University of the
West of England
BRISTOL

PROGRAMME SPECIFICATION

Part 1: Information	
Awarding Institution	University of the West of England
Teaching Institution	University Centre Weston
Delivery Location	University Centre Weston – Winter Gardens Complex
Study abroad / Exchange / Credit recognition	n/a
Faculty responsible for programme	Faculty of Environment and Technology
Department responsible for programme	Computer Science and Creative Technologies
Professional Statutory or Regulatory Body Links	A Tech Partnership Accredited, Tech Industry Gold Degree Apprenticeship Programme
Highest Award Title	BSc(Hons) Digital & Technology Solutions (Software Engineer) BSc(Hons) Digital & Technology Solutions (Business Analyst) BSc(Hons) Digital & Technology Solutions (Data Analyst) BSc(Hons) Digital & Technology Solutions (Cyber Security Analyst)
Default Award Title	n/a
Interim Award Titles	BSc Digital & Technology Solutions Dip HE Digital & Technology Solutions Cert HE Digital & Technology Solutions
UWE Progression Route	n/a
Mode of Delivery	Part time
ISIS code/s	I990
For implementation from	Sept 2017

Part 2: Description

This programme represents an extension of the department's long-standing and close-working relationship with the [Tech Partnership](#) (formerly e-skills UK; the Sector Skills Council for IT & Telecoms).

UWE is one of twenty regionally based, universities accredited by the Tech Partnership to deliver either the BSc (Hons) Information Technology Management for Business (ITMB) or the BSc (Hons) Software Development for Business 'Tech Gold' degree programmes. UWE is one of the few universities that is accredited to deliver both.

The Digital & Technology Solutions Degree Apprenticeship provides a comprehensive programme of flexible learning to Honours degree level and was created through a collaboration between the Tech Partnership, employers and the participating Universities (including UWE). The degree apprenticeship is outcomes focused and will be delivered and assessed as a four-year integrated programme. It is centred on an employer defined specification (including the apprenticeship standard), but can be augmented to meet the needs of individual employers. The apprenticeship aims to grow practical technology skills and occupational competence developed in the employer context together with the project, interpersonal and business skills required to operate successfully as a Digital & Technology Solutions Professional.

To be accredited by the Tech Partnership as a Tech Industry Gold Degree Apprenticeship the university has to meet all of the criteria set out by the Tech Partnership. This includes the delivery of the skills, knowledge and behaviours set out in the occupational standard and specific requirements with regard to the way the programme is delivered and assessed.

The learning for the programme is centred on a real job within business that extends the learning beyond the classroom and into the workplace. The aim is to integrate academic learning at degree level and on-the-job practical training to provide a holistic programme of education and training to meet the skills needs of employers now and in the future. The degree apprenticeship programme will develop Digital & Technology Solutions Professional practice contextualised in the workplace using industry standard technologies and approaches.

The programme aims to challenge students in their ways of thinking, behaving and learning, including the consideration of ethics & ethical decision making, sustainability and global citizenship.

The current occupational standard concentrates on six key role areas. Any emerging roles will be added to the specification as employer workforce requirements evolve.

The current role areas covered by the occupational standard are:

- Software Engineer
- IT Consultant
- Business Analyst
- Cyber Security Analyst
- Data Analyst
- Network Engineer

The programme covers the Software Engineer, Business Analyst, Data Analyst and Cyber Security Analyst specialisms.

Programme requirements for the purposes of the Higher Education Achievement Record (HEAR)

Employer-designed and Tech Partnership accredited, this fully integrated Degree Apprenticeship programme provides graduates with the skills and capabilities required by UK business for the specification, design, delivery and operation of ICT systems, services and solutions in a range of business contexts and application domains.

It develops technically competent individuals who think and communicate effectively and who can conduct inquiry, solve problems, undertake critical analysis and deliver effective software systems solutions in a

Part 2: Description
constantly changing business context. It provides a solid foundation for lifelong learning, emphasising the development of knowledge, skills and professional values essential to the practice of systems development.
Regulations
Delete one of the following statements as appropriate A: Approved to University Regulations and Procedures

Part 3: Learning Outcomes of the Programme

The overarching aim of the programme is to produce self-aware, socially responsible, graduate Digital & Technology Solutions professionals, specifically prepared to respond to the challenges of the business world and capable of making a real and valuable contribution to their employer from the start of their employment.

Graduates will be technically competent individuals who think and communicate effectively and who can conduct inquiry, solve problems, undertake critical analysis and deliver effective software systems solutions in a constantly changing business context. Their programme of study will provide a solid foundation for lifelong learning, emphasising the development of knowledge, skills and professional values essential to the practice of systems development.

By the end of the programme, students will be able to demonstrate a sound and systematic understanding of the main areas of the body of knowledge within their programme of study, together with an ability to exercise critical judgement, especially in its application to real world contexts.

It will equip degree apprentices with key skills and knowledge so as to:

- demonstrate a broad understanding of business operations, procedures and culture, as applicable to a career in a Digital and Technology Solutions environment;
- recognize and appreciate the nature, role and importance of Digital and Technology Solutions within business organisations including the importance of social responsibility, security and sustainability;
- demonstrate a critical understanding of the theoretical, conceptual and practical issues central to the practice of developing, implementing and maintaining Digital and Technology Solutions;
- apply critical analysis and logical reasoning to the theoretical, conceptual and practical issues central to developing technology solutions
- select and employ appropriate technologies, tools, techniques and methods for understanding, developing, deploying and operating Digital and Technology Solutions in business contexts;
- demonstrate deep knowledge and practical skills in a chosen area of occupational competence so as to enable the analysis of problems and the application of knowledge and understanding in the work environment so as to be able to play a central role in Digital and Technology Solutions projects;
- exercise the personal and inter-personal skills required to work closely and communicate with others in all aspects of Digital and Technology Solutions and to transfer knowledge and understanding to others;
- confidently and critically apply a broad set of problem-solving and modelling skills appropriate to business systems development and operations;
- exercise and continually develop the critical, evaluative team working and problem-solving abilities that will be valuable to them throughout their career;
- become independent, lifelong learners.

Part 3: Learning Outcomes of the Programme

The learning and skills outcomes for the degree are defined in the Degree Apprenticeship standard as part of a common core (in order to meet endorsement requirements this must account for roughly 60% of the programme) and as required for each of the named occupational pathways (roughly 40% of the programme).

The core knowledge and skills delivered by the core broadly covers:

- A good basic understanding of the underlying principles of systems and the systems lifecycle, programming and computation, including the application of methods tools and techniques to problem solving and the use of notations and modelling techniques to address the complexity of systems and the interactions between people and programmed systems.
- Knowledge and understanding of the essential facts, theories and principles relevant to the engineering of technology solutions including information systems, systems development, programming, data management, cyber security, IT project management, and network design and management.
- An appreciation of the context within which technology solutions are deployed including the structure, nature and operation of business, business information systems and application contexts, the need to meet business requirements and recognising and working within practical constraints.
- The ability to utilise a given set of methodologies and tools for the specification, design, development, testing, implementation, support and critical evaluation of digital and technology systems and solutions.
- An understanding of the political, economic social legal, ethical, professional and environmental issues relating to information systems practice.

Additionally for the Software Engineering specialist award

- In-depth knowledge and understanding of the engineering principles behind all stages of the software development process including requirements, analysis, design, development, and the provision of security robustness and the ability to design, build and test high-quality software solutions

Additionally for the Cyber Security Analyst specialist award

- In-depth knowledge and understanding of network infrastructure, software and data, threats, risks and vulnerabilities, controls and responses and the ability to specify, implement, maintain and support security controls and responses across the organisation and its systems, with an appreciation of current legislative requirements.

Additionally for the Data Analyst specialist award

- In-depth knowledge and understanding of data structures, software development procedures, and a range of analytic tools for standard and custom studies. and the ability to manage, cleanse, abstract and aggregate data across the network infrastructure, document and report the results of data analysis activities and make recommendations to improve business performance

Additionally for the Business Analyst specialist award

- In-depth knowledge and understanding of the models tools and techniques of business analysis, requirements elicitation, requirements engineering and systems specification and the ability to act as a liaison among stakeholders in order to understand the structure, policies, systems and operations

Part 3: Learning Outcomes of the Programme

of an organization, and to recommend solutions that enable the organization to improve its performance and achieve its goals.

The Learning and skills outcomes defined in the standard

A degree apprentice who successfully completes the programme in Digital & Technology Solutions is able to demonstrate competence in the following core topics:

Topic	Description of Topic
1	Foundations of Information Technology Systems
2	Systems Development Fundamentals
3	Data Fundamentals
4	Information and Cyber Security Fundamentals
5	Business Organisation Fundamentals
6	IT Project Management Fundamentals
7	Computer Systems and Network Fundamentals
8	Interpersonal and Foundation Skills Fundamentals

Part 3: Learning Outcomes of the Programme

Core skills:

C 1. Information Systems: is able to critically analyse a business domain in order to identify the role of information systems, highlight issues and identify opportunities for improvement through evaluating information systems in relation to their intended purpose and effectiveness.

C 2. Systems Development: analyses business and technical requirements to select and specify appropriate technology solutions. Designs, implements, tests, and debugs software to meet requirements using contemporary methods including agile development. Manages the development and assurance of software artefacts applying secure development practises to ensure system resilience. Configures and deploys solutions to end users.

C 3. Data: identifies organisational information requirements and can model data solutions using conceptual data modelling techniques. Is able to implement a database solution using an industry standard database management system (DBMS). Can perform database administration tasks and is cognisant of the key concepts of data quality and data security. Is able to manage data effectively and undertake data analysis.

C 4. Cyber Security: can undertake a security risk assessment for a simple IT system and propose resolution advice. Can identify, analyse and evaluate security threats and hazards to planned and installed information systems or services (e.g. Cloud services).

C 5. Business Organisation: can apply organisational theory, change management, marketing, strategic practice, human resource management and IT service management to technology solutions development. Develops well-reasoned investment proposals and provides business insights.

C 6. IT Project Management: follows a systematic methodology for initiating, planning, executing, controlling, and closing technology solutions projects. Applies industry standard processes, methods, techniques and tools to execute projects. Is able to manage a project (typically less than six months, no inter-dependency with other projects and no strategic impact) including identifying and resolving deviations and the management of problems and escalation processes.

C 7. Computer and Network Infrastructure: can plan, design and manage computer networks with an overall focus on the services and capabilities that network infrastructure solutions enable in an organisational context. Identifies network security risks and their resolution.

Core Technical Knowledge:

Knows and understands:

C 8. How business exploits technology solutions for competitive advantage.

C 9. The value of technology investments and how to formulate a business case for a new technology solution, including estimation of both costs and benefits.

C 10. Contemporary techniques for design, developing, testing, correcting, deploying and documenting software systems from specifications, using agreed standards and tools.

C 11. How teams work effectively to produce technology solutions.

C 12. The role of data management systems in managing organisational data and information.

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C 13. Common vulnerabilities in computer networks including unsecure coding and unprotected networks.

C 14. The various roles, functions and activities related to technology solutions within an organisation.

C 15. How strategic decisions are made concerning acquiring technology solutions resources and capabilities including the ability to evaluate the different sourcing options.

C 16. How to deliver a technology solutions project accurately consistent with business needs.

C 17. The issues of quality, cost and time for projects, including contractual obligations and resource constraints.

Core Behaviours:

Professional, interpersonal and business skills

C 18. Fluent in written communications and able to articulate complex issues.

C 19. Makes concise, engaging and well-structured verbal presentations, arguments and explanations.

C 20. Able to deal with different, competing interests within and outside the organisation with excellent negotiation skills.

C 21. Is able to identify the preferences, motivations, strengths and limitations of other people and apply these insights to work more effectively with and to motivate others.

C 22. Competent in active listening and in leading, influencing and persuading others.

C 23. Able to give and receive feedback constructively and incorporate it into his/her own development and life-long learning.

C 24. Applies analytical and critical thinking skills to Technology Solutions development and to systematically analyse and apply structured problem solving techniques to complex systems and situations.

C 25. Able to put forward, demonstrate value and gain commitment to a moderately complex technology-oriented solution, demonstrating understanding of business need, using open questions and summarising skills and basic negotiating skills.

Able to conduct effective research, using literature and other media, into IT and business related topics.

Attributes and behaviours

- Have demonstrated that they have mastered basic business disciplines, ethics and courtesies, demonstrating timeliness and focus when faced with distractions and the ability to complete tasks to a deadline with high quality.
- Flexible attitude.
- Ability to perform under pressure.
- A thorough approach to work.

Logical thinking and creative approach to problem solving.

Part 3: Learning Outcomes of the Programme

Detail level skills and learning outcomes

1.1 Foundations Information Systems

Information Systems: is able to critically analyse a business domain in order to identify the role of information systems, highlight issues and identify opportunities for improvement through evaluating information systems in relation to their intended purpose and effectiveness.

Overview:
The integrating theme of this topic is the focus on an organisation and the ways it can develop its capabilities using information technology.
Information systems are an integral part of all business activities. This topic is designed to introduce apprentices to contemporary information systems and demonstrate how these systems are used throughout organisations. The focus will be on the key components of information systems - people, software, hardware, data, and communication technologies, and how these components can be integrated and managed to create competitive advantage.
Apprentices will gain an understanding of how information is used in organisations and how IT enables improvement in quality, speed, and agility. This topic also provides an introduction to systems and development concepts, technology acquisition, and various types of application software that have become ubiquitous in modern organisations and society.

Skills:
  a. Critically analyse an business domain in order to identify the role of information systems and highlight issues

  b. Evaluate information systems in relation to their intended purpose with regard to their effectiveness

Knowledge and understanding:
  a. Explain why Information Technology is important to business and society,

  b. Understand how and why information systems are used today.

  c. Explain the technology, people, and organisational components of information systems.

  d. Understand the alignment between IT strategy and organisational strategy

  e. Understand globalisation and the role information systems has played in this evolution.

  f. Understand how businesses are using information systems for competitive advantage vs. competitive necessity.

  g. Understand the value of information systems investments as well as learn to formulate a business case for a new information system, including estimation of both costs and benefits.

  h. Identify the major components of an information systems infrastructure.

  i. Understand how information systems are enabling new forms of commerce between individuals and organisations.

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j.   Understand how information systems enable core and supportive business processes as well as those that interface with suppliers and customers.

k.   Appreciate how IS represents a key source of competitive advantage for firms.

l.   Understand existing and emerging information technologies, the functions of IS and its impact on the organisational operations.

m.   Be aware of emerging technologies that enable new forms of communication, collaboration, and partnering.

n.   Understand how various types of information systems provide the information needed to gain business intelligence to support the decision making for the different levels and functions of the organisation.

o.   Understand how enterprise systems foster stronger relationships with customers and suppliers and how these systems are widely used to enforce organisational structures and processes.

p.   Understand how organisations develop and acquire information systems and technologies.

q.   Understand how to secure information systems resources, focusing on both human and technological safeguards.

1.2 Systems Development Fundamentals

Systems Development: analyses business and technical requirements to select and specify appropriate technology solutions. Designs, implements, tests, and debugs software to meet requirements using contemporary methods including agile development. Manages the development and assurance of software artefacts applying secure development practises to ensure system resilience. Configures and deploys solutions to end users.

Overview:
The purpose of this topic is to introduce the apprentices to the fundamental concepts of systems development through programming, computational thinking and data structures. They will analyse models of application development so that they can understand the key processes related to building functioning applications and appreciate the complexity of application development.
Apprentices will learn the basic concepts of software design, data structures, programming, problem solving, programming logic, and fundamental software design techniques. This will include a review of traditional and contemporary software development methods including agile development. They will develop a holistic view of software engineering practice including gathering requirements, designing a solution, implementing a solution in a programming language, testing the completed application and deploying the solution to end users.

Skills:
a.   Analyse business and technical requirements and select appropriate solutions

b.   Design, implement, test, and debug software to meet a requirements specification

c.   Select the relevant paradigm (for example Object Oriented, Event Driven or Procedural) for a given set of business requirements

d.   Write good quality code (logic) with sound syntax in at least two languages with different paradigms (e.g. object-oriented Event Driven or Procedural

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programming*)*

e.   Develop moderately complex software solutions and software modifications to specified requirements

f.   Develop professional user interfaces for at least one channel

g.   Link software to databases to store and retrieve data

h.   Test code and analyse results to correct errors found using unit testing.

i.   Debug own code and understand structure of programmes in order to identify and resolve issues

j.   Identify and apply best practices and standards

k.   Create data models and software designs to effectively communicate understanding of the programme

l.   Create analysis artefacts, such as Use Cases and/or User Stories

m.   Build, manage and deploy software into enterprise environments

n.   Identify and implement plans for end user training and built in tool tips and help facilities

Knowledge and understanding:
a.   Understand basic programming concepts

b.   Understand programming principles including design, code, test, correct, deploy and document from supplied specifications, using agreed standards and tools

c.   Understand the stages of a software development lifecycle

d.   Understand the similarities and differences (taking into account positives and negatives of both approaches) between agile and waterfall software development methodologies

e.   understand both procedural and object-oriented *programming techniques*

f.   Be aware of the role and position of *legacy systems* in organisations and how new development environments interface and integrate with them.

g.   Understand how teams work effectively to produce software

h.   Understand software design approaches & patterns and can interpret and implement a given design (underpinning architecture how does everything fit together)

Part 3: Learning Outcomes of the Programme

1.3 Data Fundamentals

Data: identifies organisational information requirements and can model data solutions using conceptual data modelling techniques. Is able to implement a database solution using an industry standard database management system (DBMS). Can perform database administration tasks and is cognisant of the key concepts of data quality and data security. Is able to manage data effectively and undertake data analysis.

Overview:
This topic provides the apprentices with an introduction to the core concepts in data and information management. It is centred on the core skills of identifying organisational information requirements, modelling using conceptual data modelling techniques and converting the conceptual data models into relational data models. Then implementing and utilising a relational database using an industry standard database management system.
The topic will also include coverage of basic database administration tasks and key concepts of data quality and data security. In addition to developing database applications, the degree apprentice will understand how large-scale packaged systems are highly dependent on the use of database management systems.

Skills:
 a. Apply data analysis and data modelling techniques, to design data structures based on business requirements

 b. Use at least one conceptual data modelling technique (such as entity-relationship modelling) to capture the information requirements for an enterprise domain.

 c. Implement a database system using a mainstream database product such as Oracle or SQL.

 d. Translate object and data models into appropriate database schemas within design constraints

 e. Evaluate potential data solutions to meet requirements

 f. Design high-quality relational databases.

 g. Use the data definition, data manipulation, and data control language components of SQL in the context of one widely used implementation of the language.

 h. Perform simple database administration tasks.

Knowledge and understanding:
 a. Understand the role of databases and database management systems in managing organisational data and information.

 b. Understand the historical development of database management systems and logical data models.

 c. Understand the basics of how data is physically stored and accessed.

 d. Understand the fundamentals of the basic file organisation techniques.

 e. Understand the purpose and principles of normalizing a relational database structure.

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f.   Understand the concept of database transaction and apply it appropriately to an application context.

g.   Understand the basic mechanisms for accessing relational databases from various types of application development environments.

h.   Understand the role of databases and database management systems in the context of enterprise systems.

i.   Understand the key principles of data security and identify data security risk and violations in data management system design.

j.   Understand the core concepts of data quality and their application in an organisational context.

k.   Understand what is meant by data warehousing and data mining.

1.4 Information and Cyber Security Fundamentals

Cyber Security: can undertake a security risk assessment for a simple IT system and propose resolution advice. Can identify, analyse and evaluate security threats and hazards to planned and installed information systems or services (e.g. Cloud services).

Overview:
This topic provides apprentices with an introduction to the fundamental principles of Information Technology Security and Risk Management at the organisational level. They will learn critical information and cyber security principles and management. The apprentices will address the role of hardware, software, processes, communications, applications, people and policies and procedures with respect to organisational information security.

Skills:
a.   Undertake a security risk assessment for a simple system without direct supervision and propose basic remediation advice.

b.   Analyse and evaluate security threats and hazards to planned and installed information systems or services (e.g. Cloud services).

Knowledge and understanding:
a.   Explain how the concepts of threat, hazard and vulnerability relate to each other and lead to risk. Describe in simple terms what risk is and how risks are usually characterised (likelihood and impact) and illustrate by use of at least one commonly used tool (e.g. a risk register).

b.   Understand the inherent asymmetric nature of cyber security threats.

c.   Describe and characterise (in terms of capability, opportunity & motive) examples of threats and also describe some typical hazards that may concern an organisation. Relate these descriptions to example security objectives.

d.   Describe some common vulnerabilities in computer networks and systems (for example un-secure coding and unprotected networks) Assurance concepts: Explain the difference between 'trusted' and 'trustworthy' and explain what assurance is for in security. Describe the main approaches to assurance (intrinsic, extrinsic, design & implementation, operational policy & process) and give examples of how these might be applied at different stages in the lifecycle of a system.

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e.   Explain what penetration testing is and how it contributes to information assurance.

f.   Understand both technical and administrative mitigation approaches.

g.   Understand the need for a comprehensive security model and its implications for the security manager or Chief Security Officer (CSO).

1.5 Business Organisation Fundamentals

Business Organisation: can apply organisational theory, change management, marketing, strategic practice, human resource management and IT service management to technology solutions development. Develops well-reasoned investment proposals and provides business insights.

Overview:
Apprentices will develop knowledge in areas such as organisational theory, change management, marketing, strategic practice, human resource management, IT service management, and professional communications. The course will also build apprentices capacity to apply these skills in a professional setting. Apprentices will also prepare for multiple recognised industry certifications in a specific area of technology or management.
All Digital & Technology Solutions Professionals require an understanding of business functions, organisational structure and how to behave in a professional manner. They will need to understand the nature of business processes and how to develop Investment proposals. In addition they need to know how to exploit data to deliver improved business insights.

Skills:
  a.   Have demonstrated a mastery of *basic business functions, organisational structures and the impact of communication technology* in different sectors, including an international dimension, with a sound understanding of contemporary working practices and social media, covering work in the office, at home, on the move and in a virtual environment.

  b.   Have gained an appreciation of the strategic importance of *business processes* and demonstrated an ability to document and understand them.

  c.   Evaluate the issues and challenges associated with successfully and unsuccessfully incorporating IT into an organisation

  d.   Apply systems thinking, flow charting, type and frequency data analysis, modelling future flows to business scenarios

  e.   Gather, prioritise and document high quality business and technical requirements.

Knowledge and understanding:
  a.   Understand the various functions and activities within the information systems area, including the role of IT management and the CIO, structuring of IS management within an organisation, and managing IS professionals within the firm.

  b.   Understand how strategic decisions are made concerning acquiring IS resources and capabilities including the ability to evaluate the different sourcing options.

  c.   Understand the role of IT control and service management frameworks from the perspective of managing the IS function in an organisation.

Part 3: Learning Outcomes of the Programme

1.6 IT Project Management Fundamentals

IT Project Management: follows a systematic methodology for initiating, planning, executing, controlling, and closing technology solutions projects. Applies industry standard processes, methods, techniques and tools to execute projects. Is able to manage a project (typically less than six months, no inter-dependency with other projects and no strategic impact) including identifying and resolving deviations and the management of problems and escalation processes.

Overview:
This topic introduces the processes, methods, techniques and tools that organisations use to manage their IT projects. Apprentices will learn how to apply a systematic methodology for initiating, planning, executing, controlling, and closing projects. Project management in modern organisations is a complex team based activity, where various types of technologies (including project management software as well as software to support group collaboration) are an inherent part of the project management process. This topic also acknowledges that project management involves the use of resources both from within the firm, as well as contracted third parties from outside the organisation.

Skills:
a. Be able to construct a *project plan* for a multi-threaded project.

b. Demonstrate an ability to *manage a project* (typically less than six months, no inter-dependency with other projects and no strategic impact) including the rescheduling for deviations, the handling of review meetings and the management of problems and escalation processes.

c. Initiate projects, including project selection, defining project scope, and determining the feasibility of projects.

d. Manage moderately complex IT projects effectively and efficiently.

e. Manage project teams, including the fundamentals of leadership and team motivation.

f. Manage project communication, both internal to the team, and external to other project stakeholders.

g. Estimate the various activities that are required as part of an IT project

h. Manage project schedules with appropriate techniques and tools.

i. Monitor project performance against agreed tolerance levels

j. Manage project resources, including human resources, capital equipment, and time.

k. Manage project quality, including the identification of the threats and risk to project quality,

l. Manage project risk, including the identification of risk, and techniques for ensuring project risk is controlled.

m. Manage the project procurement process, including understanding external acquisition and outsourcing, as well as the steps for managing external procurement.

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n. Manage project execution, including monitoring project progress and managing project change, and appropriately documenting and communicating project status.

o. Control projects through information tracking and cost and change control techniques.

p. Close projects, including administrative, personnel, and contractual closure.

Knowledge and understanding:

a. Understand the foundations of IT project management, including its definition, scope, and the need for project management in the modern organisation.

b. Understand the issues of *quality, cost and time* concerned with project implementation, including contractual obligations and resource constraints.

c. Be aware of how to *roll out* a project in a customer friendly way and consistent with the business needs.

d. Understand *different approaches* for managing projects in an IT environment.

e. Understand the phases of the project management lifecycle.

f. Understand the techniques for measuring project quality, and how to ensure that project quality is achieved.

g. Understand the mechanisms for dealing with exceptions and issues in projects.

h. Appreciate ethnic cultural differences in working with global teams either internal to organisations or by engaging offshore outsourcers.

1.7 Computer Network Infrastructure Fundamentals

Computer and Network Infrastructure: can plan, design and manage computer networks with an overall focus on the services and capabilities that network infrastructure solutions enable in an organisational context. Identifies network security risks and their resolution.

Overview:
This topic provides an introduction to basic computer system organisation and network infrastructure with an overall focus on the services and capabilities that network infrastructure solutions enable in an organisational context.
It gives the apprentices the knowledge and skills that they need for the planning, design, implementation and management of computer networks and understanding of the network infrastructure capabilities and limitations.

Skills:

a. Plan a computer system network based upon estimated business data traffic needs that will meet the future business needs

b. Analyse business and technical requirements and select appropriate network technologies and topologies as part of the network design

c. Identifying network security risks and their remediation

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Knowledge and understanding:

a. Give an overview of computer architecture and functions, CPU, memory, instructions, instruction cycle, I/O, interrupts, peripheral devices, instructions and memory architecture. Explain how software is run and how operating system services create an interaction between hardware and software.

b. Describe the fundamental building blocks (e.g. routers, switches, hubs, storage, transmission) and typical architectures (e.g. server/client, hub/spoke) of computers networks and the Internet

c. Explain what is meant by data and protocol and how they relate to each other.

d. Describe a data format and a simple protocol in current use.

e. Describe failure modes in protocols, for example reasons why a protocol may 'hang' and the effect on a protocol of data communication errors.

f. Describe the main features of a selected subset of network protocols in widespread use on the Internet and their purpose and relationship to each other, including the physical and data link layer (e.g. https, HTTP, SMTP, SNMP, TCP, IP, etc.)

g. Explain some of main factors that affect network performance (e.g. the relationship between bandwidth, number of users, nature of traffic, contention) and propose ways to improve performance (e.g. application of traffic shaping, changes to architecture to avoid bottlenecks, network policy that prohibit streaming protocols).

h. Discuss issues that may arise in the day to day operation of networks.

1.8 Behavioural Skills Fundamentals

Professional, interpersonal and business skills

a. *Fluent in written communications and able to articulate complex issues.*

b. *Makes concise, engaging and well-structured verbal presentations, arguments and explanations.*

c. *Able to deal with different, competing interests within and outside the organisation with excellent negotiation skills.*

d. *Is able to identify the preferences, motivations, strengths and limitations of other people and apply these insights to work more effectively with and to motivate others.*

e. *Competent in active listening and in leading, influencing and persuading others.*

f. *Competent in active listening and in leading, influencing and persuading others.*

g. *Able to give and receive feedback constructively and incorporate it into his/her own development and life-long learning.*

h. *Applies analytical and critical thinking skills to Technology Solutions development and to systematically analyse and apply structured problem solving techniques to complex systems and situations.*

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i. *Able to put forward, demonstrate value and gain commitment to a moderately complex technology-oriented solution, demonstrating understanding of business need, using open questions and summarising skills and basic negotiating skills.*

j. *Able to conduct effective research, using literature and other media, into IT and business related topics.*

Overview:
Interpersonal and foundation skills are the 'transferable' skills, knowledge and understanding that all professional employees require to be productive and effective in the workplace. These include:

- Communication
- Leadership and collaboration
- Negotiation
- Analytical and critical thinking, including creativity
- Mathematical foundations
- Ethics

Communication
In order to perform effectively in any organisational role Digital & Technology Solutions Professionals require excellent written and verbal communication skills. Digital & Technology Solutions Professionals work closely with colleagues in a variety of different organisational roles, and their effectiveness is partially dependent on their ability to communicate well.

Skills:
a. Be fluent in *written communications*, with the ability to articulate complex issues, taking into account the reader's viewpoint and have demonstrated competence in this.

b. Be able to make concise, engaging and well-structured *verbal presentations*, arguments and explanations of varying lengths by using various methods, with and without the use of media, taking into account the audience viewpoint at all times.

c. Use a range of virtual collaboration tools (such as wikis, blogs, shared collaboration spaces, etc.)

Leadership and collaboration.
The apprentices will be required to act in various collaborative roles during their professional careers, and it is likely that most of them will be assuming leadership positions at various levels. Increasingly, these roles are performed in a genuinely global context. It is essential that programs prepare their apprentices to be effective collaborators and inspiring leaders.

Skills:
a. Understand how to gain insight into the preferences, motivations, *strengths and limitations of other people*, from a variety of diverse backgrounds and demonstrate how they use these insights to work more effectively with and to motivate others in group situations.

Part 3: Learning Outcomes of the Programme

b. Be competent in *active listening and in leading, influencing and persuading others*, understanding the implications of defensive behaviour and personal strategies to overcome it, demonstrating knowledge of appropriate techniques and the ability to use them effectively in realistic situations.

c. Be able to give and receive *feedback* constructively, demonstrating how they incorporate it into their own development and life-long learning.

d. Work effectively in diverse teams

Negotiation

Technology Solutions Professionals require strong negotiation skills. In their job roles, they have to deal with different, competing interests within the organisation, and excellent negotiation skills are essential. Digital & Technology Solutions Professionals also increasingly play a role in the negotiations with external IT service providers and other vendors.

Skills:

a. Be able to *put forward, demonstrate value and gain commitment to* a moderately complex technology-oriented solution, demonstrating understanding of business need, using open questions and summarising skills and basic negotiating skills.

b. Negotiating with managers about priorities, resources, estimates of time etc.

c. Negotiating with providers about service levels, quality and performance of deliverables

d. Facilitating negotiations between competing internal interests.

Analytical and critical thinking, including creativity.

Strong analytical and critical thinking skills are a foundation for many activities that Digital & Technology Solutions Professionals undertake. It is essential that they are able to systematically analyse complex systems and situations, break them down into manageable components, understand connections within systems, and create solutions based on the results of a systematic analysis. Problem solving is also ubiquitous in the life of Digital & Technology Solutions Professionals.

Skills:

a. Be *creative, self-motivated and self-aware* and able to reflect on successes and failures in ways that strengthen their positive attitude and develop their self-reliance through an understanding of their own personal preferences, styles, strengths and weaknesses.

b. Solve complex problems using structured problem solving techniques

c. Able to investigate the context of complex problems using a variety of resources (professional, academic, crowd-sourced).

d. Use quantitative analysis techniques appropriately and effectively

Mathematical Foundations

Technology Solutions Professionals require a solid foundation in mathematics. These needs will vary depending on an individual's specialty. To support in-depth analysis of data and algorithms, Digital & Technology Solutions Professionals should have a foundation in statistics and probability as well as algorithmic thinking, and discrete mathematics.

Part 3: Learning Outcomes of the Programme

Ethics:

a) Legal issues: civil and criminal law, Intellectual property rights, software copyright, patents, designs, trade marks and passing off; copyright and webpages, Internet domain names, protection of computer images and icons, jurisdiction; confidentiality. Data protection law; freedom of movement of personal data; privacy issues. Computer crime; fraud; computer misuse.

b) Ethical issues. Society and ethics, ethical issues in software engineering and computer science, software and hardware reliability, case studies: notable system failures

Part 3: Learning Outcomes of the Programme

Learning and Skills Outcomes for Occupational Specialisms

This section defines the learning and skills outcomes that Graduates of the e-skill UK undergraduate Digital & Technology Solutions Degree Apprenticeship programme must be able to demonstrate.

- Software Engineer
- Business Analyst
- Cyber Security Analyst
- Data Analyst

Software Engineer Specialism Learning and Skills Outcomes

Role Profile
The primary role of a software engineer is to be able to design, build and test, high-quality software solutions following best practices and industry standards. They will typically be working as part of a larger collaborative team, in which they will have responsibility for significant elements of the overall project. The developer will need to be able to interpret requirements specification documentation and designs in order to develop and test software that meets its requirements, even when these requirements may change.

Technical Competencies

Be able to:

SE 1. Create effective and secure software solutions using contemporary software development languages to deliver the full range of functional and non-functional requirements using relevant development methodologies.

SE 2. Undertake analysis and design to create artefacts, such as use cases to produce robust software designs.

SE 3. Produce high quality code with sound syntax in at least one language following best practices and standards.

SE 4. Perform code reviews, debugging and refactoring to improve code quality and efficiency.

SE 5. Test code to ensure that the functional and non-functional requirements have been met.

SE 6. Deliver software solutions using industry standard build processes, and tools for configuration management, version control and software build, release and deployment into enterprise environments.

SE 7. Work collaboratively and professionally with others in cross functional teams

SE 8. Apply secure and robust development principles to ensure software resilience

Part 3: Learning Outcomes of the Programme

Technical Knowledge and Understanding

Know and understand:

SE 9. How to operate at all stages of the software development lifecycle.

SE 10. How teams work effectively to develop software solutions embracing agile and other development approaches.

SE 11. How to apply software analysis and design approaches.

SE 12. How to interpret and implement a design, compliant with functional, non-functional and security requirements.

SE 13. How to perform functional and unit testing.

SE 14. How to use and apply the range of software tools used in software engineering.

SE 15. The business environment and business issues related to software development

Part 3: Learning Outcomes of the Programme

Business Analyst Specialism Learning and Skills Outcomes

Role Profile
A business analyst is responsible for assessing the business impact of change, capturing, analysing and documenting requirements and supporting the communication and delivery of requirements with relevant stakeholders. They create detailed analysis of systems and make recommendations for improvement. They produce specifications of user requirements that enable software engineers to develop the right software solutions. They require a broad foundation of skills and knowledge to be able to be effective as their work incorporates all aspects of digital technology systems.

Technical Competencies

Be able to:

BA 1. Apply structured processes for identifying, defining and analysing unstructured business problems, their root cause and impact

BA 2. Develop and apply modelling and analysis techniques to describe business problem scenarios and to help select solutions using a range of industry standard analysis techniques

BA 3. Elicit and prioritise business requirements for an IT system using 'industry best practice' methods

BA 4. Develop a clear, complete, unambiguous and testable requirements specification, including functional, non-functional, data, user interface and security requirements.

BA 5. Model the 'as is' and future state for a business process using industry standard approaches and notation.

BA 6. Evaluate selected models against business objectives and system requirements

BA 7. Use 'industry' standard tools to facilitate the analysis, documentation and traceability of requirements

BA 8. Develop and maintain models of system functionality using industry standard approaches such as use case diagrams with supporting use case descriptions

BA 9. Use techniques to document, analyse and redesign business processes

BA 10. Develop models of system data, such as entity relationship models or analysis class models, with supporting descriptions

BA 11. Adapt business analysis tools and techniques to real world scenarios

Part 3: Learning Outcomes of the Programme

Technical Knowledge and Understanding

Know and understand:

BA 12. The use of requirements elicitation techniques and their relevance to given situations

BA 13. The principles of requirements engineering and the importance of managing requirements

BA 14. How to conduct a range of business/organisational analyses

BA 15. The use of tools to support modelling and requirements engineering

BA 16. How the selected models inter-relate with each other

BA 17. How the products of analysis feed into the design and development of a system

BA 18. The problems that can arise with requirements and how these can be mitigated

BA 19. The principles of requirements validation and approaches to validating requirements

BA 20. How to develop, document and prioritise a set of functional and non-functional requirements

Part 3: Learning Outcomes of the Programme

Cyber Security Analyst Specialism Learning and Skills Outcomes

Role Profile
A cyber security analyst is responsible for the implementation, maintenance and support of the security controls that protect an organisation's systems and data assets from threats and hazards. They ensure that security technologies and practices are operating in accordance with the organisation's policies and standards to provide continued protection. They require a broad understanding of network infrastructure, software and data to identify where threat and hazard can occur. They are responsible for performing periodic vulnerability assessments to evaluate the organisation's ongoing security posture and will provide visibility to management of the main risks and control status on an ongoing basis. They respond to security incidents and implement resolution activities across the organisation.

Technical Competencies

Be able to:

CS 1. Analyse and evaluate security threats and vulnerabilities to planned and installed information systems or services and identify how these can be mitigated against

CS 2. Perform security risk assessments for a range of information systems and propose solutions

CS 3. Develop a security case against recognised security threats, and recommend mitigation, security controls and appropriate processes.

CS 4. Define and justify a user access policy for an information system given knowledge of the system architecture, security requirements and threat/risk environment. This should be in terms of what they can do, resources they can access, and operations they are allowed to perform

CS 5. Perform a business impact analysis in response to a security incident and follow a disaster recovery plan to meet elements of a given business continuity policy

CS 6. Conduct a range of cyber security audit activities to demonstrate security control effectiveness

CS 7. Research and investigate common and emerging attack techniques and recommend how to defend against them

CS 8. Identify and follow organisational security policies and standards and implement security processes in line with policies and standards

CS 9. Analyse security requirements including functional and non-functional security requirements that may be presented in a security case.

Part 3: Learning Outcomes of the Programme

Technical Knowledge and Understanding

Know and understand:

CS 10. The types of security (confidentiality, authentication; non-repudiation; service integrity) and security big picture (network security; host OS security; physical security)

CS 11. The main types of common attack techniques, including phishing, social engineering, malware, network interception, blended techniques, denial of service and theft

CS 12. How to recognise and assess risk including performing a risk assessment

CS 13. How to apply penetration testing effectively and how it contributes to assurance

CS 14. The different approaches to risk treatment and management in practice

CS 15. What the 'cyber security culture' in an organisation is, and how it may contribute to security risk

CS 16. The typical security hazards that may concern an organisation

Part 3: Learning Outcomes of the Programme

Data Analyst Specialism Learning and Skills Outcomes

Job Profile
The primary role of a data analyst is to collect, organise and study data to provide new business insight. They are responsible for providing up-to-date, accurate and relevant data analysis for the organisation. They are typically involved with managing, cleansing, abstracting and aggregating data across the network infrastructure. They have a good understanding of data structures, software development procedures and the range of analytical tools used to undertake a wide range of standard and custom analytical studies, providing data solutions to a range of business issues. They document and report the results of data analysis activities making recommendations to improve business performance. They need a broad grounding in technology solutions to be effective in their role.

Technical Competencies

Be able to:

DA 1 Import, cleanse, transform, and validate data with the purpose of understanding or making conclusions from the data for business decision making purposes

DA 2 Present data visualisation using charts, graphs, tables, and more sophisticated visualisation tools

DA 3 Perform routine statistical analyses and ad-hoc queries

DA 4 Use a range of analytical techniques such as data mining, time series forecasting and modelling techniques to identify and predict trends and patterns in data

DA 5 Report on conclusions gained from analysing data using a range of statistical software tools

DA 6 Summarise and present results to a range of stakeholders making recommendations

DA 7 Design and develop relational databases for collecting data and influencing data input screens

DA 8 Develop Data Definition Language or Data Manipulation Language software

DA 9 Analyse large datasets, to derive inferences

DA 10 Interpret and apply the organisations data and information security standards, policies and procedures to data management activities

Part 3: Learning Outcomes of the Programme

Technical Knowledge and Understanding

Know and understand:

DA 11   The quality issues that can arise with data and how to avoid and/or resolve these

DA 12   The processes involved in carrying out data analysis projects.

DA 13   How to use and apply industry standard tools and methods for data analysis

DA 14   The range of data protection and legal issues

DA 15   The fundamentals of data structures, database system design, implementation and maintenance

DA 16   The organisation's data architecture

DA 17   How to use a range of appropriate data analysis techniques or processes

DA 18   The importance of clearly defining customer requirements for data analysis

DA 19   The steps involved in carrying out routine data analysis tasks

DA 20   The importance of the domain context for data analytics

Part 4: Programme Structure
This structure diagram demonstrates the student journey from Entry through to Graduation for a typical part time student .

ENTRY		Compulsory Modules	Optional Modules	Awards
	Year 1 : Level 1	UFCFNM-15-1 Business Organisations	**NONE**	**Interim award**: *(120 credits)* Cert HE Digital & Technology Solutions
		UFCFPM-30-1 Business Information Systems		
		UFCFQM-30-1 Fundamentals of Software Development		
		UFCFRM-15-1 Academic and Professional Skills		
	Year2 : Level 1	UFCFSM-15-1 Business Security		
		UFCFTM-15-1 Webapp Development		

		Compulsory Modules	Optional Modules	Interim Awards
	Year 2 : Level 2	UFCFUM-15-2 Object Oriented Software Design and Development I	***Cyber Security Analyst:*** UFCFXM-15-2 Networking and Security 2	**Interim award**: *(240 credits)* Dip HE Digital & Technology Solutions
		UFCFVM-15-2 Networking and Security I	***Data Analyst:*** UFCF7N-15-2 Data Analysis	
		UFCFWM-15-2 Work based Experience Project	***Software Engineer:*** UFCFYM-15-2 Object Oriented Software Design and Development II	
			Business Analyst: UFCF8N-15-2 Business Analysis	

		Compulsory Modules	Optional Modules	Interim Awards
	Year 3 : Level 2	UFCF9N-30-2 Online Database Management		
		UFCFAN-30-2 Introduction to Project Management		
		Year Out: **NOT APPLICABLE TO A DEGREE APPRENTICESHIP PROGRAMME**		
	Year 3 : Level 3	UFCFE6-15-3 Professional Experience UFCFD5-15-3 Technical Writing and Editing	***Cyber Security Analyst*** UFCFDN-15-3 Internet of Things ***Data Analyst:*** UFCFDN-15-3 Internet of Things ***Software Engineer:*** UFCFX3-15-3 Advanced Topics in Web Development 1 ***Business Analyst*** UFCFB5-15-3 Ethical and Professional Issues in Computing and Digital Media	**Interim award**: *300 credits* BSc Digital & Technology Solutions

		UFCFHN-30-3 Synoptic Project Presentation Note – Prior to enrolling on *UFCFHN-30-3 Synoptic Project Presentation* apprentices must achieve 330 credits, including all compulsory modules and all optional modules for their chosen specialism.	*Cyber Security Analyst* UFCFBN-30-3 Practical Security UFCFEN-15-3 Cloud Computing Platforms *Data Analyst:* UFCFCN-30-3 Data Analytics and Visualisation UFCFEN-15-3 Cloud Computing Platforms *Software Engineer:* UFCFFN-30-3 Collaborative Software Development UFCFR5-15-3 Advanced Topics in Web Development 2 *Business Analyst* UFCFGN-30-3 Business Analysis and Decision Making UFCFP5-15-3 Integrated Case Studies	**HIGHEST AWARD:** BSc (Hons) Digital & Technology Solutions (Software Engineer) BSc (Hons) Digital & Technology Solutions (Business Analyst) BSc (Hons) Digital & Technology Solutions (Data Analyst) BSc (Hons) Digital & Technology Solutions (Cyber Security Analyst)
	Year 4 : Level 3			

Part 5: Entry Requirements
The University's Standard Entry Requirements apply Tariff points as appropriate for the year of entry - up to date requirements are available through the courses database.

Part 6: Reference Points and Benchmarks
Set out which reference points and benchmarks have been used in the design of the programme: In designing this programme, the team has drawn upon the following external reference points: • QAA UK Quality Code for HE: National qualification framework • QAA Subject benchmark statements for Computing and Business & Management • UWE Bristol Strategy 2020 • Tech Partnership Endorsement Documents for the BSc Digital and Technology Solutions

Part 6: Reference Points and Benchmarks

Professional degree apprenticeship
- Digital and Technology Solutions Professional degree apprenticeship standard
- Digital and Technology Solutions Professional degree apprenticeship assessment plan

The QAA UK quality code for Higher Education Qualifications describes the attributes and skills expected of Honours graduates. It is our view that the learning outcomes of the programme are fully consistent with the qualification descriptor in the Framework, and hence that graduates are able to demonstrate that they meet the expectations of the Framework.

The curriculum for the programme draws on the QAA Subject Benchmark Statements for Computing and (to a lesser extent) those for Business & Management. The QAA Computing Benchmarking document recognizes that computing awards may be placed on a spectrum, with those covering a broad range of computing topics at one end, and those focusing on specialist areas, e.g. safety-critical systems, at the other. The specialist routes through this award lie between the two extremes in that, in all cases, they provide a reasonably broad coverage of the main areas of Information Systems development applicable in the business context. The specified aims, objectives and philosophy lead to an award which conforms to the principles of course design in the benchmark statement. The QAA Business & Management benchmark explicitly recognises the important role of the study of Information Systems in the context of business, and the design of the programme reflects this.

Through its constituent teaching and learning elements, assessment strategies, practical focus and learning outcomes, the programme intends to support the achievement of the workstreams defined in the UWE Bristol Strategy 2020. Specifically, the programme will contribute to the strategic ambitions of outstanding learning (Work-stream 1) and developing ready and able graduates (Work-stream 2).

UWE's Learning & Teaching Strategy has informed the Faculty's policy for the delivery of its programmes and this companion to an already well-established programme (ITMB) and the more recent Tech Gold offering (SEfB) is proposed in the light of the university's commitment to strengthening collaborations with business and the professional bodies that represent it. It also takes account of the policies and requirements set out in UWE's Technology Enhanced Learning Strategy and the current FET Teaching, Learning and Assessment Strategy. In particular, it seeks to maximise the efficiency of resource utilisation while promoting the achievement of high quality outcomes through, for example:

- consolidation of the existing emphasis on partnership, student-centred engagement and an appropriate balance of education, training and practice-based experience;
- a focus on self-awareness, social responsibility and the ethical and professional issues relating to digital and technology solutions.

The Digital and Technology Solutions Professional degree apprenticeship is a national degree programme, accredited by the Tech Partnership and developed by a Trailblazer Group with the help of some of the UK's leading companies. The qualification process to receive accreditation requires the UWE programme to meet the learning outcomes and teaching style developed by the employer group. The Tech Partnership has driven the curriculum design process and will act in the capacity of external reviewer for programme development, as well as accrediting UWE's version of the programme for delivery and operation.

The emphasis of the programme is to prepare students with a solid grounding in Digital and Technology Solutions so as to enable them to take up a variety of technical positions in industry. The success of the employer designed/supported degree approach has been demonstrated by the wide variety of organisations in which ITMB students have been placed and/or employed and by the overwhelmingly positive feedback of their employers.

The development of the programme reflects UWE policies and is fully consistent with the University's commitment to 'make a positive difference to our students, business and society'.

Part 6: Reference Points and Benchmarks

UWE Bristol Strategy 2020, Outstanding Learning:

As previously stated, central and crucial to the SDfB programme will be an emphasis on partnership, student centred engagement and an appropriate balance of education, training and practice-based experience. As with the ITMB and SEfB programmes, this award is expected to set high standards with respect to:

- Relevance of content
- Effective employer engagement
- Attracting the highest quality students
- Appeal to women as well as men
- Degree completion rates
- Progression into IT careers

NB: the companion Tech Partnership accredited 'Tech Gold' award (ITMB) scored 100% for O/A satisfaction in THE NSS for both 2015 and 2016.

UWE Bristol Strategy 2020, Ready and able graduates:

The high level of employer involvement in a degree apprenticeship programme will help to confirm and consolidate the relevance and importance of the topics and subjects covered by the award, to broaden the context of study for the students through exposure to contemporary applications, initiatives and issues and to inspire them to see their education as a powerful force in their personal and professional development.

The study while you work approach is of great value in preparing students as capable, knowledgeable and reflective practitioners and provides for high quality working and learning experiences. It also helps to instil a strong sense of self-worth in both the participating students and the wider cohort, and helps students to readily understand that academic achievement is only one part of the skills mix required for success in life

FOR OFFICE USE ONLY

First CAP Approval Date	31 May 2017			
Revision CAP Approval Date		Version	1	Link to APT (ID 4237)
Next Periodic Curriculum Review due date	Sep 2023			
Date of last Periodic Curriculum Review				