><td rowspan="2">Group Project Implementation
20 Credits - Core</td><td>Internet & Mobile App Development
20 Credits - Option</td><td rowspan="2">Responsible Computing
20 Credits - Core</td></tr>
<tr><td>Database and Web-based Information Systems
20 credits- option</td></tr>
<tr><td>Tri 3</td><td></td><td></td><td></td></tr>
</table>

Year 3 Full Time structure (Level 6)

<table>
<tr><td rowspan="2">Tri 1</td><td>Advanced Mobile Development
20 Credits - Option</td><td rowspan="2">Advanced 3D Modelling & Animation
20 Credits - Core</td><td rowspan="2">Advanced Web Technology
20 Credits – Core</td></tr>
<tr><td>It Project Management
20 credits - option</td></tr>
<tr><td>Tri 2</td><td>21st Century Computing
20 Credits - Core</td><td colspan="2">Project
40 Credits - Core</td></tr>
<tr><td>Tri 3</td><td></td><td></td><td></td></tr>
</table>

Intended learning outcomes of the programme

The following additional outcomes are fully compatible with the benchmark statements of Computing and are met through the overall design and selection of modules.

In addition to the generic programme learning outcomes identified earlier, graduates of the BSc (Hons) Creative Computing programme will also be able to demonstrate the following:

C. Subject specific skills

C3	Students are required to develop technical skills. This involves the students engaging in practical and project work throughout the course. This work is actively integrated to ensure that students relate theory and analysis to the design of, operation and maintenance of multimedia applications, tools and systems.

C. Subject specific skills

		Level 4 Cert He	Level 5 Dip He	Level 6 Degree	Level 6 Honours Degree
C3	Students are required to develop technical skills. This involves the students engaging in practical and project work throughout the course. This work is actively integrated to ensure that students relate theory and analysis to the design of, operation and maintenance of multimedia applications, tools and systems.	On successful completion of this level, the student will be able to: Demonstrates basic skills that underpin good practice in the field of computers and networking, e.g. laboratory tasks involving the creation of simple programs and the use of operating systems. Demonstrates skills in IT (e.g. word processing, spreadsheets) and web techniques (e.g. web searching, web page creation). Demonstrate an understanding of hardware issues, including interfacing and data communications, and their impact on the overall design and performance of computer based systems. Undertake the conceptual design of a database system using an established data modelling technique and	Students will deepen their knowledge of programming concepts and approaches as well as being introduced to systems development techniques, information structure, and web applications. At this level, students will also be introduced to professional, legal and ethical issues relevant to the computing and IT industry. On successful completion of this level, the student will be able to: Undertake the requirement specification and design of a computing/I.T. system using a variety of tools and techniques. Design and implement interactive systems that require a windows or web-based graphical user interface. Design and implement interactive systems that	Students will learn key skills of cooperation, organisation, communication, negotiation and teamwork. On successful completion of this stage, the student will be able to: Apply knowledge and understanding of interactive 3D computer graphics and 2D animation. Demonstrate a knowledge and understanding of the elements of interactive multimedia and its applications.	Students will achieve effective use of investigative and design strategies, and the integration of these strategies with other tools and methodologies. These skills will be particularly demonstrated in the students' management of an individual project. The final year practical and project work will require the type of evaluation of technical and non-technical factors and the management of methodologies and progress which IT professionals exercise early in their careers. On successful completion of this stage, the student will be able to: Analyse and critically appraise current and emerging technologies.

		demonstrate critical judgement in selecting a proprietary database management system for any given application. Apply object oriented software development methods and make an informed selection of algorithms and/or data representatives for solving a range of standard problems. Demonstrate an awareness and understanding of the concepts, techniques, design process and context of computer graphics	manage information in a variety of media types. Display knowledge and understanding of fundamental techniques for designing, creating and manipulating 2D interactive graphics.		Propose, plan, undertake and report a self-directed individual programme of investigation, design and implementation which will enable the effective use of self-directed investigative, design and other technical skills to be demonstrated through the management of an individual computing project. Demonstrate knowledge and understanding of project management techniques Demonstrate a knowledge and understanding in the specific areas of interactive 3D animation and in the creation and manipulation of graphical 3D models. Apply the principles of 2D and 3D computer graphics in order to provide visualisations of a wide range of types of data. Show adaptability for employment in industry and commerce in a rapidly changing environment, undertake research and extended self-study.

CURRICULUM MATRIX (Creative Computing) demonstrating how the overall programme outcomes are achieved and where skills are developed and assessed within individual modules.

			Knowledge and understanding, intellectual skills, subject skills, and practical, professional and employability skills																	
	Module Title	Core/ Opt	**A1**	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**C1**	**C2**	**C3**	**D1**	**D2**	**D3**	**D4**	**D5**	**D6**
L4	Professional Development in Computing: Information Engineering	C				X			X			X				X			X	X	X
	Problem Solving with Programming	C	X	X	X			X	X	X					X		X		X		X
	Digital Media Principles	C		X	X			X		X	X			X					X	X	
	Web Technologies	C	X	X	X	X		X	X	X	X				X	X			X	X	X
	Computer Systems	C	X		X	X		X	X		X	X				X	X		X	X	
	Managing Data	C	X	X	X			X	X	X	X					X	X		X		
	Module Title	Core/ Opt	**A1**	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**C1**	**C2**	**C3**	**D1**	**D2**	**D3**	**D4**	**D5**	**D6**
L5	Group Project Design	C	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Group Project Implementation	C	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Human Computer Relationships	C	X	X		X		X	X	X	X		X		X	X			X	X	
	3D Modelling & Animation	C	X	X	X		X	X		X	X			X					X	X	X
	Internet & Mobile App Development	O		X	X	X		X	X	X	X		X				X		X		X

	Database and Web-based Information Systems																				
	Responsible Computing	C	X	X	X	X	X	X	X			X	X		X	X			X	X	X
	Module Title	Core/ Opt	**A1**	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**C1**	**C2**	**C3**	**D1**	**D2**	**D3**	**D4**	**D5**	**D6**
L6	Advanced Mobile Development	O		X	X	X		X	X	X	X		X			X	X		X		X
	Advanced 3D Modelling & Animation	C	X	X	X		X	X		X	X			X					X	X	X
	Advanced Web Technology	C		X	X	X		X	X	X	X		X				X		X		X
	IT Project Management	O																			
	21st Century Computing	C	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Project	C	X	X	X	X		X	X	X	X	X	X		X	X	X	X	X	X	X

BSc (HONOURS) ARTIFICIAL INTELLIGENCE

Distinctive features of the programme

Computer science is a rapidly expanding area with many companies requiring intelligent algorithmic solutions to their problems. Gaining new knowledge and skills is critical to the success of complex information systems for businesses and organisations. As with traditional computer degrees this degree also places a strong emphasis on the principles of computer science and practical programming. Students will gain an understanding of the fundamental theory, principles and contemporary issues in AI and the computing techniques that are making an impact on businesses and organisations.

AI includes traditional and nature-inspired computational methodologies to handle complex real-world problems. Evolutionary algorithms are inspired by the biological evolution process and are used to design many products in high-tech industry automatically, for instance, integrated circuits. AI also studies information extraction methods from a data set and the methodology to transform the extracted data into an understandable structure for further use. This data mining is used by virtually all large corporations and finds use even in non-commercial scenarios.

There is a diverse range of opportunities available to graduates from this course, including: business intelligence developer, optimisation engineer, data miner, data analyst, software engineer, data engineer, research engineer, data scientist, expert systems developer, design engineer, research officer, and many others.

Among other computer science related modules, students can expect to study modules on artificial intelligence foundations, applied data mining, computability and optimisation. This programme also has a strong focus in student projects addressing real world problems

Key facts:

- Developed in accordance with British Computer Society accreditation criteria (proposal for accreditation to be submitted in the near future)
- Research active department in Future and Emerging Technologies. The department has been successful in achieving funding for developing a range of intelligent kitchen appliances for use by elderly or disabled people and continues to develop research projects
- Our lecturers are part of the Creative and Applied Research Centre for Digital Society (CARDS) which brings together expertise in both the creative and applied elements of the University's digital society research

The programme is practical in nature and its general aims are to:

- Provide students with the knowledge and skills required to pursue a career in data mining, optimisation, computer-aided engineering design tool development
- Provide students with the ability to apply professional standards to the analysis, design, testing, evaluation and modification of intelligent algorithms and systems
- Develop the students' critical, analytical and problem solving skills in relation to the development of intelligent algorithmic solutions
- Stimulate an enquiring, analytical, and creative approach to artificial intelligence development that will encourage independent judgement and critical awareness

Programme structure

(BSc (Hons) Artificial Intelligence)

Year 1 Full Time structure (Level 4)

Tri 1	Professional Development in Computing: Information Engineering 20 Credits - Core	Problem - solving Programming 20 Credits - Core	Managing Data 20 Credits - Core	Computer Systems 20 Credits - Core
Tri 2			Computational Thinking 20 Credits - Core	Option 20 credits
Tri 3				

Year 2 Full Time structure (Level 5)

Tri 1	Group Project Design 20 Credits - Core	Artificial Intelligence 20 Credits - Core	Option 20 credits
Tri 2	Group Project Implementation 20 Credits - Core	Responsible Computing 20 Credits - Core	Applied Programming 20 Credits - Core
Tri 3			

Year 3 Full Time structure (Level 6)

Tri 1	IT Project Management 20 Credits - Core	Applied Data Mining 20 Credits - Option	Computability and Optimisation 20 Credits - Core
Tri 2	21st Century Computing 20 Credits - Core	Project 40 Credits - Core	
Tri 3			

Level four options:
Student Initiated Module (SIM4)
Computing Maths
Network Technologies
Digital Media principles
Web Technologies
CCNA R&S - Routing and Switching Essentials
CCNA R&S Introduction to Networks
Intro to JavaScript programming and DOM scripting
IT Business Graphics
IT for Information Analysis

Level five options:
Student Initiated Module (SIM5)

Internet & Mobile App Development
Data Communications and Networks
CCNA Routing and Switching: Connecting Networks
CCNA R&S Scaling Networks
Databases and Web-based Information Systems
Agile Application Development
Database Administration and Optimisation

Intended learning outcomes of the programme

The following additional outcomes are fully compatible with the benchmark statements of Computing and are met through the overall design and selection of modules.

In addition to the generic programme learning outcomes identified earlier, graduates of the BSc (Hons) Artificial Intelligence programme will also be able to demonstrate the following:

C. Subject specific skills	
C3	Students are required to develop technical skills. This involves the students engaging in practical and project work throughout the course. This work is actively integrated to ensure that students relate theory and analysis to the application, selection, improvement, design and test of intelligent algorithms.

C. Subject specific skills

		Level 4 Cert He	Level 5 Dip He	Level 6 Degree	Level 6 Honours Degree
C3	Students are required to develop technical skills. This involves the students engaging in practical and project work throughout the course. This work is actively integrated to ensure that students relate theory and analysis to the application, selection, improvement, design and test of intelligent algorithms	On successful completion of this stage, the student will be able to: Demonstrates basic skills that underpin good practice in the field of computers and computational methods, e.g. laboratory tasks involving the creation of simple programs and the use of operating systems. Demonstrates skills in IT (e.g. word processing, spreadsheets) and web techniques (e.g. web searching). Demonstrate an understanding of hardware issues, including interfacing and data communications, and their impact on the overall design and performance of computer based systems. Undertake the conceptual design of a database system using an established data modelling technique and	Students will deepen their knowledge of programming concepts and approaches for complex problems. At this level, students will also be introduced to professional, legal and ethical issues relevant to the computing and IT industry. On successful completion of this level, the student will be able to: Basically understand and proficiently apply several existing artificial intelligence techniques for learning and optimisation targeting at real-world problems. Design and implement object oriented software for interactive systems that require a windows or web-based graphical user interface. Co-operate in an effective manner with colleagues and other professionals through the development	Students will learn key skills related to data mining and optimization, as well as cooperation, organisation, communication, negotiation and teamwork. On successful completion of this stage, the student will be able to: Design and implement evolutionary computation and data mining methods. Utilise a range of tools and techniques to develop intelligent tools for effective real-world complex problem solving.	Students will achieve effective use of investigative and design strategies, and the integration of these strategies with other tools and methodologies. These skills will be particularly demonstrated in the students' management of an individual project. The final year practical and project work will require the type of evaluation of technical and non-technical factors and the management of methodologies and progress which IT professionals exercise early in their careers. On successful completion of this stage, the student will be able to: Analyse and critically appraise current and emerging technologies.

		demonstrate critical judgement in selecting a proprietary database management system for any given application. Apply object oriented software development methods and make an informed selection of algorithms and/or data representatives for solving a range of standard problems. Demonstrate an understanding of computational complexity and fundamental computational mathematics	of interpersonal and communication skills, within in a project and business context. Display knowledge and understanding of programming and professional issues.		Propose, plan, undertake and report a self-directed individual programme of investigation, design and implementation which will enable the effective use of self-directed investigative, design and other technical skills to be demonstrated through the management of an artificial Intelligence project. Demonstrate knowledge and understanding of project management techniques Assume an active role in the planning and design of an intelligent tool, both as an individual and as an effective member of a project team.

CURRICULUM MATRIX (Artificial Intelligence) demonstrating how the overall programme outcomes are achieved and where skills are developed and assessed within individual modules.

			Knowledge and understanding, intellectual skills, subject skills, and practical, professional and employability skills																	
	Module Title	Core/ Opt	**A1**	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**C1**	**C2**	**C3**	**D1**	**D2**	**D3**	**D4**	**D5**	**D6**
L4	Professional Development in Computing: Information Engineering	C				X			X			X				X			X	X	X
	Problem Solving with Programming	C	X	X	X			X	X	X					X		X		X		X
	Computational Thinking	C	X					X	X						X	X	X		X	X	
	Managing Data	C	X	X	X			X	X	X	X					X	X		X		
	Computer Systems	C	X		X	X		X	X		X	X				X	X		X	X	
	SIM4	O																			
	Module Title	Core/ Opt	**A1**	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**C1**	**C2**	**C3**	**D1**	**D2**	**D3**	**D4**	**D5**	**D6**
L5	Group Project Design	C	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Group Project Implementation	C	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Artificial Intelligence	C	X	X			X	X	X	X		X		X	X	X	X	X	X	X	
	Responsible Computing	C	X	X	X	X	X	X	X			X	X		X	X			X	X	X
	Applied Programming	C	X	X	X			X	X	X	X				X	X	X		X	X	
	SIM5	O																			

	Module Title	Core/ Opt	**A1**	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**C1**	**C2**	**C3**	**D1**	**D2**	**D3**	**D4**	**D5**	**D6**
L6	IT Project Management	C	X	X	X	X		X	X	X	X	X	X		X	X	X	X	X	X	X
	Applied Data Mining	C	X	X			X	X	X	X		X	X	X	X	X	X	X	X	X	
	Computability and Optimisation	C	X	X			X	X	X	X	X		X	X	X	X	X		X		X
	21st Century Computing	C	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Project	C	X	X	X	X		X	X	X	X	X	X		X	X	X	X	X	X	X

BSc (HONOURS) COMPUTING PHILOSOPHY

Distinctive features of the programme

There are many employment opportunities for graduates that have a wide understanding of technology and we have developed a suite of exciting new degrees with this in mind. Students taking Computing Philosophy will study the technology we use today and could use in the future while considering social, legal, ethical and environmental issues.

Throughout the programme, students will develop the ability to question, critically analyse, and debate the issues of current and future technologies.

What exactly is computation? Is a computer just an electronic brain or is there a fundamental difference? Is there a difference between the ways in which a computer and a human solve problems? What is intelligence? Is machine intelligence different to human intelligence? Are there limits to what computers can and can't do? Are some problems harder than others? What does the future of Computing look like? How does computing relate to the rest of technology? Can computers continue to get smaller, faster and more powerful or is there some natural limit? What are the social, legal, ethical and environmental impacts of technological development? Will quantum computing, biological computing or optical computing take over from conventional electronic computing? Will we reach a point at which computers and robots are better and more powerful than humans? What will happen then? These are some of the deep and complex issues to be considered by this fascinating course on the philosophy of computing.

The course looks at the origins of computers and their development to the present time. Consideration is given to ongoing, and often undecided, problems in computing theory and the limits of computers, including the relationship between humans and computers and the relationship between human intelligence and computational intelligence. The focus will be just as much on social impact of the technology as the technology itself. Much of the course will be spent looking to the future and trying to establish how the subsequent generations of computers will appear and interact with us. The course is extremely multidisciplinary, including elements of computing, computing science, mathematics, physics, engineering, sociology, theology, law, psychology and philosophy.

There is a diverse range of opportunities available to graduates from this course, including: optimisation engineer, data engineer, business intelligence developer, data analyst, research engineer, data scientist, intelligent systems developer, data miner, design engineer, software engineer, research officer, and many others. The degree may also lead to further study at MSc and PhD levels.

Key facts:

- Opportunities for work experience relevant to your degree
- Developed in accordance with British Computer Society accreditation criteria (proposal for accreditation to be submitted in the near future)
- Research active department in Future and Emerging Technologies. The department has been successful in achieving funding for developing a range of intelligent kitchen appliances for use by elderly or disabled people and continues to develop research projects
- Our lecturers are part of the Creative and Applied Research Centre for Digital Society (CARDS) which brings together expertise in both the creative and applied elements of the University's digital society research

- Newly refurbished IT labs
- Host of biennial internet research conference attracting delegates from across the world

The programme aims are to:

- Provide students with the wider philosophical knowledge and skills required to pursue a career in the computing industry
- Explore the impact of ethical and social challenges of Artificial Intelligence, Singularity and Futurology
- Develop the students' critical, analytical and problem solving skills in relation to the current and future computing issues
- Stimulate an enquiring, analytical, and creative approach to systems development that will encourage independent judgement and critical awareness
- Develop the students' skills in learning that will underpin their ability to ensure that their skills can kept up-to-date in a fast changing discipline and that they appreciate the need for continuing professional development
- Provide students with practical and transferable skills, such as oral and written communication, time management and group working, to assist them in subsequent employment or further study.

Programme structure

(BSc (Hons) Computing Philosophy)

Year 1 Full Time structure (Level 4)

Tri 1	Professional Development in Computing: Information Engineering 20 Credits - Core	Problem - solving Programming 20 Credits - Core	Managing Data 20 Credits - Core	Computer Systems 20 Credits - Core
Tri 2			Computational Thinking 20 Credits - Core	Option 20 credits
Tri 3				

Year 2 Full Time structure (Level 5)

Tri 1	Group Project Design 20 Credits - Core	Human Computer Relationships 20 Credits - Core	Artificial Intelligence 20 Credits - Core
Tri 2	Group Project Implementation 20 Credits - Core	Responsible Computing 20 Credits - Core	Option 20 credits
Tri 3			

Year 3 Full Time structure (Level 6)

Tri 1	IT Project Management 20 Credits - Core	Singularities and Society 20 Credits - Core	Computability and Optimisation 20 Credits - Core
Tri 2	21st Century Computing 20 Credits - Core	Project 40 Credits - Core	
Tri 3			

Level four options:
Student Initiated Module (SIM4)
Computing Maths
Network Technologies
Digital Media principles
Web Technologies
CCNA R&S - Routing and Switching Essentials
CCNA R&S Introduction to Networks
Intro to JavaScript programming and DOM scripting
IT Business Graphics
IT for Information Analysis

Level five options:
Student Initiated Module (SIM5)
Applied Programming
Internet & Mobile App Development
Data Communications and Networks
Human Computer Relationships
Server Technology
CCNA Routing and Switching: Connecting Networks
CCNA R&S Scaling Networks
Databases and Web-based Information Systems
Agile Application Development
Database Administration and Optimisation

Intended learning outcomes of the programme

The following additional outcomes are fully compatible with the benchmark statements of Computing and are met through the overall design and selection of modules.

In addition to the generic programme learning outcomes identified earlier, graduates of the BSc (Hons) Computing Philosophy programme will also be able to demonstrate the following:

C. Subject specific skills	
C3	Students are required to develop analytical and technical skills. This involves the students engaging in seminars, practical and project work throughout the course. This work is actively integrated to ensure that students relate theory and analysis to the design, operation and maintenance of future computing systems.

C. Subject specific skills

		Level 4 Cert He	Level 5 Dip He	Level 6 Degree	Level 6 Honours Degree
C3	Students are required to develop analytical and technical skills. This involves the students engaging in practical and project work throughout the course. This work is actively integrated to ensure that students relate theory and analysis to the design, operation and maintenance of present and future computer systems.	On successful completion of this stage, the student will be able to: Demonstrate basic skills that underpin good practice in the field of computers and computational methods, e.g. laboratory tasks involving the creation of simple programs and the use of operating systems. Demonstrates skills in IT (e.g. word processing, spreadsheets) and web techniques (e.g. web searching). Demonstrate an understanding of hardware issues, including interfacing and data communications, and their impact on the overall design and performance of computer based systems. Undertake the conceptual design of a database system using an established data modelling technique and	Students will deepen their knowledge and understanding of computing concepts and approaches for complex problems. At this level, students will also be introduced to professional, legal, ethical and environmental issues relevant to the computing and IT industry. On successful completion of this level, the student will be able to: Appreciate and evaluate the philosophical issues of human-computer relationships. Demonstrate relevant skills to recognise specific problems that can be addressed using appropriate AI techniques. Design and implement object oriented software for interactive systems that require a windows or web-based graphical user interface.	Students will learn key skills of cooperation, organisation, communication, negotiation and teamwork. On successful completion of this stage, the student will be able to: Analyse and discuss the social impact of technology as well as the technology itself. Appreciate fundamental concepts and key techniques in computational complexity and evolutionary computation. Demonstrate a responsible self-critical and reflective approach to problem-solving and decision-making in a professional computing context. Utilise a range of tools and techniques to develop intelligent tools for effective real-world complex problem solving.	Students will achieve effective use of investigative and design strategies, and the integration of these strategies with other tools and methodologies. These skills will be particularly demonstrated in the students' management of an individual project. The final year practical and project work will require the type of evaluation of technical and non-technical factors and the management of methodologies and progress which IT professionals exercise early in their careers. On successful completion of this stage, the student will be able to: Critique and debate the relationship between human intelligence and computational intelligence.

		demonstrate critical judgement in selecting a proprietary database management system for any given application. Apply object oriented software development methods and make an informed selection of algorithms and/or data representatives for solving a range of standard problems. Demonstrate an understanding of computational complexity and fundamental computational mathematics	Co-operate in an effective manner with colleagues and other professionals through the development of interpersonal and communication skills, within in a project and business context. Display knowledge and understanding of programming and professional issues.		Analyse and critically appraise current and emerging technologies. Propose, plan, undertake and report a self-directed individual programme of investigation, design and implementation which will enable the effective use of self-directed investigative, design and other technical skills to be demonstrated through the management of an individual AI computing project. Demonstrate knowledge and understanding of IT project management techniques Assume an active role in the planning and design of an intelligent tool, both as an individual and as an effective member of a project team.

CURRICULUM MATRIX (Computing Philosophy) demonstrating how the overall programme outcomes are achieved and where skills are developed and assessed within individual modules.

			Knowledge and understanding, intellectual skills, subject skills, and practical, professional and employability skills																	
	Module Title	Core/ Opt	**A1**	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**C1**	**C2**	**C3**	**D1**	**D2**	**D3**	**D4**	**D5**	**D6**
L4	Professional Development in Computing: Information Engineering	C				X			X			X				X			X	X	X
	Problem Solving with Programming	C	X	X	X			X	X	X					X		X		X		X
	Computational Thinking	C	X					X	X						X	X	X		X	X	
	Managing Data	C	X	X	X			X	X	X	X					X	X		X		
	Computer Systems	C	X		X	X		X	X		X	X				X	X		X	X	
	SIM4	O																			
	Module Title	Core/ Opt	**A1**	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**C1**	**C2**	**C3**	**D1**	**D2**	**D3**	**D4**	**D5**	**D6**
L5	Group Project Design	C	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Group Project Implementation	C	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Human Computer Relationships	C	X	X		X		X	X	X	X		X		X	X			X	X	
	Responsible Computing	C	X	X	X	X	X	X	X			X	X		X	X			X	X	X
	Artificial Intelligence	C	X	X				X	X	X			X		X	X	X		X	X	
	SIM5	O																			

	Module Title	Core/ Opt	**A1**	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**C1**	**C2**	**C3**	**D1**	**D2**	**D3**	**D4**	**D5**	**D6**
L6	IT Project Management	C	X	X	X	X		X	X	X	X	X	X		X	X	X	X	X	X	X
	Singularities and Society	C	X	X	X	X		X	X			X	X		X	X	X	X	X	X	X
	Computability and Optimisation	C	X	X			X	X	X	X	X		X	X	X	X	X		X		X
	21st Century Computing	C	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Project	C	X	X	X	X		X	X	X	X	X	X		X	X	X	X	X	X	X

BSc (HONOURS) COMPUTER SCIENCE

Distinctive features of the programme

The demand for graduates with the knowledge, understanding and skills required to analyse, design, develop, test and maintain modern computer systems is high. Organisations rely on the use of computers for information processing and problem solving so the industry requires specialists to create, understand and further advance computer science. This degree will look at the computer science at the core of the underlying technologies that are increasingly infiltrating every element of our society.

This degree aims to equip you with the knowledge and skills required to work as professional engineer and / or consultant in the design, configuration and management of computer systems. The main focus is on the more technical aspects and underlying principles of computer systems. The course will enable you to develop both analytical and design skills across the range of subjects. As well as gaining and developing a wide range of computer science knowledge and skills, the course will cover issues of professionalism and ethics. This is achieved through theoretical studies alongside practical design projects, laboratory activities and group project work. You will also become conversant with industrial practice and familiar with software to analyse and simulate computer systems.

This degree has been designed to develop practical and applied skills and to provide the practical experience needed to apply these skills effectively. To this end, you will have the opportunity of working on a live group based project during your second year where you will apply your academic knowledge and interpersonal skills in a real-world environment. The group work places emphasis on teamwork, which will be a major factor in students' subsequent careers.

The course presents opportunities designed to enhance your employment prospects. The technical content is regularly reviewed and updated to reflect industry demand. Extensive, hands on experience in essential areas such as computer systems architecture and computational thinking is a key part of the learning process. In addition, the course covers practical skills in a variety of modern programming languages, project management, artificial intelligence, data modelling and software development. You will also develop the graduate skills that industry regularly asks for through the Responsible Computing module that looks at standards, ethics and the way professionals work. The course culminates in an individual project which allows students to bring together many strands of their course

Key facts:

- Developed in accordance with British Computer Society accreditation criteria (proposal for accreditation to be submitted in the near future)
- Research active department in Future and Emerging Technologies. The department has been successful in achieving funding for developing a range of intelligent kitchen appliances for use by elderly or disabled people and continues to develop research projects
- Our lecturers are part of the Creative and Applied Research Centre for Digital Society (CARDS) which brings together expertise in both the creative and applied elements of the University's digital society research
- Newly refurbished IT labs
- Host of biennial internet research conference attracting delegates from across the world

The programme is practical in nature and its general aims are to:

- Provide students with the knowledge and skills required to pursue a career in the development of computer systems
- Provide students with the ability to apply professional standards to the analysis, design, testing, evaluation and modification of reliable and maintainable software
- Develop the students' critical, analytical and problem solving skills in relation to issues in the field of computer science.
- Stimulate an enquiring, analytical, and scientific approach to computer systems development that will encourage independent judgement and critical awareness
- Develop the students' skills in learning that will underpin their ability to ensure that their technical skills can kept up-to-date in a fast changing discipline and that they appreciate the need for continuing professional development
- Provide students with practical and transferable skills, such as oral and written communication, time management and group working, to assist them in subsequent employment or further study.

Programme structure

(BSc (Hons) Computer Science)

Year 1 Full Time structure (Level 4)

Tri 1	Professional Development 20 Credits - Core	Problem - solving Programming 20 Credits - Core	Managing Data 20 Credits - Core	Computer Systems 20 Credits - Core
Tri 2			Computational Thinking 20 Credits - Core	Option 20 credits
Tri 3				

Year 2 Full Time structure (Level 5)

Tri 1	Group Project Design 20 Credits - Core	Artificial Intelligence 20 Credits - Core	Option 20 credits
Tri 2	Group Project Implementation 20 Credits - Core	Responsible Computing 20 Credits - Core	Applied Programming 20 Credits – Core
Tri 3			

Year 3 Full Time structure (Level 6)

Tri 1	Project Management 20 Credits - Option	Singularities and Society 20 Credits - Core	Distributed Data 20 Credits - Core
Tri 2	21st Century Computing 20 Credits - Core	Project 40 Credits - Core	
Tri 3			

Level four options:
Student Initiated Module (SIM4)
Computing Maths
Network Technologies
Digital Media principles
Web Technologies
CCNA R&S - Routing and Switching Essentials
CCNA R&S Introduction to Networks
Intro to JavaScript programming and DOM scripting
IT Business Graphics
IT for Information Analysis

Level five options:
Student Initiated Module (SIM5)
Human Computer Relationships
Internet & Mobile App Development
Data Communications and Networks
CCNA Routing and Switching: Connecting Networks
CCNA R&S Scaling Networks
Databases and Web-based Information Systems
Agile Application Development
Database Administration and Optimisation

Intended learning outcomes of the programme

The following additional outcomes are fully compatible with the benchmark statements of Computing and are met through the overall design and selection of modules.

In addition to the generic programme learning outcomes identified earlier, graduates of the BSc (Hons) Computer Science programme will also be able to demonstrate the following:

C. Subject specific skills	
C3	Students are required to develop technical skills. This involves the students engaging in practical and project work throughout the course. This work is actively integrated to ensure that students relate theory and analysis to the design, operation and maintenance of computer systems.

C. Subject specific skills

		Level 4 Cert He	Level 5 Dip He	Level 6 Degree	Level 6 Honours Degree
C3	Students are required to develop technical skills. This involves the students engaging in practical and project work throughout the course. This work is actively integrated to ensure that students relate theory and analysis to the design, development and maintenance of computer systems.	On successful completion of this stage, the student will be able to: Demonstrates basic skills that underpin good practice in the field of computers and computational methods, e.g. laboratory tasks involving the creation of simple programs and the use of operating systems. Demonstrates skills in IT (e.g. word processing, spreadsheets) and web techniques (e.g. web searching). Demonstrate an understanding of hardware issues, including interfacing and data communications, and their impact on the overall design and performance of computer based systems. Undertake the conceptual design of a database system using an established data modelling technique and	Students will deepen their knowledge of programming concepts and approaches for complex problems. At this level, students will also be introduced to professional, legal and ethical issues relevant to the computing and IT industry. On successful completion of this level, the student will be able to: Basically understand and proficiently apply several existing artificial intelligence techniques for learning and optimisation targeting at real-world problems. Design and implement object oriented software for interactive systems that require a windows or web-based graphical user interface. Co-operate in an effective manner with colleagues and other professionals through the development	Students will learn key analysis skills related to social consequences of technology, including ethical, legal, sustainability and environmental issues of current and future technologies. Students will also learn about established and upcoming database technology. On Successful completion of this level, students will be able to: Analyse the impact of current and future computing technology on society, taking into account the ethical dilemmas that such technology may bring. Critically assess some of the more advanced developments in database technology, including but not limited to: distributed databases, multidimensional databases, mobile databases.	Students will achieve effective use of investigative and design strategies, and the integration of these strategies with other tools and methodologies. These skills will be particularly demonstrated in the students' management of an individual project. The final year practical and project work will require the type of evaluation of technical and non-technical factors and the management of methodologies and progress which IT professionals exercise early in their careers. On successful completion of this stage, the student will be able to: Analyse and critically appraise current and emerging technologies, taking into account its impact on society.

		demonstrate critical judgement in selecting a proprietary database management system for any given application. Apply object oriented software development methods and make an informed selection of algorithms and/or data representatives for solving a range of standard problems. Demonstrate an understanding of computational complexity and fundamental computational mathematics	of interpersonal and communication skills, within in a project and business context. Display knowledge and understanding of programming and professional issues.	Evaluate the current issues associated with theory to practical implementations in database research. Explore advanced aspects of data warehousing, distributed data, data intensive computing, remote access and personalised data; encompassing the principles, research results and commercial application of the technologies. Critically evaluate the adoption/use of data warehouse systems and business intelligence practices for achieving organisational benefits.	Propose, plan, undertake and report a self-directed individual programme of investigation, design and implementation which will enable the effective use of self-directed investigative, design and other technical skills to be demonstrated through the management of an individual computing project. Demonstrate knowledge and understanding of project management techniques Assume an active role in the planning and design of an intelligent tool, both as an individual and as an effective member of a project team.

CURRICULUM MATRIX (Computer Science) demonstrating how the overall programme outcomes are achieved and where skills are developed and assessed within individual modules.

			Knowledge and understanding, intellectual skills, subject skills, and practical, professional and employability skills																	
	Module Title	Core/ Opt	**A1**	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**C1**	**C2**	**C3**	**D1**	**D2**	**D3**	**D4**	**D5**	**D6**
L4	Professional Development	C				X			X			X				X			X	X	X
	Problem Solving with Programming	C	X	X	X			X	X	X					X		X		X		X
	Computational Thinking	C	X					X	X						X	X	X		X	X	
	Managing Data	C	X	X	X			X	X	X	X					X	X		X		
	Computer Systems	C	X		X	X		X	X		X	X				X	X		X	X	
	SIM4	O																			
	Module Title	Core/ Opt	**A1**	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**C1**	**C2**	**C3**	**D1**	**D2**	**D3**	**D4**	**D5**	**D6**
L5	Group Project Design	C	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Group Project Implementation	C	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Artificial Intelligence	C	X	X				X	X	X			X		X	X	X		X	X	
	Responsible Computing	C	X	X	X	X	X	X	X			X	X		X	X			X	X	X
	Applied Programming	C	X	X	X			X	X	X	X				X	X	X		X	X	
	SIM5	O																			

	Module Title	Core/ Opt	**A1**	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**C1**	**C2**	**C3**	**D1**	**D2**	**D3**	**D4**	**D5**	**D6**
L6	IT Project Management	C	X	X	X	X		X	X	X	X	X	X		X	X	X	X	X	X	X
	Singularities and Society	C	X	X	X	X		X	X			X	X		X	X	X	X	X	X	X
	Distributed Data	C	X	X	X	X		X	X	X	X	X	X		X	X	X	X	X	X	X
	21st Century Computing	C	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Project	C	X	X	X	X		X	X	X	X	X	X		X	X	X	X	X	X	X