Prifysgol Cymru
Y Drindod Dewi Sant
University of Wales
Trinity Saint David

MODULE DIRECTORY

LEVEL 5

ACADEMIC DISCIPLINE OF APPLIED COMPUTING

WALES INSTITUTE OF SCIENCE AND ART

2024-2025

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INTRODUCTION

This Module Directory includes all the modules for Level 5 within the Academic Discipline of Applied Computing (WISA) in the academic year 2024-2025.

This directory accompanies the Programme of Study Handbook, which will provide you with details of which modules you will be studying for your programme this year in the 'Programme of Study' section. This directory may include modules that are running on other programmes of study within your Academic Discipline/Institute. If you require assistance in identifying the modules for your programme of study, please contact the Programme Manager (whose name and contact details are provided in the accompanying Programme of Study Handbook), or the relevant Institute Office.

The University has made every effort to make the information as full and as accurate as possible, but you should note that minor changes in the organisation of modules between the planning stage and the actual teaching are inevitable. We shall try to keep any such changes to a minimum, and you will receive plenty of advance warning in the event of any alteration. We would also be grateful if you would let us know about any changes that you think might be helpful if introduced into future handbooks.

MODULES

Module Code	ACCA5023
Title	Network Operating Systems and Services
Date	09/09/2020
Level	5
Credits	20
Pre-Requisites	None

AIM(S)

- To provide students with a sound understanding of the concepts, principles, skills and techniques required to manage and deploy network resources in a Network Operating Systems environment, e.g. Windows, or Linux.

LEARNING OUTCOMES

Upon the successful completion of this module, the student should be able to:

- Apply a systematic understanding of network operating system environments to deploy, manage and maintain critical network services and resources.

- Analyse a given network to produce suitable security audit/disaster recovery strategy, working individually and as part of a team.

INDICATIVE CONTENT

- Overview of Directory Services.

- Directory Services administration, e.g. user, computer accounts, group accounts.

- The name resolution process.

- Deployment, configuration and testing of a Domain Name System (DNS) server.

- Dynamic Host Configuration Protocol (DHCP) and its relevance to network deployment.

- Deployment, configuration and testing of a Dynamic Host Configuration Protocol (DHCP) server.

- Identification of the risks and threats to the security of resources and data (digital and physical).

- Disaster prevention and recovery methods.

- Principles and common levels of Redundant Array of Inexpensive Disk (RAID) arrays, e.g. 0, 1, 5, 6, 10.

- Virtualisation.

- Failover clustering and associated principles, e.g. quorum-based decision-making.

- Network load balanced clustering.

- Monitoring programs: use of network monitoring and management tools/protocols.
- Network penetration testing as pertains to the services explored.
- Legal, social and ethical issues.

Study Time Allocation

The study time for the module is divided as follows:

Activity type	Hours	Percentage
Scheduled learning	48	24%
Independent learning	152	76%
Placement learning	0	0%
TOTAL	**200**	**100%**

ASSESSMENT

Assessment Component 1

☐ **Written exam** ☒ **Coursework** ☐ **Practical**

Mode of assessment	Volume	Weighting
Coursework	2500 words	50%

Assessment Component 2

☐ **Written exam** ☒ **Coursework** ☐ **Practical**

Mode of assessment	Volume	Weighting
Coursework	2500 words	50%

Assessment Summary

Activity type	Percentage
Written exam	0%
Coursework	100%
Practical	0%
TOTAL	**100%**

INDICATIVE READING LIST

Module Code	ACCA5023	
Module Title	Network Operating Systems and Services	
Classification	**Reading List entry**	**Electronic***
Essential	Bekim Dauti (2019) Windows Server 2019 Administration Fundamentals: A beginner's guide to managing and administering Windows Server environments, 2nd Edition. Packt Publishing	☐
Essential	Evi Nemeth et al. (2017) UNIX and Linux System Administration Handbook. Addison Wesley	☐
Further	ACM	☒

Further	IEEE	☒
Further	Computer Networking	☒
Further	Data Communications	☒

Module Code	**ACCA5024**
Title	**Advanced Networking**
Date	**09/09/2020**
Level	**5**
Credits	**20**
Pre-Requisites	**None**

AIM(S)

- To provide the student with a systematic knowledge of OSI reference model and TCP/IP protocol model. Students will gain a detailed understanding of the various hardware devices used in modern network design and will understand the essential technical principles of protocols used in various layers of OSI model and IP Addressing.

LEARNING OUTCOMES

Upon the successful completion of this module, the student should be able to:

- Demonstrate a knowledge and understanding of network principles and protocols used in OSI and TCP/IP model.

- Implement simple LANs, perform basic configurations for routers and switches, and implement IP addressing schemes.

INDICATIVE CONTENT

- Networking today

- Understanding devices used to implement networks

- Protocols and standards

- OSI and TCP/IP models and layers

- IPv4 and v6 addressing

- Design and implementing networks using routers and switches

- Testing and troubleshooting

- Fundamentals of network security

Study Time Allocation

The study time for the module is divided as follows:

Activity type	Hours	Percentage
Scheduled learning	48	24%
Independent learning	152	76%
Placement learning	0	0%
TOTAL	**200**	**100%**

ASSESSMENT

Assessment Component 1

☐ **Written exam** ☐ **Coursework** ☒ **Practical**

Mode of assessment	Volume	Weighting
Practical portfolio	Students will complete practical work as in-class tests or as a workshop journal.	75%

Assessment Component 2

☐ **Written exam** ☒ **Coursework** ☐ **Practical**

Mode of assessment	Volume	Weighting
Online test	1 hour	25%

Assessment Summary

Activity type	Percentage
Written exam	0%
Coursework	25%
Practical	75%
TOTAL	**100%**

INDICATIVE READING LIST

Module Code	ACCA5024	
Module Title	Advanced Networking	
Classification	**Reading List entry**	**Electronic***
Essential	Introduction to Networks v6 Companion Guide by Cisco Networking Academy (2016), Cisco Press	☒
Essential	www.netacad.com username and password required	☒
Further	W Odom (2019) CCNA 200-301 Official Cert Guide Library, Cisco Press part of the Official Cert Guide series	☒

Module Code	**ACCA5026**
Title	**Databases and Application Development**
Date	**09/09/2020**
Level	**5**
Credits	**20**
Pre-Requisites	**None**

AIM(S)

- To provide students with a systematic understanding of the concepts underlying the design and development of databases and data applications for real-world problems.

LEARNING OUTCOMES

Upon the successful completion of this module, the student should be able to:

- Critically evaluate the concepts, technologies and techniques used in the design and development of databases and data applications.

- Select and deploy appropriate concepts, technologies and techniques to design and implement database solutions and backend data applications for real-world problem scenarios.

INDICATIVE CONTENT

- Relational database concepts e.g. data independence, normalisation techniques, transaction management.

- Database query languages e.g. Structured Query Language (SQL).

- NoSQL and NewSQL database concepts.

- Data models e.g. entity-relationship, object-oriented, object-relational, and NoSQL models.

- Software programming languages, development libraries, frameworks, object-oriented design methods, design patterns, and architectural models for data applications.

- Data access, management and manipulation techniques, options for preserving data and dynamic data content, and displaying data user interfaces and views.

- Security, authorisation and authentication measures in databases and data applications.

- Testing, debugging, and evaluation techniques and tools.

Study Time Allocation

The study time for the module is divided as follows:

Activity type	Hours	Percentage
Scheduled learning	48	24%
Independent learning	152	76%
Placement learning	0	0%
TOTAL	**200**	**100%**

ASSESSMENT

Assessment Component 1

☐ **Written exam** ☒ **Coursework** ☐ **Practical**

Mode of assessment	Volume	Weighting
Portfolio	6 - 8 elements	100%

Assessment Summary

Activity type	Percentage
Written exam	0%
Coursework	100%
Practical	0%
TOTAL	**100%**

INDICATIVE READING LIST

Module Code	ACCA5026	
Module Title	Databases and Application Development	
Classification	**Reading List entry**	**Electronic***
Essential	Connolly, T., Begg, C., 2015, *Database Systems: A Practical Approach to Design, Implementation and Management*, 6th Edition, Addison Wesley	☒
Essential	Viescas, J. L., 2018, SQL Queries for Mere Mortals: A Hands-On Guide to Data Manipulation in SQL, 4th Edition, Addison-Wesley Professional	☒
Essential	Joshi, B., 2019, *Beginning Database Programming Using ASP.NET Core 3: With MVC, Razor Pages, Web API, jQuery, Angular, SQL Server, and NoSQL*, Apress	☒
Further	Freeman, A., 2020, *Pro ASP.NET Core 3: Develop Cloud-Ready Web Applications Using MVC 3, Blazor, and Razor Pages*, 8th Edition, Apress	☒
Further	Lock, A., 2018, *ASP.NET Core in Action*, Manning Pub	☒
Further	Kleppmann, M., 2017, *Designing Data-Intensive Applications: The Big Ideas Behind Reliable, Scalable, and Maintainable Systems*, O'Reilly Media	☒
Further	Sharp, J., 2018, *Microsoft Visual C# Step by Step* (9th Edition), Microsoft Press	☒
Further	Troelsen,A., Japiske, P., 2017, *Pro C# 7: With .NET and .NET Core*, 8th Edition, Apress	☒

Module Code	**ACCA5028**
Title	**Indie Game Development**
Date	**09/09/2020**
Level	**5**
Credits	**20**
Pre-Requisites	**None**

AIM(S)

- To synthesise software development concepts and the principles and techniques of games development with the aim of producing an independent (indie) game artefact.

LEARNING OUTCOMES

Upon the successful completion of this module, the student should be able to:

- Develop a systematic understanding of the principles, concepts, and techniques used in the development of games.

- Synthesise and deploy appropriate technologies, software programming techniques, design patterns, frameworks, and games engine platforms in the development of indie games.

INDICATIVE CONTENT

- Fundamentals of games development, such as concept development, gameplay design, core mechanics, user interfaces, game characters, storytelling, AI techniques, etc.

- Games development engines, e.g. Unity, Ureal, for developing cross-platform and mobile games.

- Frameworks and software design patterns for common problems in games development.

- Data persistence techniques for saving and loading data between sessions in games, e.g. JSON, serialisation and deserialization.

- Testing, debugging, and evaluation. Optimisation and performance techniques.

Study Time Allocation

The study time for the module is divided as follows:

Activity type	Hours	Percentage
Scheduled learning	48	24%
Independent learning	152	76%
Placement learning	0	0%
TOTAL	**200**	**100%**

ASSESSMENT

Assessment Component 1

☐ **Written exam** ☒ **Coursework** ☐ **Practical**

Mode of assessment	Volume	Weighting
Portfolio	6 - 8 elements	100%

Assessment Summary

Activity type	Percentage
Written exam	0%
Coursework	100%
Practical	0%
TOTAL	**100%**

INDICATIVE READING LIST

Module Code	ACCA5028	
Module Title	Indie Game Development	
Classification	**Reading List entry**	**Electronic***
Essential	Adams, E., 2013, *Fundamentals of Game Design*, 3rd Edition, New Riders	☒
Essential	Bond, J. B., 2017, *Introduction to Game Design, Prototyping, and Development: From Concept to Playable Game with Unity and C#*, 2nd Edition, Addison-Wesley Professional	☒
Essential	Hocking, J., 2018, *Unity in Action: Multiplatform game development in C#*, 2nd Edition, Manning Publications	☒
Further	Nystrom, R., 2014, Game Programming Patterns, Genever Benning	☒
Further	Baron, D., 2019, Hands-On Game Development Patterns with Unity 2019: Create engaging games by using industry-standard design patterns with C#, Packt Publishing	☒
Further	Daglow, D. L., 2018, *Indie Games: From Dream to Delivery*, Sausalito Media LLC	☒
Further	Chandler, H. M., Chandler, R., 2010, *Fundamentals of Game Development*, Jones & Bartlett Learning	☐
Further	Felicia, P., 2019, Unity from Zero to Proficiency (Beginner): A Step-by-step guide to coding your first game	☒

Module Code	**ACCA5031**
Title	**Web and Mobile Technologies**
Date	**09/09/2020**
Level	**5**
Credits	**20**
Pre-Requisites	**None**

AIM(S)

- To provide students with a systematic understanding of web and mobile using client- and server-side technologies.

LEARNING OUTCOMES

Upon the successful completion of this module, the student should be able to:

- Evaluate the concepts, principles, technologies and techniques used in the development of web and mobile applications.
- Design and implement web and mobile applications using client- and server-side programming language(s) to resolve a range of problem scenarios.

INDICATIVE CONTENT

- Client-side scripting languages eg JavaScript
- Server-side programming languages eg PHP
- Syntax, semantics, constructs including data types, variables, operators, arrays, lists etc.
- Web-based database programming techniques providing typical CRUD functionality
- Reading and validating data from web forms eg cleaning data, string processing
- Handling stateless HTTP eg cookies, sessions
- Dynamic content eg time-driven events
- Use of web-based data for different audiences eg mobile applications
- Programming for mobile applications
- Use of cross-platform techniques for mobile applications
- The DOM

Study Time Allocation

The study time for the module is divided as follows:

Activity type	Hours	Percentage
Scheduled learning	48	24%
Independent learning	152	76%
Placement learning	0	0%
TOTAL	**200**	**100%**

ASSESSMENT

Assessment Component 1

☐ **Written exam** ☒ **Coursework** ☐ **Practical**

Mode of assessment	Volume	Weighting
Coursework	2000 words equivalent	50%

Assessment Component 2

☐ **Written exam** ☒ **Coursework** ☐ **Practical**

Mode of assessment	Volume	Weighting
Coursework	2000 words equivalent	50%

Assessment Summary

Activity type	Percentage
Written exam	0%
Coursework	100%
Practical	0%
TOTAL	**100%**

INDICATIVE READING LIST

Module Code	ACCA5031	
Module Title	Web and Mobile Technologies	
Classification	**Reading List entry**	**Electronic***
Essential	Welling, L. (2016) PHP and MySQL Web Development, 5th Edition, Addison Wesley	☐
Further	Nixon, R. (2016) *Learning PHP, MySQL & JavaScript: With jQuery, CSS & HTML5*, 4th Edition, O'Reilly Media	☐
Further	Snider, E (2019) *Mastering Xamarin.Forms: App architecture techniques for building multi-platform, native mobile apps with Xamarin.Forms 4*, 3rd Edition, Packt Publishing	☐
Further	Bennett, J (2018) *Xamarin in Action: Creating Native Cross-Platform Mobile Apps*, Manning Publications	☐

Module Code	ACCA5032
Title	Object Oriented Programming and Algorithms
Date	09/09/2020
Level	5
Credits	20
Pre-Requisites	None

AIM(S)

- To provide students with a conceptual understanding of abstract data types, data structures and algorithms used in web development and the ability to apply these concepts using object oriented (OO) development methods in web development scenarios

LEARNING OUTCOMES

Upon the successful completion of this module, the student should be able to:

- Critically evaluate the suitability of selected algorithms and data structures to solve given problems
- Develop OO solutions to solve a given problem scenario(s) often encountered in web development

INDICATIVE CONTENT

- Abstract data types (ADT)
- Simple data structures e.g. stacks, queues
- Complex data structures and algorithms e.g. lists, linked lists, heaps
- Graphs – properties and graph traversal
- Trees – properties, traversal, balancing
- Hashing
- Algorithms for sorting
- Algorithms for searching
- Containers and iterators
- Object oriented concepts e.g. classes, objects, encapsulation, inheritance and polymorphism
- Essential object oriented programming principles for web development

Study Time Allocation

The study time for the module is divided as follows:

Activity type	Hours	Percentage
Scheduled learning	48	24%
Independent learning	152	76%
Placement learning	0	0%
TOTAL	**200**	**100%**

ASSESSMENT

Assessment Component 1

☐ **Written exam** ☒ **Coursework** ☐ **Practical**

Mode of assessment	Volume	Weighting
Implementation and Essay	2500 words equivalent	50%

Assessment Component 2

☒ **Written exam** ☐ **Coursework** ☐ **Practical**

Mode of assessment	Volume	Weighting
Exam	2 hours	50%

Assessment Summary

Activity type	Percentage
Written exam	50%
Coursework	50%
Practical	0%
TOTAL	**100%**

INDICATIVE READING LIST

Module Code	ACCA5032	
Module Title	Object Oriented Programming and Algorithms	
Classification	**Reading List entry**	**Electronic***
Essential	Greene, J., Stellman, A., (2020) Head First C#, 4th Edition, O'Reilly	☐
Essential	Cormen,T.H., Leiseron, C.E., (2009) Introduction to Algorithms, MIT Press	☒
Further	Weisfeld, M., (2018), The Object-Oriented Thought Process, Addison Wesley	☒
Further	Sharp, J., (2018), Microsoft Visual C# Step by Step, Microsoft Press	☐
Further	Sedgewick, R., (2011) Algorithms, 4th edition, Addison-Wesley	☐

Module Code	**ACCA5033**
Title	**Changemakers: Creativity and Value Creation**
Date	**25/06/2020**
Level	**5**
Credits	**20**
Pre-Requisites	**None**

AIM(S)

- To develop the concepts and practice of creativity and value creation for the development of innovative, aspiring and progressive solutions.

LEARNING OUTCOMES

Upon the successful completion of this module, the student should be able to:

- Demonstrate knowledge and critical understanding of innovation, creativity and enterprising mindset, recognising the values and the contribution creativity makes to the common good.

- Conceive, articulate and apply creative thinking within a work-based or academic context to develop novel solutions and/or value creation.

INDICATIVE CONTENT

- Creativity in theory and practice.

- Value creation in theory and practice.

- Creative and ethical leadership: skills and challenges.

- Driving innovation and change, the intra and entrepreneurial individual.

- Critical thinking, troubleshooting and problem solving, developing novel solutions.

- Information gathering for inspiration, vision creation and ideation.

- Developing the enterprising and data driven mindset.

- Contemporary technologies: virtual and augmented reality and artificial intelligence to enhance creativity and innovation.

- Time management practices for an entrepreneurial mindset.

- Being resourceful, in the context of making do with less.

- Reflection and self-reflection.

Study Time Allocation

The study time for the module is divided as follows:

Activity type	Hours	Percentage
Scheduled learning	48	24%
Independent learning	152	76%
Placement learning	0	0%
TOTAL	**200**	**100%**

ASSESSMENT

Assessment Component 1

☐ **Written exam** ☒ **Coursework** ☐ **Practical**

Mode of assessment	Volume	Weighting
Online portfolio of set exercises	2,000 words or equivalent	50%

Assessment Component 2

☐ **Written exam** ☒ **Coursework** ☐ **Practical**

Mode of assessment	Volume	Weighting
Assignment	2,000 words or equivalent	50%

Assessment Summary

Activity type	Percentage
Written exam	0%
Coursework	100%
Practical	0%
TOTAL	**100%**

INDICATIVE READING LIST

This will be guided by the student's subject area.

Module Code	**ACCA5033**	
Module Title	Changemakers: Creativity and Value Creation	
Classification	**Reading List entry**	**Electronic***
Essential	Hargreaves, J., and Page, L. (2013) *Reflective Practice*. (Key Themes in Health and Social Care Series). Polity Press.	☒
Essential	Nardi, P.M. (2017) *Critical Thinking : Tools for Evaluating Research*. University of California Press	☒
Essential	Westerman, G., Bonnet, D. and McAfee, A., *Leading Digital: Turning Technology Into Business Transformation. (Audiobook)* Recorded Books. 2017.	☒
Further	Schiuma, G. (2011) *Managing Knowledge Assets and Business Value Creation in Organizations : Measures*	☒

	and Dynamics Hershey, Pa.: Business Reference Service.	
Further	Rescher, N. (2014). *A System of Pragmatic Idealism, Volume II The Validity of Values, A Normative Theory of Evaluative Rationality* (Princeton Legacy Library). Princeton: Princeton University Press.	☒
Further	Turner, E. (2020) *Be Less Zombie: How great companies create dynamic innovation, fearless leadership and passionate people*. John Wiley & Sons.	☒

Module Code	ACCA5034
Title	Data Security and Compliance
Date	09/09/2020
Level	5
Credits	20
Pre-Requisites	None

AIM(S)

- To provide students with the basic concepts and understanding about threats and vulnerabilities present in systems. They must learn how to use the information assets securely to support the goals and objectives of organisations through information security governance, risk management and regulatory compliance.

LEARNING OUTCOMES

Upon the successful completion of this module, the student should be able to:

- Understand the key issues associated with inspection, protection, detection of and reaction to threats to information assets.

- Provide an overview of the field of information security assurance, governance, policies, risk management and regulatory compliance.

INDICATIVE CONTENT

- Introduction to Information Security
- The Need for Security
- Legal, Ethical, and Professional Issues in Information Security
- Planning for Security
- Risk Management
- Regulatory Acts
- Security Governance Concepts, Principles, and Policies
- How does security governance interact with risk management?
- Security Technology: Access Controls, Firewalls, and VPNs
- Security Technology: Intrusion Detection and Prevention Systems and Other Security Tools
- Cryptography
- Physical Security
- Implementing Information Security
- Security and Personnel
- Information Security Maintenance

Study Time Allocation

The study time for the module is divided as follows:

Activity type	Hours	Percentage
Scheduled learning	48	24%
Independent learning	152	76%
Placement learning	0	0%
TOTAL	**200**	**100%**

ASSESSMENT

Assessment Component 1
(Tick one)

☐ **Written exam** ☒ **Coursework** ☐ **Practical**

Mode of assessment	Volume	Weighting
Portfolio	5,000 words equivalent	100%

Assessment Summary

Activity type	Percentage
Written exam	
Coursework	100%
Practical	
TOTAL	**100%**

INDICATIVE READING LIST

Module Code	ACCA5034	
Module Title	Data Security and Compliance	
Classification	**Reading List entry**	**Electronic***
Essential	Principles of Information Security, 6th Edition Michael E. Whitman | Herbert J. Mattord Copyright 2018	☐
Essential	Ladley, J. (2012), Data Governance: How to Design, Deploy and Sustain an Effective Data Governance Program, Morgan Kaufmann, MA, USA.	☒
Essential	Plotkin, D. (2013), Data Stewardship: An Actionable Guide to Effective Data Management and Data Governance, Morgan Kaufmann, MA, USA.	☒
Further	CISSP Guide to Security Essentials, 2nd Edition. Peter H. Gregory, Copyright 2015. ISBN-10: 130584601X ISBN-13: 9781305846012	☒
Further	Information Security Governance: A Practical Development and Implementation Approach by Krag Brotby. ISBN: 978-1-118-58551-1. August 2017	☒
Further	Gregory, P.H. (2015) CISSP Guide to Security Essentials, 2nd Edition. Course Technology.	☒
Further	Quinn, M. J. (2015), Ethics for the Information Age: International Edition, Pearson: NY, 2015	☒

Further	Brotby, K. (2017), Information Security Governance: A Practical Development and Implementation Approach, Wiley.	☒
Further	IEEE/ACM, IEEE/ACM Transactions on Networking	☒
Further	IEEE, IEEE Network Magazine	☒
Further	Science Direct	☒
Further	Scopus	☒
Further	ACM Transactions on Database Systems	☒
Further	ACM Transactions on Information Systems	☒
Further	CISCO Academy Website, cisco.netacad.net (password access only)	☒

Module Code	**ACCA5038**
Title	**Advanced Character Animation**
Date	**08/12/2021**
Level	**5**
Credits	**20**
Pre-Requisites	**None**

AIM(S)

- To heighten and extend character animation skills and techniques within the context of emerging trends and innovations in the animation industry.
- To formulate effective 3D strategies and industry-facing methods in advancing the visual components that aid in designing both realistic and stylistic-based sequences.

LEARNING OUTCOMES

Upon the successful completion of this module, the student should be able to:

- Critically analyse and cultivate animation ability to high-end levels of character performance and/or realism.
- Select, evaluate and employ industry method processes, trends, techniques and production environments to progress students' own developing animation skillset.

INDICATIVE CONTENT

- Generalist and specialist Animator/Lead Animator/Story dept. roles
- Animation production and pipeline considerations
- Progression of animation specialisms in:
- Pre-production and Concept design
- Character animation
- 3D Character deployment
- Principles of animation
- Use of technology to benefit animation workflows
- Story design and evocation
- Story mechanics
- Rigging
- Effects Animation

Study Time Allocation

The study time for the module is divided as follows:

Activity type	Hours	Percentage
Scheduled learning	48	24%
Independent learning	152	76%
Placement learning	0	0%
TOTAL	**200**	**100%**

ASSESSMENT

Assessment Component 1

☐ **Written exam** ☒ **Coursework** ☐ **Practical**

Mode of assessment	Volume	Weighting
Portfolio	20-30 seconds of self-directed animations (equivalent 5,000 words)	100%

Assessment Summary

Activity type	Percentage
Written exam	
Coursework	100%
Practical	
TOTAL	**100%**

INDICATIVE READING LIST

Project-specific texts, sites, files determined in conjunction with module tutor(s). It is anticipated that students would want to study/refer to some of the following:

Module Code	**ACCA5038**	
Module Title	**Advanced Character Animation**	
Classification	**Reading List entry**	**Electronic***
Essential	Osborn, K. (2019) *Cartoon Character Animation with Maya* London: Bloomsbury Academic	☐
Essential	Naas, P (2018) *How to Cheat in Maya 2017: Tools and Techniques For Character Animation* London: CRC Press	☐
Essential	Roberts, S. (2012) *Character Animation Fundamentals: Developing Skills for 2D and 3D Character Animation* London: Routledge	☐
Essential	O'Hailey, T. (2013) *Rig It Right! Maya Animation Rigging Concepts* London: Focal Press	☐
Essential	Keller, E. (2013) *Maya Visual Effects: The Innovator's Guide* London: John Wiley & Sons.	☐
Further	Holmes, M. T. (2016) *Designing Creatures and Characters: How to Build an Artist's Portfolio For Video Games*, Film, Animation London: Impact Books	☐
Further	Osipa, J. (2010) *Stop Staring: Facial Modelling and Animation Done Right* London: John Wiley & Sons	☐

Further	Labreque, J. (2021) Mastering Adobe Animate 2021 London: Packt Publishing	☐
Further	Murdock, K. (2019) *Autodesk Maya 2019* London: SDC Publications	☐
Further	Sawicki, M. (2007) *Filming the Fantastic: A Guide to Visual Effects Cinematography* London: Focal Press	☐
Further	Lasseter, J. (1987) "*Principles of Traditional Animation Applied to 3D Computer Animation",* Computer Graphics, pp. 35-44, 21:4, July 1987 (SIGGRAPH 87)	☒
Further	50mostinfluentialdisneyanimators | Countdown of the 50 Most Influential Animators in Disney Studio History (wordpress.com)	☒
Further	Understand Disney's 12 principles of animation | Creative Bloq	☒
Further	Animation World Network - YouTube	☒
Further	Acting For Animation & Character Performance - Skwigly Animation Magazine	☒
Further	Computer Animation and Virtual Worlds - Wiley Online Library	☒
Further	3D World magazine | Creative Bloq	☒

Module Code	**ACCA5039**
Title	**Body Mechanics and Creature Animation**
Date	**08/12/2021**
Level	**5**
Credits	**20 credits**
Pre-Requisites	**None**

AIM(S)

- To explore and integrate studies of biomechanics, both internally and externally, in the study of motions and actions and forces in 3D space.
- To advance the student's understanding of simulating biophysical animation and their representation on realistic creatures and characters.

LEARNING OUTCOMES

Upon the successful completion of this module, the student should be able to:

- Demonstrate an advanced appreciation and understanding of physical forces that induce states of change or determine the motion of a character in a scene.
- Extend levels of visual acuity, motion studies and analytical techniques to help in the creature/character creation workflow.

INDICATIVE CONTENT

- Observational analysis and recording of motion (life drawing, photography, film, etc)
- Principles of Animation/Character Animation (e.g. pose to pose, slow-in, slow-out, etc.)
- Timing for animation; screen/interactive planning, co-ordination and timing
- Body mechanics, and animated turntables/moves in 3D space
- Animated cycles, key poses/gestures and acting/staging ideas
- An adoption of displaying weight and force and gravity (etc.) with reference to performance/styles of character
- 2D & 3D computer animation approaches for controlling characters.
- States of matter and their influence upon the action of characters in scenes
- Biological studies and analysis (including musculoskeletal systems)
- Environmental conditions and forces (e.g. gravity, friction, inertia)
- Technical animation and composition factors for characters and creatures within Film, VFX, Games.
- Anatomical studies and illustrations; human and animal biophysical motion studies

- Technically orientated exercises and simulations will incorporate other studies (e.g. bio-medical systems, effects upon physical bodies) and what is required to present these via 3D technology.

- Theoretical input will also cover topics related to the underpinning science and biophysical foundations of motion across life.

Study Time Allocation

The study time for the module is divided as follows:

Activity type	Hours	Percentage
Scheduled learning	48	24%
Independent learning	152	76%
Placement learning	0	0%
TOTAL	**200**	**100%**

ASSESSMENT

Assessment Component 1

☐ **Written exam** ☒ **Coursework** ☐ **Practical**

Mode of assessment	Volume	Weighting
Portfolio	e.g. set of animation moves/actions, methodology/process, 10 mins (per person) presentation (equivalent to 5,000 words)	100%

Assessment Summary

Activity type	Percentage
Written exam	
Coursework	100%
Practical	
TOTAL	**100%**

INDICATIVE READING LIST

Module Code	**ACCA5039**	
Module Title	**Body Mechanics and Creature Animation**	
Classification	**Reading List entry**	**Electronic***
Essential	Roberts, S (2004) *Character Animation in 3D: Use Traditional Drawing Techniques to Produce Stunning CGI Animation* London: Focal Press	☐
Essential	Kundert-Gibbs, J., (2009) *Action! Acting Lessons for CG Animators* London: John Wiley & Sons	☐
Essential	Williams, R. (2002). *The Animator's Survival Kit: A Manual of Methods, Principles, and Formulas for Classical, Computer, Games, Stop Motion, and Internet Animators* London: Faber & Faber	☐
Essential	Knudson, D. (2007) *Fundamentals of Biomechanics*, London: Springer	☐
Essential	Cooper, J. (2019) *Game Anim: Video Game*	☒

	Animation Explained, London: A. K. Peters/CRC Press.	
Essential	McNeill A. R. (2006), *Principles of Animal Locomotion*, London: Princeton University Press	☐
Further	Bourg, D. M. and Bywalec, B. (2013) *Physics for Game Developers: Science, math, and code for realistic effects*, London: O'Reilly Media	☒
Further	Mattesi, M. (2017) *FORCE: Dynamic Life Drawing* CRC Press	☐
Further	Stump, D. (2014) *Digital Cinematography: Fundamentals, Tools, Techniques, and Workflows*. London: Focal Press.	
Further	Hooks, E. (2003) *Acting for Animators: A Complete Guide to Performance Animation*, London: Heinemann	☐
Further	Lasseter, J. (1987) "*Principles of Traditional Animation Applied to 3D Computer Animation*", Computer Graphics, pp. 35-44, 21:4, July 1987 (SIGGRAPH 87).	☒
Further	Living Lines Library https://livlily.blogspot.com/	☒
Further	Animation World Network https://www.awn.com/	☒

Module Code	**ACCA5040**
Title	**Game Theory and Design**
Date	**08/12/2021**
Level	**5**
Credits	**20**
Pre-Requisites	**None**

AIM(S)

- To further develop the student's understanding of the interrelated historical, social, cultural, and technological contexts within which games designers operate. This includes game theory, study of gaming demographics, interactive narrative and general narrative theory.

- To apply project management methodologies and production of industry-level documentation in preparation for the final year of study.

LEARNING OUTCOMES

Upon the successful completion of this module, the student should be able to:

- Demonstrate a critical insight and understanding of industry-standard professional production practices when managing collaborative game development projects, using this experience and information to inform design decisions on future game proposals.

- Practically apply the theoretical content of the module to develop a Game Design Document to a professional level that can be used for the purpose of game development.

INDICATIVE CONTENT

- Application of production management methods in a working environment (e.g. use of Gantt charts, role allocation and agile development to establish and achieve manageable goals, etc.).

- Analysis of current gamer demographics.

- Ludology: game mechanics, game play, flow and game design, game critique and analyses, interactivity, exploration, immersion and suspension of disbelief.

- Application of prototyping as a method of developing gameplay mechanics.

- Introduction to film, literary and narrative theory, including interactive narrative, branching narrative, emergent narrative, storytelling and structures, and character design

- Creation of professional industry-level Design Documentation used in active projects.

Study Time Allocation

The study time for the module is divided as follows:

Activity type	Hours	Percentage
Scheduled learning	48	24%
Independent learning	152	76%
Placement learning	0	0%
TOTAL	**200**	**100%**

ASSESSMENT

Assessment Component 1

☐ **Written exam** ☐ **Coursework** ☒ **Practical**

Mode of assessment	Volume	Weighting
Presentation (group)	10 min per person	50%

Assessment Component 2

☐ **Written exam** ☒ **Coursework** ☐ **Practical**

Mode of assessment	Volume	Weighting
Written assessment	2,500 words	50%

Assessment Summary

Activity type	Percentage
Written exam	
Coursework	50%
Practical	50%
TOTAL	**100%**

INDICATIVE READING LIST

Module Code	**ACCA5040**	
Module Title	**Game Theory and Design**	
Classification	**Reading List entry**	**Electronic***
Essential	Johnson, M. (2018) *The Unpredictability of Gameplay* London: Bloomsbury Academic.	☐
Essential	Fullerton, T., Swain, C. and Hoffman, S. (2004) *Game Design Workshop: Designing, Prototyping and Playtesting Games* San Francisco: CMP Books	☒
Essential	Glassner, A. (2004) *Interactive Storytelling: Techniques for 21st Century Fiction* Natick, Massachusetts: A. K. Peters	☐
Essential	Newton, R. (2007) *Project Management Step by Step: How to Plan and Manage a Highly Successful Project* London: Pearson Business.	☐

Essential	Rogers, S. (2010) *Level Up! The Guide to Great Video Game Design* Chichester: Wiley.	☒
Further	Gunter, B. (2015) *The Effects of Video Games on Children: The Myth Unmasked* London: Bloomsbury Academic	☐
Further	Murray, S. (2018) *On Video Games: The Visual Politics of Race, Gender and Space* London: Bloomsbury Academic.	☐
Further	Adams, E. and Rollings, A. (2007) *Game Design and Development. Fundamentals of Game Design*, Upper Saddle River, NJ: Pearson Education In.	☐
Further	Crawford, C. (2003), *Chris Crawford on Game Design*, Indiana: New Riders Publishing	☐
Further	Johnson, H. and Sims, C. (2012) *Scrum: A Breathtakingly Brief and Agile Introduction* London: Dymaxicon.	☐
Further	McGonigal, J. (2012) *Reality Is Broken: Why Games Make Us Better and How They Can Change the World*, London: Vintage.	☐
Further	Shore, J. and Warden, S. (2007) *The Art of Agile Development* London: O'Reilly Media.	☐
Further	Marx, C. (2007) *Writing for Animation, Comics and Games* Oxford: Focal.	☐
Further	McKee, R. (1999) *Story: Substance, Structure, Style, and the Principles of Screenwriting* London: Methuen Publishing	☐
Further	Rollings, A. and Morris, D. (2004) *Game Architecture and Design* Indianapolis, Indiana: New Riders.	☐
Further	Salen, K. and Zimmerman, E. (2004) *Rules of Play: Game Design Fundamentals* London: MIT	☐
Further	Schell, J. (2008) *The Art of Game Design: A Book of Lenses* London: Morgan Kaufmann.	☐
Further	EDGE, Bath: Future Publishing.	☒
Further	*Games and Culture*, Thousand Oaks, CA.; London: Sage Publications.	☐
Further	*MCV: The Interactive Entertainment Weekly*, Hertfordshire, Intent Media.	☒
Further	http://www.theesa.com/ Entertainment Software Association website	☒
Further	http://gamasutra.com/	☒
Further	http://www.develop-online.net/	☒

Module Code	**ACCA5041**
Title	**Level Design and Development**
Date	**08/12/2021**
Level	**5**
Credits	**20**
Pre-Requisites	**None**

AIM(S)

- To develop the students' ability to research, discuss, critically evaluate, design and create appropriate game content for game environments.
- To apply continued testing, analysis and refinement in gameplay mechanics within a game engine environment.

LEARNING OUTCOMES

Upon the successful completion of this module, the student should be able to:

- Apply knowledge of theoretical design and practical implementation in relation to a functional gameplay and aesthetic prototype.
- Demonstrate an ability to analyse and document the design process and individual contribution to the evolution of the production process.

INDICATIVE CONTENT

- Allocating roles within a production team, with emphasis on: Design, Art, Technical and Animation.
- UI, gameplay and mechanic design.
- Asset creation, modelling, sculpting, texturing and surface shaders.
- Development of character-based control systems and implementation of gameplay mechanics.
- Animation cycles for game character.
- Identify and target suitable audiences.

Study Time Allocation

The study time for the module is divided as follows:

Activity type	Hours	Percentage
Scheduled learning	48	24%
Independent learning	152	76%
Placement learning	0	0%
TOTAL	**200**	**100%**

ASSESSMENT

Assessment Component 1

☐ **Written exam** ☐ **Coursework** ☒ **Practical**

Mode of assessment	Volume	Weighting
Live presentation	10 minutes per student	50%

Assessment Component 2

☐ **Written exam** ☒ **Coursework** ☐ **Practical**

Mode of assessment	Volume	Weighting
Written report	2,000 words	50%

Assessment Summary

Activity type	Percentage
Written exam	
Coursework	50%
Practical	50%
TOTAL	**100%**

INDICATIVE READING LIST

Module Code	**ACCA5041**	
Module Title	**Level Design and Development**	
Classification	**Reading List entry**	**Electronic***
Essential	Bowater, C. and Stenning, D. (2015) *Beginner's Guide to Digital Painting in Photoshop: Characters* London: 3DTotal Publishing.	☒
Essential	Cabera, C. and Urschel, J. (2014) *Digital Painting Techniques: Volume 6.* London: 3DTotal Publishing.	☒
Essential	Hoffman, S. (2004) *Game Design Workshop: Designing, Prototyping and Playtesting Games.* London: Focal Press.	☐
Essential	Rogers, S. (2014) *Level Up! The Guide to Great Video Game Design*. London: Wiley.	☒
Further	Bim, J. (2013) *Digital Lighting And Rendering*. London: New Riders	☒
Further	Georgina, S. (2012) *Designing For Screen: Production Design and Art Direction Explained*. Marlborough: The Crowood Press Ltd	☐
Further	Kremers, R. (2009) *Level Design: Concept, Theory, and Practice*. London: A K Peters/CRC Press	☐
Further	Simblet, S. (2001) *Anatomy for the Artist*. DK	☐
Further	Williams, R. (2009) *The Animator's Survival Kit* London: Faber & Faber	☐

Further	Winslow, C. (2006) *The Handbook of Set Design*. Marlborough: The Crowood Press Ltd	☐
Further	http://gamasutra.com/	☒
Further	https://www.youtube.com/user/3DBuzz	☒
Further	http://www.develop-online.net/	☒

Module Code	**ACCA5042**
Title	**Virtual Production Design**
Date	**08/12/2021**
Level	**5**
Credits	**20**
Pre-Requisites	**None**

AIM(S)

- To apply artistic scene sensibilities and technical decision-making in the visual areas of look development within animation and VFX
- To advance methods in the iterative design process within virtual, realtime technological productions

LEARNING OUTCOMES

Upon the successful completion of this module, the student should be able to:

- Analyse and synthesise the principles of Look Development using both traditional methods and digital virtual technologies
- Acquire visual acuity and competency in production-based skills - within the acquisition, manipulation and calibration of digital virtual worlds

INDICATIVE CONTENT

- The design of film production, animation and cinematic art
- History of digital filmmaking, 3D animation and VFX
- Production management, co-ordination and planning
- Stages from previs to postvis in 3D/virtual production
- Traditional studio and real-world camera movements
- Film grammar, shot types and pre-visualisation
- Narrative structures and scene compositions
- 3D asset constructs and deliverables for a specific shot/production
- Painting with light (cinematographers and DOPs in film and animation)
- Integration and deployment of VFX within live action
- Look development iterative stages and realisation
- Virtual production forms and industry applications
- The art of lighting and texturing (e.g. inc. SUBSTANCE PAINTER)

- Physics and VFX-orientated techniques (e.g. inc. HOUDINI, UNITY, UDK)
- Physical and virtual camera technology and control
- Advanced material and shader development
- Management of assets tracking and visual elements in VP
- Extending the quality of virtual locations and environments
- Iterative development and transitions on shots
- Advanced compositing techniques (e.g. inc. NUKE)
- Creature FX, live action and cinematography

Study Time Allocation

The study time for the module is divided as follows:

Activity type	Hours	Percentage
Scheduled learning	48	24%
Independent learning	152	76%
Placement learning	0	0%
TOTAL	**200**	**100%**

ASSESSMENT

Assessment Component 1

☐ **Written exam** ☒ **Coursework** ☐ **Practical**

Mode of assessment	Volume	Weighting
Planning and realisation of VFX Shot & presentation	12 mins	70%

Assessment Component 2

☐ **Written exam** ☒ **Coursework** ☐ **Practical**

Mode of assessment	Volume	Weighting
Production Tracking	1,500 words	30%

Assessment Summary

Activity type	Percentage
Written exam	
Coursework	100%
Practical	
TOTAL	**100%**

INDICATIVE READING LIST

Module Code	ACCA5042	
Module Title	Virtual Production Design	
Classification	Reading List entry	Electronic*
Essential	Murdock, K. (2020) *Autodesk Maya 2020* London: SDC Publications	☐
Essential	Williams, E (2021) *Virtual Reality Cinema: Narrative Tips and Techniques* London: Routledge	☐
Essential	Shannon, T. (2017) *Unreal Engine 4 for Design Visualization: Developing Stunning Interactive Visualizations, Animations, and Renderings,* London: Pearson Education (US)	☐
Essential	Gauthier, J-M. (2005) *Building Interactive Worlds in 3D: Virtual Sets and Pre-visualization for Games, Film and the Web* London: Routledge	
Essential	Doyle, B. F (2019) *Understanding Design in Film Production: Using Art, Light & Locations to Tell Your Story* London: Routledge	
Further	McDermott, W. (2018) *The PBR Guide: A Handbook for Physically Based Rendering* London: Allegorithmic	☐
Further	Ettedgui, P. (2001) *Production Design and Art Direction (Screencraft,* London: Focal Press	☐
Further	Tickoo, S. (2020) *Pixologic ZBrush 2020: A Comprehensive Guide* London: CADCIM Technologies	☐
Further	Bennett, T. and Berry, P. (2021) *The Story of Marvel Studios: The Making of the Marvel Cinematic Universe* London: Abrams Books	☐
Further	Dinur, E. (2017) *The Filmmaker's Guide to Visual Effects: The Art and Techniques of VFX for Directors, Producers, Editors and Cinematographers* London: Routledge	☐
Further	Brinkmann, R. (2008) *The Art and Science of Digital Compositing: Techniques for Visual Effects, Animation and Motion Graphics* London: Morgan Kaufmann	☐
Further	Birn, J. (2000) *Digital Lighting and Rendering* London: New Riders	☐
	Lanier, L. (2017) *Advanced Visual Effects Compositing: Techniques for Working with Problematic Footage* London: Routledge	
Further	Home Page - The Art of VFX	☒
Further	VFXWorld Magazine | Animation World Network (awn.com)	☒
Further	Art of LED Wall Virtual Production, Part One: 'Lessons from the Mandalorian' – fxguide	☒
Further	RealTime Conference: The World's Premiere Event for Real-Time Technologies	☒

Module Code	**ACCA5043**
Title	**Visual Effects**
Date	**08/12/2021**
Level	**5**
Credits	**20**
Pre-Requisites	**None**

AIM(S)

- To provide students with an advanced ability to integrate photorealistic computer-generated assets within live action footage through comprehensive theoretical and practical knowledge.

- To further advance the student's visual aesthetic and technical skills required for the photorealistic integration of these CG assets with live action footage.

LEARNING OUTCOMES

Upon the successful completion of this module, the student should be able to:

- Effectively manipulate individual visual components in the process of designing photorealistic composites or cinematically coherent scenes.

- Evaluate the skills and concepts that inform the role of a digital compositor and the artistic and technical balance required in manipulating the cg elements (e.g. textures, shader development, lighting, rendering passes and plates).

INDICATIVE CONTENT

- Creative thinking & idea generation

- Learning to See – Human eye, perception and 'ways of seeing'

- Colour and light in nature and in art history

- Colour Science and digital representation of visual information

- Digital images – structure, resolution, pixel aspect ratio.

- Image and sound relationships and impact

- Point tracking and planar tracking.

- Image enhancement – histograms, curves, colour spaces.

- Alpha channels and mattes

- 2D and 3D compositing techniques – rotoscoping, keying, layer masks, blending

- Matte Painting – history and techniques

- Colour correction and grading

- Green screen compositing
- High dynamic range, light wrapping, bit depth
- A range of effects simulation techniques
- Hierarchical systems - rigging techniques and character-driven simulation
- Physics - Newton's laws of motion, forces and fields
- Rendering and simulation technologies using an HPC cluster

Study Time Allocation

The study time for the module is divided as follows:

Activity type	Hours	Percentage
Scheduled learning	48	24%
Independent learning	152	76%
Placement learning	0	0%
TOTAL	**200**	**100%**

ASSESSMENT

Assessment Component 1

☐ **Written exam** ☐ **Coursework** ☒ **Practical**

Mode of assessment	Volume	Weighting
Presentation	15-20 minutes	80%

Assessment Component 2

☐ **Written exam** ☒ **Coursework** ☐ **Practical**

Mode of assessment	Volume	Weighting
Production Diary	1,000 words	20%

Assessment Summary

Activity type	Percentage
Written exam	
Coursework	20%
Practical	80%
TOTAL	**100%**

INDICATIVE READING LIST

Module Code	**ACCA5043**	
Module Title	**Visual Effects**	
Classification	**Reading List entry**	**Electronic***
Essential	Wright, S., (2011) *Compositing Visual Effects: Essentials for the Aspiring Artist* London: Focal Press.	☐
Essential	Ganbar, R., (2011) *Nuke 101: Professional Compositing and Visual Effects* London: Peachpit Press	☐
Essential	Lanier, L. (2009) *Professional Digital Compositing: Essential Tools and Techniques* London: John Wiley & Sons	☐
Further	Dobbert, T. (2012) *Matchmoving: The Invisible Art of Camera Tracking* London: John Wiley & Sons	☐
Further	Okun, J. A. (2012) *The VES Handbook of Visual Effects: Industry Standard VFX Practices and Procedures* London: Focal Press	☐
Further	Foster, J., (2010) *The Green Screen Handbook: Real-World Production Techniques*, London: John Wiley & Sons	☐
Further	Frost. J. B. (2009) *Cinematography for Directors: A Guide for Creative Collaboration*, London: Michael Wiese Productions	☐
Further	Bluttman, K. (2012) *Digital Photography in Simple Steps* London: Pearson	☐
Further	Bridson, R. (2008) *Fluid Simulation for Computer Graphics*, London: A K Peters/CRC Press	☐
Further	Flake, G. (2000)*The Computational Beauty of Nature: Computer Explorations of Fractals, Chaos, Complex Systems and Adaptation* London: MIT Press	☐

Module Code	**ACCA5045**
Title	**Evolving Your Creative Craft**
Date	**18/10/2023**
Level	**5**
Credits	**20**
Pre-Requisites	**None**
DBS Check	**May be required ☐ Not required ☒**

AIM(S)

- To advance students' creative craft in the areas of modelling, texturing, and prop design, while also providing exposure to industry professionals through guest speaker sessions.

LEARNING OUTCOMES

Upon the successful completion of this module, the student should be able to:

- analyse and integrate feedback to refine and evolve their creative work;
- gain insights from industry professionals and integrate their knowledge into their creative practice.

INDICATIVE CONTENT

1. Advanced 3D Modelling Techniques:
    - Advanced polygonal modelling techniques for complex objects and characters.
    - High-resolution sculpting and detailing techniques.
    - Retopology and optimization for animation and real-time rendering.
    - Advanced rigging and posing techniques.
2. Texturing and Shading:
    - Procedural and hand-painted texture creation.
    - Advanced UV mapping and texture unwrapping techniques.
    - Material creation and shading networks for realistic rendering.
    - PBR (Physically Based Rendering) workflows and material integration.
3. Prop Design and Integration:
    - Analysing and recreating real-world objects and props.
    - Designing and integrating props into 3D scenes and environments.
    - Understanding scale, composition, and visual storytelling through prop design.

- Enhancing realism through lighting and material interaction with props.

4. Industry Speaker Sessions:

   - Inviting industry professionals as guest speakers to share their insights and experiences.
   - Q&A sessions and discussions on current trends, challenges, and opportunities.
   - Case studies of successful projects and collaborations within the industry.

Study Time Allocation

The study time for the module is divided as follows:

Activity type	Hours	Percentage
Scheduled learning	48	24%
Independent learning	152	76%
Placement learning	0	0%
TOTAL	**200**	**100%**

ASSESSMENT

Assessment Component 1
(Tick one)

☐ **Written exam** ☒ **Coursework** ☐ **Practical**

Mode of assessment	Volume	Weighting
Written report	2,000 words	50%

Assessment Component 2
(Tick one)

☐ **Written exam** ☒ **Coursework** ☐ **Practical**

Mode of assessment	Volume	Weighting
Model / 3D Turnaround Portfolio	4-5 elements	50%

Assessment Summary

Activity type	Percentage
Written exam	
Coursework	100%
Practical	
TOTAL	**100%**

INDICATIVE READING LIST

Module Code	**ACCA5045**	
Module Title	**Evolving Your Creative Craft**	
Classification	**Reading List entry**	**Electronic***
Essential	Hamdani, A & Barreto, C. (2023) *3D Environment Design with Blender: Enhance your modelling texturing and lighting skills to create realistic 3D scenes.* Packt.	☒

Essential	Ferrier, M. (2018) *Texturing for Games: A Guide for Beginners.* CRC Press.	☒
Essential	Murdock, Kelly L (2023) *Autodesk Maya 2024 Guide.* SDC Publications.	☒
Further	Kermode, M. (2019). *The Making of Alien: Resurrection.* Titan Books.	☒
Further	Rogers, S. (2014). *Level Up! The Guide to Great Video Game Design.* John Wiley & Sons.	☐
Further	Totten, C., (2019) *An Architectural Approach to Level Design.* CRC Press.	☒

Module Code	**ACCA5046**
Title	**Experimental Animation Techniques**
Date	**18/10/2023**
Level	**5**
Credits	**10**
Pre-Requisites	**None**
DBS Check	**May be required ☐ Not required ☒**

AIM(S)

- To develop the student's individual self-expression through the manipulation and experimentation of animated artefacts, via established and alternative production processes.

LEARNING OUTCOMES

Upon the successful completion of this module, the student should be able to:

- demonstrate an advanced appreciation and understanding of animated innovations and invention, their study, and the principles underlying the representation of these forms in trans-dimensional space(s);

- develop skills and new appreciations of the range of methods by which motion can be employed with reference to the staging and technical overlaps between various media and techniques.

INDICATIVE CONTENT

- Research and analysis of visual material and self-sustained visual research.

- History of animated filmmaking and special fx.

- Observational analysis and life drawing (via poses, photography, film etc).

- Principles of Animation/Character Animation (e.g. pose to pose, slow-in, slow-out, etc.).

- The study and analysis of the natural world (and motions) and their representations in film / animation.

- Planning, layout and (pre)visualisation of shot(s).

- Art direction & conceptual design approaches.

- 2D, 3D and hybrid animation techniques.

- Types of shots, framing and composition.

- Techniques in scene development and modification.

- Camera positions, movements and techniques.

- Matte painting integration and composition.

- Titles and credits sequences, graphics, logos and idents.
- Cut-out, model sculpting and miniatures (physical).
- Model-stopframe, puppetry and digital crossovers.
- Construction of narrative design elements, staging and co-ordination of components.
- Identification of character / asset design aesthetics and/or structure.
- 2D / 3D / VFX progress and progression reels.
- Creation and completion of the animated shot and/or image.
- Management and manipulation of production stages.

Study Time Allocation

The study time for the module is divided as follows:

Activity type	Hours	Percentage
Scheduled learning	24	24%
Independent learning	76	76%
Placement learning	0	0%
TOTAL	**100**	**100%**

ASSESSMENT

Assessment Component 1
(Tick one)

☐ **Written exam** ☒ **Coursework** ☐ **Practical**

Mode of assessment	Volume	Weighting
Video presentation - an edited breakdown on the development and manufacture of a short animated sequence	20 secs in length, 2,500 words equivalent	100%

Assessment Summary

Activity type	Percentage
Written exam	
Coursework	100%
Practical	
TOTAL	**100%**

INDICATIVE READING LIST

Module Code	**ACCA5046**	
Module Title	**Experimental Animation Techniques**	
Classification	**Reading List entry**	**Electronic***
Further	Murdock, K. L. (2022) *Autodesk Maya 2023 Basics Guide.* SDC Publications.	☐

Essential	Shaw, S (2017) *Stop Motion: Craft Skills for Model Animation.* Routledge.	☐
Essential	Uesugi, Dennison (2010) *d'Artistie Matte Painting Masterclass books.* Ballistic Publishing.	☐
Further	Matte Painting: An Introduction to Matte Painting | Art Rocket (clipstudio.net).	☒
Essential	Doyle, B. F. (2019) *Understanding Design in Film Production: Using Art, Light & Locations to Tell Your Story.* Routledge.	☐
Further	Gilland, J. (2008) *Elemental Magic: Volumes 1 + 2.* Routledge.	☐
Further	Harris, M. Husbands, L. Taberham, P. (2019) *Experimental Animation: From Analogue to Digital.* Routledge.	☐
Further	Wells, P. Hardstaff, J. (2008) *Re-imagining Animation: The Changing Face of the Moving Image.* AVA Publishing.	☐
Further	Fox, T. (2022), *Anatomy for Artists: Drawing Form & Pose.* 3D Total Publishing.	☐
Further	Roberts, S. (2021) *Animation Techniques.* Crowood Press.	☐
Further	Blazer, L (2019) *Animated Storytelling.* Peachpit Press.	☐
Further	Shaw, A, (2019) *Design for Motion: Fundamentals & Techniques of Motion Design.* Routledge.	☐
Further	Johnson, O. & Thomas, F. (1995) *The Illusion of Life: Disney Animation.* Hyperion Press.	☐
Further	FX Guide: https://www.fxguide.com	☒
Further	Short of the Week: https://www.shortoftheweek.com	☒
Further	Adobe: What Is Motion Graphics? A Complete Guide | Adobe.	☒
Further	Studio Binder: https://www.studiobinder.com/catergory/directing/cinematography	☒
Further	Forget the Films, watch the titles: Forget the Film, Watch the Titles!	☒

Module Code	**ACCA5047**
Title	**Narrative and World-Building**
Date	**18/10/2023**
Level	**5**
Credits	**10**
Pre-Requisites	**None**
DBS Check	**May be required ☐ Not required ☒**

AIM(S)

- To develop students' skills in creating compelling narratives and immersive worlds across various media platforms.

LEARNING OUTCOMES

Upon the successful completion of this module, the student should be able to:

- analyse and apply storytelling techniques to create engaging narratives;
- develop immersive and cohesive worlds across different media forms.

INDICATIVE CONTENT

1. Narrative Elements and Structure:
    - Understanding narrative theories and storytelling techniques.
    - Character development, arc, and motivation.
    - Plot structure, conflict, and resolution.
    - Crafting engaging dialogue and subtext.
2. World-Building Techniques:
    - Developing believable and immersive fictional worlds.
    - Creating consistent and cohesive visual and narrative elements.
    - Defining rules, cultures, and histories of fictional worlds.
    - Incorporating world-building into different media formats.
3. Transmedia Storytelling:
    - Exploring storytelling across multiple media platforms.
    - Integrating narratives and world-building across various media forms.
    - Creating synergy and coherence within transmedia projects.
    - Analysing successful transmedia campaigns and franchises.

Study Time Allocation

The study time for the module is divided as follows:

Activity type	Hours	Percentage
Scheduled learning	24	24%
Independent learning	76	76%
Placement learning	0	0%
TOTAL	**100**	**100%**

ASSESSMENT

Assessment Component 1
(Tick one)

☐ **Written exam** ☒ **Coursework** ☐ **Practical**

Mode of assessment	Volume	Weighting
Worldbuilding/Character Portfolio	3-4 elements, 2,500 words equivalent	100%

Assessment Summary

Activity type	Percentage
Written exam	
Coursework	100%
Practical	
TOTAL	**100%**

INDICATIVE READING LIST

Module Code	**ACCA5047**	
Module Title	**Narrative and World-Building**	
Classification	**Reading List entry**	**Electronic***
Essential	Glassner, A. (2022). *Interactive Storytelling: Techniques for 21st Century Fiction.* CRC Press.	☒
Essential	Hartmann, R and Chilton, E (2020) *The Structure of Story: how to Write Great Stories by Focusing on What Really Matters.* Kiingo.	☒
Further	Wardrip-Fruin, N., & Harrigan, P. (2012) *Third Person: Authoring and Exploring Vast Narratives.* The MIT Press.	☐
Further	Crawford, C. (2012) *Chris Crawford on Interactive Storytelling.* New Riders.	☒
Further	Jenkins, H. (2008) *Convergence Culture: Where Old and New Media Collide.* NYU Press.	☐
Further	McKee, R. (1997) *Story: Substance, Structure, Style, and the Principles of Screenwriting.* HarperCollins.	☐
Further	Medows, M. (2003) *Pause and Effect: The Art of Interactive Narrative.* New Riders.	☐
Further	Vogler, C. (2020) *The Writer's Journey: Mythic Structure for Storytellers and Screenwriters, 25th Anniversary Edition.* Pan.	☒

Module Code	**ACCA5048**
Title	**Sound Design**
Date	**18/10/2023**
Level	**5**
Credits	**10**
Pre-Requisites	**None**
DBS Check	**May be required ☐ Not required ☒**

AIM(S)

- To provide students with a comprehensive understanding of sound design principles and their applications across various industries, equipping them with the skills necessary to create immersive auditory experiences in fields such as film, animation, video games, virtual reality, and multimedia installations.

LEARNING OUTCOMES

Upon the successful completion of this module, the student should be able to:

- exhibit a comprehension of fundamental sound design principles and methodologies;
- implement established sound design techniques commonly utilised in the industry to craft and manipulate auditory environments, sound effects, spoken content, and music, with the aim of enriching narratives and eliciting precise emotional responses.

INDICATIVE CONTENT

1. Introduction to Sound Design:
   - Principles and theories of sound design for various media forms.
   - Analysing the role of sound in enhancing storytelling and creating mood.
   - Understanding the elements of sound design, including Foley, ambience, and sound effects.
2. Recording and Editing Techniques:
   - Microphone selection and placement for capturing high-quality audio.
   - Recording and editing techniques for Foley, dialogue, and sound effects.
   - Understanding audio editing software and plugins.
   - Noise reduction, equalization, and mixing techniques.
3. Sound Design for Media:
   - Sound design considerations for film, animation, games, and interactive media.
   - Creating soundscapes and ambiences to enhance the overall experience.
   - Implementing audio synchronization and interactive audio elements.

- Exploring adaptive audio techniques for responsive and dynamic sound design.

Study Time Allocation

The study time for the module is divided as follows:

Activity type	Hours	Percentage
Scheduled learning	24	24%
Independent learning	76	76%
Placement learning	0	0%
TOTAL	**100**	**100%**

ASSESSMENT

Assessment Component 1
(Tick one)

☐ **Written exam** ☐ **Coursework** ☒ **Practical**

Mode of assessment	Volume	Weighting
Practical assessment with production showcased by PowerPoint presentations	2,500 words equivalent	100%

Assessment Summary

Activity type	Percentage
Written exam	
Coursework	100%
Practical	
TOTAL	100%

INDICATIVE READING LIST

Module Code	**ACCA5048**	
Module Title	**Sound Design**	
Classification	**Reading List entry**	**Electronic***
Essential	Yewdall, D. L. (2019) *Practical Art of Motion Picture Sound (Fourth Edition).* Focal Press.	☒
Essential	Hillman, Neil (2021) *Sound for Moving Pictures: The Four Sound Areas (Sound Design).* Focal Press.	☒
Further	Harrison, T. (2021) *Sound Design for Film.* Crowood Press Ltd.	☒
Further	Case, A. (2017) *Sound Design: The Expressive Power of Music, Voice and Sound Effects in Cinema.* Michael Wiese Productions.	☒
Further	Sonnenschein, D. (2012) *Sound Design: The Complete Guide to Film and Video Game Sound Design.* Michael Wiese Productions.	☐
Further	Rose, J. (2018) *Audio Postproduction for Film and Video.*	☐
Further	McGregor, Iain (2020) *Sound Design*. Independent Publication.	☒

Module Code	**ACCB5011**
Title	**Advanced Software Development**
Date	**09/09/2020**
Level	**5**
Credits	**20**
Pre-Requisites	**None**

AIM(S)

- To provide students with a conceptual understanding of abstract data types, data structures and algorithms used in computer science and software engineering and the ability to apply these concepts using object oriented (OO) development methods

LEARNING OUTCOMES

Upon the successful completion of this module, the student should be able to:

- Critically evaluate the suitability of selected algorithms and data structures to solve given problems
- Develop OO solutions to solve a given problem scenario(s)

INDICATIVE CONTENT

- Abstract data types (ADT)
- Simple data structures e.g. stacks, queues
- Complex data structures and algorithms e.g. lists, linked lists, heaps
- Graphs – properties and graph traversal
- Trees – properties, traversal, balancing
- Hashing
- Algorithms for sorting
- Algorithms for searching.
- Containers and iterators
- Object oriented concepts e.g. classes, objects, encapsulation, inheritance and polymorphism
- Essential object oriented programming principles

Study Time Allocation

The study time for the module is divided as follows:

Activity type	Hours	Percentage
Scheduled learning	48	24%
Independent learning	152	76%
Placement learning	0	0%
TOTAL	**200**	**100%**

ASSESSMENT

Assessment Component 1

☐ **Written exam** ☒ **Coursework** ☐ **Practical**

Mode of assessment	Volume	Weighting
Implementation and Essay	2500 words equivalent	50%

Assessment Component 2

☒ **Written exam** ☐ **Coursework** ☐ **Practical**

Mode of assessment	Volume	Weighting
Exam	2 hours	50%

Assessment Summary

Activity type	Percentage
Written exam	50%
Coursework	50%
Practical	0%
TOTAL	**100%**

INDICATIVE READING LIST

Module Code	ACCB5011	
Module Title	Advanced Software Development	
Classification	**Reading List entry**	**Electronic***
Essential	Horton, I., Weert, P.V., (2018), Beginning C++17: From Novice to Professional, 5th Edition, Apress	☐
Essential	Cormen, T.H., Leiseron, C.E., (2009) Introduction to Algorithms, MIT Press	☐
Further	Greene, J., Stellman, A., (2020) Head First C#, 4th Edition, O'Reilly	☐
Further	Weisfeld, M., (2018), The Object-Oriented Thought Process, Addison Wesley	☐
Further	Sedgewick, R., (2011) Algorithms, 4th edition, Addison-Wesley	☐

Module Code	**ACCB5017**
Title	**Games Architecture and Mechanics**
Date	**09/09/2020**
Level	**5**
Credits	**20**
Pre-Requisites	**None**

AIM(S)

- To achieve a systematic understanding of core games software, tools and concepts used in games and physics engines.

LEARNING OUTCOMES

Upon the successful completion of this module, the student should be able to:

- Demonstrate a sound understanding of the architecture of games and physics engine components necessary for the development of games software.
- Deploy appropriate languages, tools and techniques in the development of games and game physics applications.

INDICATIVE CONTENT

- Games programming principles and techniques
- Games programming design patterns
- Application and use of software libraries, SDKs and APIs used in Games programming
- Application of specified programming language (C/C++)
- Cross platform development for game development QT, SDL2, etc.
- Importing game resources e.g. textures, audio, 3D models, etc
- Principles of 3D graphics and the Graphics pipeline
- Graphics APIs, eg OpenGL
- Physics Engine architecture
- Mechanics
- Bounding Volumes
- Collision Detection
- Collision Response
- Numerical Integration and updates

- Physics Engine APIs and libraries, eg Bullet, PhysX, etc.

Study Time Allocation

The study time for the module is divided as follows:

Activity type	Hours	Percentage
Scheduled learning	48	24%
Independent learning	152	76%
Placement learning	0	0%
TOTAL	**200**	**100%**

ASSESSMENT

Assessment Component 1

☐ **Written exam** ☒ **Coursework** ☐ **Practical**

Mode of assessment	Volume	Weighting
Written Assessment	2500 words	50%

Assessment Component 2

☐ **Written exam** ☒ **Coursework** ☐ **Practical**

Mode of assessment	Volume	Weighting
Written Assessment	2500 words	50%

Assessment Summary

Activity type	Percentage
Written exam	0%
Coursework	100%
Practical	0%
TOTAL	**100%**

INDICATIVE READING LIST

Module Code	ACCB5017	
Module Title	Games Architecture and Mechanics	
Classification	**Reading List entry**	**Electronic***
Essential	Millington. I. (2010) Game Physics Engine Development 2nd Edition, CRC Press	☒
Essential	Van Verth, J.M, Bishop, L.M (2015) Essential Mathematics for Games and Interactive Applications. A Programmers Guide, Morgan Kaufmann	☒
Essential	Hearn, D and Baker, P.M (2010) Computer Graphics with OpenGL, 4th Edition, Prentice Hall	☒
Essential	Nystrom, R (2014) Games Programming Patterns, Genever Benning	☒
Further	Shreiner, D, et al (2016) OpenGL Programming Guide, 9th Edition, Addison-Wesley	☒

Further	Lengyel, E (2011) Mathematics for 3D Game Programming and Computer Graphics 3rd Edition, Cengage Learning	☐
Essential	Lengyel, E. (2016) Foundations of Game Engine Development, Volume 1: Mathematics, Terathon Software.	☐
Further	Lengyel, E. (2016) Foundations of Game Engine Development, Volume 2: Rendering, Terathon Software.	☐

Module Code	**ACCB5021**
Title	**Statistical Programming**
Date	**09/09/2020**
Level	**5**
Credits	**20**
Pre-Requisites	**None**

AIM(S)

- To develop the knowledge and skills required to perform more advanced statistical analysis of experimental and informatics data.
- To develop the knowledge and skills required to perform basic statistical programming in an appropriate programming language.

LEARNING OUTCOMES

Upon the successful completion of this module, the student should be able to:

- Select and apply appropriate statistical methods for the analysis of experimental data
- Manipulate data and implement statistical programming techniques on large datasets
- Select and apply appropriate visualisation methods for the presentation of analytical data

INDICATIVE CONTENT

- Data input and output in multiple formats, including graphical plots
- Scripts and functions
- Performing basic statistical analyses including correlation analysis and statistical tests.
- Building packages with suitable documentation and examples
- Data preparation for import into analysis and visualisation tools

Study Time Allocation

The study time for the module is divided as follows:

Activity type	Hours	Percentage
Scheduled learning	48	24%
Independent learning	152	76%
Placement learning	0	0%
TOTAL	**200**	**100%**

ASSESSMENT

Assessment Component 1

☐ **Written exam** ☒ **Coursework** ☐ **Practical**

Mode of assessment	Volume	Weighting
Programming problems	2500 words equivalent	50%

Assessment Component 2

☐ **Written exam** ☒ **Coursework** ☐ **Practical**

Mode of assessment	Volume	Weighting
Programming problems	2500 words equivalent	50%

Assessment Summary

Activity type	Percentage
Written exam	0%
Coursework	100%
Practical	0%
TOTAL	**100%**

INDICATIVE READING LIST

Module Code	ACCB5021	
Module Title	Statistical Programming	
Classification	**Reading List entry**	**Electronic***
Essential	Matloff, N (2013) *The Art of R Programming*, No Starch Press	☒
Further	Kranzler, J.H. (2010) *Statistics for the Terrified*, Pearson	☒
Further	Cotton, R (2013) *Learning R*, O'Reilly	☒
Further	Alvaro, F (2016) *R: Easy R Programming for Beginners*, Pearson	☒
Further	Spiegel, M.R (2014) *Shaum's Outline of Statistics, fifth ed.*, McGraw Hill Education Limited	☒
Further	Gonick, L & Smith, W. (2000) *Cartoon Guide to Statistics*, William Morrow Paperbacks	☒

Module Code	**ACCB5027**
Title	**Geographical Information Systems**
Date	**22/08/2022**
Level	**5**
Credits	**20**
Pre-Requisites	**None**

AIM(S)

- To introduce the student to the science technology and management of geographical information. The student should develop a critical understanding of the underlying theories of GIS through examination of current GIS software trends. A coherent understanding of geovisualisation is regarded as a key concept and will be developed throughout the module.

LEARNING OUTCOMES

Upon the successful completion of this module, the student should be able to:

- Evaluate and critically appraise a variety of application areas, which could benefit from a GIS solution.
- Demonstrate a conceptual understanding of visual perception and communications, analysing a real world scenario of GIS as a member of a team, applying appropriate design methods and tools
- Accurately identify spatial databases and understand the concepts of manipulating and representing spatial data solutions.

INDICATIVE CONTENT

- Identifying types of data involved in Geo-information systems including DIGIMAP.
- Fundamental theories of spatial databases and spatial analysis including SQL.
- Geovisualisation and cartographic representation of sociodemographic data.
- The principles of thematic mapping and attributes of spatial data sets.
- Evaluating usage of GIS within the organisations including location-based services, location intelligence and epidemiology studies.
- Using appropriate GIS software for data analysis.
- Development of end user GIS applications.
- Use of appropriate collaborative tools.

Study Time Allocation

The study time for the module is divided as follows:

Activity type	Hours	Percentage
Scheduled learning	48	24%
Independent learning	152	76%
Placement learning	0	0%
TOTAL	**200**	**100%**

ASSESSMENT

Assessment Component 1

☐ **Written exam** ☒ **Coursework** ☐ **Practical**

Mode of assessment	Volume	Weighting
Research Report	2500 words	50%

Assessment Component 2

☐ **Written exam** ☒ **Coursework** ☐ **Practical**

Mode of assessment	Volume	Weighting
Report / Demo (group work)	2500 words	50%

Assessment Summary

Activity type	Percentage
Written exam	0%
Coursework	100%
Practical	0%
TOTAL	**100%**

INDICATIVE READING LIST

Module Code	**ACCB5027**	
Module Title	**Geographical Information Systems**	
Classification	**Reading List entry**	**Electronic***
Essential	Longley, P, Goodchild, M, Maguire, D, Rhind, D (2015)*Geographical Information Systems and Science*, Wiley	☒
Essential	Heywood, I., Cornelius, S. and Carver, S. (2011) *An Introduction to Geographical Information Systems*, Prentice Hall	☒
Further	Daniel, L., Loree, P. and Whitener, A. (2002) *Inside MapInfo Professional,* Onward Press,	☐
Further	Worboys, M. and Duckham, M. (2004)	☐
Further	Whitener, A. (1997) *MapBasic Developers Guide*, Onword Press	☐
Further	http://www.mapinfo.co.uk	☒
Further	http://www.agi.org.uk/	☒
Further	http://www.ordnancesurvey.co.uk/oswebsite/	☒
Further	http://ukdataservice.ac.uk/	☒
Further	http://digimap.edina.ac.uk/digimap/home	☒

Module Code	**ACCB5029**
Title	**Network Programmability**
Date	**22/08/2022**
Level	**5**
Credits	**20**
Pre-Requisites	**None**

AIM(S)

- To give students the ability to work with network programmability and automation tools, with a further focus on software devops.

LEARNING OUTCOMES

Upon the successful completion of this module, the student should be able to:

- Demonstrate a robust understanding of the key principles of network programmability tools and languages to solve specific problems.

- Apply appropriate analysis, design, implementation and testing techniques for programming and automation of network devices working as member of a development team

INDICATIVE CONTENT

- Configuration management and orchestration tools, e.g. Chef, Puppet, Ansible, Saltstack, Terraform, Pulumi.

- Principles and practice of Infrastructure as Code (IaC).

- Key scripting languages for network programmability, e.g. Python, JavaScript, Bash, PowerShell.

- Software design principles for network engineers: devops, continuous integration, source control, etc.

- Necessary auxiliary technologies for network programmability, e.g. Linux, Mako, Ruby, XML, JSON, YAML.

- Data modelling languages, e.g. YANG.

- API programming for networking and automation, e.g. the NAPALM library.

- Programming for IoT implementation

- Tools used to facilitate team working eg Git

Study Time Allocation

The study time for the module is divided as follows:

Activity type	Hours	Percentage
Scheduled learning	48	24%
Independent learning	152	76%
Placement learning	0	0%
TOTAL	**200**	**100%**

ASSESSMENT

Assessment Component 1

☐ **Written exam** ☒ **Coursework** ☐ **Practical**

Mode of assessment	Volume	Weighting
Implementation (group work) + report	2500 words equivalent	50%

Assessment Component 2

☐ **Written exam** ☒ **Coursework** ☐ **Practical**

Mode of assessment	Volume	Weighting
Essay	2500 words	50%

Assessment Summary

Activity type	Percentage
Written exam	0%
Coursework	100%
Practical	0%
TOTAL	**100%**

INDICATIVE READING LIST

Module Code	**ACCB5029**	
Module Title	**Network Programmability**	
Classification	**Reading List entry**	**Electronic***
Essential	Jason Edelman, Scott S. Lowe, Matt Oswalt. Network Programmability and Automation: Skills for the Next-Generation Network Engineer. 2018, O'Reilly Media	☐
Essential	Kief Morris. Infrastructure as Code: Managing Servers in the Cloud. 2016, O'Reilly Media	☐
Further	Betsy Beyer, Jennifer Petoff, Chris Jones, Niall Richard Murphy. Site Reliability Engineering. 2016, O′Reilly	☐
Further	Sam Washington & M.O Faruque Sarker. Learning Python Network Programming 2015, Packt Publishing	☐
Further	ACM	☒
Further	IEEE	☒
Further	Computer Networking	☒
Further	Data Communications	☒

Module Code	ACCB5030
Title	Software Engineering Principles and Testing
Date	22/08/2022
Level	5
Credits	20
Pre-Requisites	None

AIM(S)

- To enable students to evaluate and deploy appropriate software methodologies, software development methods, tools and techniques in the design and testing of software.

LEARNING OUTCOMES

Upon the successful completion of this module, the student should be able to:

- Evaluate software development approaches, software development methodologies, software design techniques and approaches for collaborative working

- Recognise the importance of software testing and demonstrate knowledge of the essential principles of test development

- Apply effective judgement in the selection and deployment of software development principles and techniques in the implementation of software, working individually and as a member of a team

INDICATIVE CONTENT

- Software development process and approaches e.g. Software Development Life-Cycle (SDLC), Agile, SCRUM

- Software development methodologies and approaches e.g. Waterfall, Spiral, Iterative Development, RUP

- Software development methods e.g. Feature Driven Development

- Software design methods e.g. User Stories vs Use Cases, Class Diagrams

- Software quality and complexity e.g. coding standards, Cyclomatic complexity

- Software development tools e.g. UML design tools, code coverage tools, software configuration management (SCM)

- Essential software testing principles and concepts e.g. Black Box vs White Box, Unit Testing

- Software test frameworks

- Software design principles and patterns e.g. cohesion vs coupling, Decorator Pattern

Study Time Allocation

The study time for the module is divided as follows:

Activity type	Hours	Percentage
Scheduled learning	48	24%
Independent learning	152	76%
Placement learning	0	0%
TOTAL	**200**	**100%**

ASSESSMENT

Assessment Component 1

☐ **Written exam** ☒ **Coursework** ☐ **Practical**

Mode of assessment	Volume	Weighting
Essay and Implementation	5000 words equivalent	100%

Assessment Summary

Activity type	Percentage
Written exam	0%
Coursework	100%
Practical	0%
TOTAL	**100%**

INDICATIVE READING LIST

Module Code	**ACCB5030**	
Module Title	**Software Engineering Principles and Testing**	
Classification	**Reading List entry**	**Electronic***
Essential	Sommerville, I. (2015), Software Engineering, , Pearson	☒
Essential	Ammann, P., Offutt, J., (2016) Introduction to Software Testing, 2nd Edition, Cambridge University Press	☒
Further	Gamma, E., Helm, R. Johnson, R., Vlissides, J., (1994), Design patterns : elements of reusable object-oriented software, Addison Wesley	☒
Further	Crispin, L., (2008), Agile Testing: A Practical Guide for Testers and Agile Teams, Addison-Wesley	☒
Further	Martin, R., (2008), Clean Code: A Handbook of Agile Software Craftsmanship, Prentice Hall	☒
Further	Langr, J., (2013), Modern C++ Programming with Test-Driven Development: Code Better, Sleep Better, Pragmatic Bookshelf	☒
Further	Sutherland, J., (2015) Scrum: The Art of Doing Twice the Work in Half the Time, Random House Business	☒

Module Code	**ACCD5000**
Title	**Computer Forensics**
Date	**09/09/2020**
Level	**5**
Credits	**20**
Pre-Requisites	**None**

AIM(S)

- To provide students with computer forensics concepts and understanding for the need of computer forensics. Students will learn best practices for general incidence response. The module will then focus on the tools and techniques to perform a full computer forensic investigation

LEARNING OUTCOMES

Upon the successful completion of this module, the student should be able to:

- Use their knowledge, of the fundamentals of computer forensics, to evaluate and formulate a range of problems and solutions with respect to the relationship between IT and forensics.

- Communicate accurately and reliably the legal aspects of forensics and the best practices for incidence response.

INDICATIVE CONTENT

- Introduction to Computer Forensics.

- Computer Forensics Investigation Process.

- Searching and Seizing Computers.

- Presenting Digital Evidence.

- First Responder Procedures.

- Understanding Hard Disks and File Systems.

- Data Acquisition and Duplication.

- Recovering Deleted Files and Deleted Partitions.

- Forensics Investigation using CAINE Live DVD.

- Forensics Investigation Using AccessData FTK.

- Network Forensics Investigation using Wireshark.

- Steganography and Image File Forensics.

Study Time Allocation

The study time for the module is divided as follows:

Activity type	Hours	Percentage
Scheduled learning	48	24%
Independent learning	152	76%
Placement learning	0	0%
TOTAL	**200**	**100%**

ASSESSMENT

Assessment Component 1

☐ **Written exam** ☒ **Coursework** ☐ **Practical**

Mode of assessment	Volume	Weighting
Coursework	4000 words	100%

Assessment Summary

Activity type	Percentage
Written exam	0%
Coursework	100%
Practical	0%
TOTAL	**100%**

INDICATIVE READING LIST

Module Code	ACCD5000	
Module Title	Computer Forensics	
Classification	**Reading List entry**	**Electronic***
Essential	The Basics of Digital Forensics: The Primer for Getting Started in Digital Forensics. Author: John Sammons.	☐
Essential	Digital Evidence and Computer Crime: Forensic Science, Computers, and the Internet. Author: Eoghan Casey.	☐
Essential	Digital Forensics with Open Source Tools. Authors: Cory Altheide and Harlan Carvey	☐
Essential	X-Ways Forensics Practitioner's Guide: Authors: Brett Shavers and Eric Zimmerman.	☐
Further	Incident Response and Computer Forensics, Second Edition. Authors: Chris Prosis, Kevin Mandia, and Matt Pepe.	☐
Further	Incident Response: Computer Forensics Toolkit. Author: Doglas Schweizer.	☐
Further	Forensic Computing: A Practitioner's Guide, Second edition. Authors: Tony Sammes and Brian Jenkinson.	☐
Further	**Journals** IEEE/ACM, IEEE/ACM Transactions on Networking IEEE, IEEE Network Magazine Science Direct Scopus	☒

	ACM Transactions on Database Systems ACM Transactions on Information Systems	
Further	**Websites** http://www.tandf.co.uk/15567281 www.cftt.nist.gov http://www.jdfsl.org/ CERIAS Forensics Research (http://www.cerias.purdue.edu/research/forensics/) DoD Cyber Crime Center (http://www.dc3.mil) http://www.digitalforensicsmagazine.com/ http://nij.ncjrs.org/publications/pubs_db.asp	☒

Module Code	**ACDA5001**
Title	**Electrical Engineering**
Date	**13/10/2021**
Level	**5**
Credits	**20**
Pre-Requisites	**None**

AIMS

- To develop a knowledge of circuit theory and principles and a critical understanding and analysis of AC and DC electrical and electronic systems.

LEARNING OUTCOMES

Upon the successful completion of this module, the student should be able to:

- Critically Analyse and evaluate AC and DC electrical circuits and systems including Three Phase Systems
- Perform critical analysis and detailed simulation of relevant circuits.

INDICATIVE CONTENT

- Circuit theorems and application to complex AC & DC networks and electronic circuits.
- Complex Power calculations
- Power Factor and Power Factor Correction
- Maximum Power Transfer for resistive and reactive circuits.
- Three Phase circuits.
- Star-Delta and Delta –Star transformations.
- Equivalent circuits for transformers
- Complex wave analysis
- Laplace Transforms

Study Time Allocation

The study time for the module is divided as follows:

Activity type	Hours	Percentage
Scheduled learning	48	24%
Independent learning	152	76%
Placement learning	0	0%
TOTAL	**200**	**100%**

ASSESSMENT

Assessment Component 1

☐ **Written exam** ☒ **Coursework** ☐ **Practical**

Mode of assessment	Volume	Weighting
Assignment	2000 Words	50%

Assessment Component 2

☒ **Written exam** ☐ **Coursework** ☐ **Practical**

Mode of assessment	Volume	Weighting
Exam	2 Hours	50%

Assessment Summary

Activity type	Percentage
Written exam	50%
Coursework	50%
Practical	0
TOTAL	**100%**

INDICATIVE READING LIST

Module Code	**ACDA5001**	
Module Title	**Electrical Engineering**	
Classification	**Reading List entry**	**Electronic***
Essential	Nilsson, J. and Riedel, S. (2010) *Electric Circuits, 9th Ed,* Boston: Prentice Hall	☒
Essential	Bird, J. (2010) *Electrical Circuit Theory and Technology,* 4th Ed, Oxford: Newnes (2010)	☒
Essential	Bird, J. (2010) *Electrical and Electronic Principles and Technology*, 4th Ed. Oxford: Newnes	☒
Further	Cathey, J. J. (2011) *Schaum's Outline of Electronic Devices and Circuits* 2nd Ed, New York: McGraw Hill	☐
Further	Agarwal, A. and Lang, J. (2005) *Foundations of Analog and Digital Electronic Circuits*, Amsterdam: Morgan Kaufmann	☐

Module Code	**ACDA5002**
Title	**Electronics I**
Date	**13/10/2021**
Level	**5**
Credits	**20**
Pre-Requisites	**None**

AIM(S)

- To build on the basic component level theory studied at Level 4, and thus provide the student with knowledge of how these components are utilised in real life scenarios as functional building blocks or as parts of holistic working systems, with emphasis given to design solutions based on embedded microcontroller / microprocessors.

LEARNING OUTCOMES

Upon the successful completion of this module, the student should be able to:

- Demonstrate and critically analyse the deployment of discrete components and microcontrollers in the design of functional building blocks and complete circuits.
- Critically analyse existing designs and be able to understand and effectively communicate how they function.

INDICATIVE CONTENT

- Design of simple linear power supplies. Single, Split and multi rail.
- SMPS principles. Buck, Boost configurations etc.
- DC Power Control. Using e.g. PWM techniques.
- AC Power Control. Using e.g. phase angle firing.
- Data acquisition via custom devices/modules
- Serial and Parallel bus interfacing
- System Input, Output and UI design considerations
- Case studies of existing embedded system designs.
- Awareness and evaluation of various design approaches. E.g. microcontroller vs ASIC vs Embedded PC etc.

Study Time Allocation

The study time for the module is divided as follows:

Activity type	Hours	Percentage
Scheduled learning	48	24%
Independent learning	152	76%
Placement learning	0	0
TOTAL	**200**	**100%**

ASSESSMENT

Assessment Component 1

☐ **Written exam** ☒ **Coursework** ☐ **Practical**

Mode of assessment	Volume	Weighting
Assignment	2500 Words	60%

Assessment Component 2

☐ **Written exam** ☐ **Coursework** ☒ **Practical**

Mode of assessment	Volume	Weighting
Timed Lab exercise	2 hr timed session	40%

Assessment Summary

Activity type	Percentage
Written exam	0%
Coursework	60%
Practical	40%
TOTAL	**100%**

INDICATIVE READING LIST

Module Code	**ACDA5002**	
Module Title	**Electronics I**	
Classification	**Reading List entry**	**Electronic***
Essential	Horowitz, P. and Hill, W. (2015) *The Art of Electronics,* 3rd ed Cambridge: Cambridge University Press	☒
Essential	Scherz, P. and, Monk, S. (2016) *Practical Electronics for Inventors*, New York: McGraw Hill	☒
Further	Embedded Control Handbook – Microchip Technologies http://ww1.microchip.com/downloads/cn/devicedoc/cn_00711a.pdf	☐
Further	*Elektor* – Electronics Design Magazine. UWTSD Owen Library.	☐

Module Code	**ACDA5008**
Title	**Digital Signal Processing and Communications**
Date	**15/08/2018**
Level	**5**
Credits	**10**
Pre-Requisites	**None**

AIM(S)

- To equip students with a critical understanding of both digital communications and digital signal processing systems. A detailed understanding of digital modulation techniques along with relevant digital signal processing methods will be developed along with a knowledge that will equip the student with the skills needed to design, analyse and simulate digital signal processing and digital communications systems.

LEARNING OUTCOMES

Upon the successful completion of this module, the student should be able to:

- Demonstrate detailed knowledge of the basic theoretical concepts of digital signal processing and digital communication systems;

- Demonstrate proficient use of system level simulation software.

INDICATIVE CONTENT

- Digital signal processing: signals and sequences, the sampling theorem and digital convolution;

- Spectrum Analysis: The Discrete and Fast Fourier Transforms;

- Moving average and windowed FIR filter design and implementation, simulation of filters and DSP concepts;

- Digital Communications, Signals and Channels.

Study Time Allocation

The study time for the module is divided as follows:

Activity type	Hours	Percentage
Scheduled learning	24	24%
Independent learning	76	76%
Placement learning	0	0%
TOTAL	**100**	**100%**

ASSESSMENT

Assessment Component 1

☐ **Written exam** ☒ **Coursework** ☐ **Practical**

Mode of assessment	Volume	Weighting
Lab Report	2,000 words	100%

Assessment Summary

Activity type	Percentage
Written exam	
Coursework	100%
Practical	
TOTAL	**100%**

INDICATIVE READING LIST

Module Code	ACDA5008	
Module Title	Digital Signal Processing and Communications	
Classification	Reading List entry	Electronic*
Essential	Parker, M. (2017) *Digital Signal Processing 101: A Practical Guide*, Oxford: Newnes.	☒
Essential	Haykin, S. (2013) *Digital Communication Systems: A Modern Introduction*, Hoboken, NJ: Wiley	☐
Further	G. and A. Levesque (2015) *Modeling of Digital Communication Systems Using Simulink*, Hoboken, NJ: Wiley-Blackwell	☒
Further	Sklar, B. (2013) *Digital Communications: Fundamentals and Applications* New International Edition London: Pearson	☒
Further	**Journals** IEEE Communications Magazine IEEE Signal Processing Magazine	☒
Further	**Websites** http://www.mathworks.co.uk	☒

Module Code	**ACDA5017**
Title	**Group Project**
Date	**13/10/2021**
Level	**5**
Credits	**20**
Pre-Requisites	**None**

AIM(S)

- To apply engineering principles and skills to the cost effective solution of technical problems with due regard to specification, design, cost and methods of production, working in a team, and developing effective team skills.

LEARNING OUTCOMES

Upon the successful completion of this module, the student should be able to:

- Select, specify and plan a project, as part of a team, and to verbally present the design and development concepts and implementation stages.

- Select appropriate design methodology and development an artefact from initial concept to final realisation, including references to the project specification, research, implementation and achievements etc.

- Implement the design and development, as part of a team, and demonstrate its operation and also demonstrate an ability to produce the design on time and within budget.

INDICATIVE CONTENT

- Systematic design procedures

- Objective design selection

- Project Planning

- Cost prediction, manufacturing

- Quality and reliability

- Technical report writing

- Group working and management

- Communication skills

- Legal, social, and ethical and entrepreneurial aspects of projects

Study Time Allocation

The study time for the module is divided as follows:

Activity type	Hours	Percentage
Scheduled learning	48	24%
Independent learning	152	76%
Placement learning	0	0%
TOTAL	**200**	**100%**

ASSESSMENT

Assessment Component 1

☐ **Written exam** ☒ **Coursework** ☐ **Practical**

Mode of assessment	Volume	Weighting
Portfolio of work	5000 words equivalent	100%

Students will produce a portfolio of work appropriate to the nature of their project. Portfolio elements will include a selection of the following:

- Written Report
- Presentation slides
- Demonstration of work
- Ethical approval form

Assessment Summary

Activity type	Percentage
Written exam	0%
Coursework	100%
Practical	0%
TOTAL	**100%**

INDICATIVE READING LIST

Module Code	**ACDA5017**	
Module Title	**Group Project**	
Classification	**Reading List entry**	**Electronic***
Essential	Schertz, P. (2012) *Practical Electronics for Inventors*, New York: McGraw Hill Professional	☐
Essential	Sherin, A. (2013) *Sustainable Thinking: Ethical Approaches to Design and Design Management*, Required Reading Range New York: Fairchild	☐
Further	Floyd, T. L. (2009) *Electronic Circuits Fundamentals*, 8/E, Boston: Prentice Hall	☐
Further	Mataric, M. J. (2007) *The Robotics Primer: Intelligent Robotics & Autonomous Agents*, Massachusetts: MIT Press	☐
Further	Elktor Electronics World	☐

Module Code	**ACDA5018**
Title	**Distributed Intelligence Systems**
Date	**13/10/2021**
Level	**5**
Credits	**20**
Pre-Requisites	**None**

AIM(S)

- To develop in the student an in depth understanding of the design and implementation of distributed microcontroller systems and their application to modern electronic devices and systems.

LEARNING OUTCOMES

Upon the successful completion of this module, the student should be able to:

- Analyse distributed microcontroller systems for a range of technical applications through the use of state-of-the-art simulation and synthesis software.
- Implement advanced distributed microcontroller systems, including point to point and point to multipoint systems.

INDICATIVE CONTENT

- Interconnection standards and protocols
- Point to point systems, Point to multipoint systems: Mesh, Star
- RS232, RS485, SPI, I2C, CAN
- LoRa, Bluetooth, Zigbee
- Data security, design safety features, failure modes

Study Time Allocation

The study time for the module is divided as follows:

Activity type	Hours	Percentage
Scheduled learning	48	24%
Independent learning	152	76%
Placement learning	0	0%
TOTAL	**200**	**100%**

ASSESSMENT

Assessment Component 1

☐ **Written exam** ☒ **Coursework** ☐ **Practical**

Mode of assessment	Volume	Weighting
Report	2,500 words	50%

Assessment Component 2

☐ **Written exam** ☐ **Coursework** ☒ **Practical**

Mode of assessment	Volume	Weighting
Lab Practical	2 Hours	50%

Assessment Summary

Activity type	Percentage
Written exam	0%
Coursework	50%
Practical	50%
TOTAL	**100%**

INDICATIVE READING LIST

Module Code	**ACDA5018**	
Module Title	**Distributed Intelligence Systems**	
Classification	**Reading List entry**	**Electronic***
Essential	Williams, R. (2006) *Real-time Systems Development*. Oxford: Butterworth-Heinemann	☐
Essential	Gaonkar, R. S. *Fundamentals of Microcontrollers and Applications in Embedded Systems with the PIC18F Microcontroller Famil*) Clifton Park NY: Thomson / Delmar Learning	☐
Essential	Bates, M. (2008) *Programming 8-Bit PIC Microcontrollers in C with Interactive Hardware Simulation*. Oxford: Newnes	☐
Further	Journals	☐

Module Code	**ACDA5019**
Title	**Radio Frequency Systems**
Date	**13/10/2021**
Level	**5**
Credits	**10**
Pre-Requisites	**None**

AIM(S)

- To provide the student with the knowledge of various radio frequency systems and an understanding of their application and operation.

LEARNING OUTCOMES

Upon the successful completion of this module, the student should be able to:

- Apply detailed knowledge of the basic theoretical concepts of RF Systems to solve specific problems.
- Critically analyse various RF systems through the use of simulation software

INDICATIVE CONTENT

- Basic transmitter and receiver architectures
- Mixing theory
- Interference
- Digital radio systems: Bluetooth, LoRA, WiFi etc.

Study Time Allocation

The study time for the module is divided as follows:

Activity type	Hours	Percentage
Scheduled learning	24	24%
Independent learning	76	76%
Placement learning	0	
TOTAL	**100**	**100%**

ASSESSMENT

Assessment Component 1

☐ **Written exam** ☒ **Coursework** ☐ **Practical**

Mode of assessment	Volume	Weighting
Lab report	2,000 Words	100%

Assessment Summary

Activity type	Percentage
Written exam	0%
Coursework	100%
Practical	0%
TOTAL	**100%**

INDICATIVE READING LIST

Module Code	**ACDA5019**	
Module Title	**Radio Frequency Systems**	
Classification	**Reading List entry**	**Electronic***
Essential	Huang, Y. and Boyle, K. (2008) Antennas from Theory to Practice, John-Wiley & Sons Ltd	☐
Essential	Lathi, B. P. (2009) Modern Digital & Analog Communication Systems, 4th Edition, Oxford University Press	☐
Essential	Couch, L. W. (2013) Digital & Analog Communication Systems, 8th Edition, Pearson	☐
Further	Orfanidis, S. J. (1996) Introduction to Signal Processing, Prentice Hall, Upper Saddle River, New Jersey	☐
Further	Journals IEEE Communications Magazine IEEE Signal Processing Magazine	☐

Module Code	**ACDA5021**
Title	**Systems Engineering**
Date	**17/08/2022**
Level	**5**
Credits	**20**
Pre-Requisites	**None**

AIM(S)

- To provide the students with a holistic and interdisciplinary approach as a means of enabling the realisation of a working system.
- To provide the students with experience of left shifting design to aid safety, test, manufacturing, breakdown and disposal.

LEARNING OUTCOMES

Upon the successful completion of this module, the student should be able to:

- Embed the process of system thinking, including needs analysis, developing options, assessing risk and constraints.
- Use suitable engineering design methods to design a safe system which is robust solution to a defined set of requirements.
- Apply underlying concepts and principles, to justify the process, design methods and tools used in the development of the above solution.

INDICATIVE CONTENT

- Design of robust, practical and safe solutions
- Design for test, safety, manufacturing, and disposal
- Combining instrumentation, Range operation and safety systems to design a trial
- Needs Analysis
- Integration and Evaluation.

Study Time Allocation

The study time for the module is divided as follows:

Activity type	Hours	Percentage
Scheduled learning	48	24%
Independent learning	152	76%
Placement learning	0	0%
TOTAL	**200**	**100%**

ASSESSMENT

Assessment Component 1
(Tick one)

☐ **Written exam** ☒ **Coursework** ☐ **Practical**

Mode of assessment	Volume	Weighting
Portfolio (Group work)	5,000-words equivalent. The portfolio includes design process and group presentation.	100%

Assessment Summary

Activity type	Percentage
Written exam	0%
Coursework	100%
Practical	0%
TOTAL	**100%**

INDICATIVE READING LIST

Module Code	**ACDA5021**	
Module Title	**Systems Engineering**	
Classification	**Reading List entry**	**Electronic***
Essential	Kossiakoff, A., Sweet, W., Seymour, S. and Biemer, S. (2011) *Systems Engineering Principles and Practice,* New Jersey : Wiley-Blackwell	☒
Essential	Leveson, N.G and Moses, J. (2017) *Engineering a safer world: Systems thinking applied to safety (Engineering systems)*, MIT Press	☒
Further	Blanchard, B. (2016) *Systems Engineering Management - 5th ed*, New Jersey : John Wiley	☒
Further	Kasser, J. (2013) *A Framework for Understanding Systems Engineering - 2nd ed,* CreateSpace Independent Publishing Platform	☒
Further	Jenney, J., Gangl, M., Kwolek, R., Melton, D., Ridenour, N. and Coe, M. (2011) *Modern Methods of Systems Engineering, with an Introduction to Pattern and Model-Based Methods,* CreateSpace Independent Publishing Platform	☐
Further	Kasser, J. (2013) *Holistic Thinking: Creating Innovative Solutions to Complex Problems,* CreateSpace Independent Publishing Platform	☒
Further	Hitchins, D.K. (2007) System Engineering: A 21st century systems methodology, Wiley. ISBN: 978-0-470-05856-5	☒
Further	Checkland, P. (1999) Systems Thinking, Systems practice: Includes a 30-year retrospective, Wiley.	☒
Further	Ramage, M. and Shipp, K. (2009) Systems Thinkers, Springer.	☒
Further	**Journals** *ACM Transactions on Information Systems* *Journal of Data and Information Quality*	☒

	Journal of the ACM *Journal of Systems Engineering and Electronics*	

Module Code	**ACDA5022**
Title	**Work-Based Group Project**
Date	**17/08/2022**
Level	**5**
Credits	**20**
Pre-Requisites	**None**

AIM(S)

- As a team, apply system thinking principles and skills to the solution of a defined technical problem.

LEARNING OUTCOMES

Upon the successful completion of this module, the student should be able to:

- Select, specify and plan a project, as part of a team, and to present the design and development concepts and implementation stages.
- Select appropriate design methodology and development of an artefact from initial concept to final realisation.
- Critically evaluate the component features of the design and explain strategies for delivery of a reliable and robust product.
- Demonstrate specific in-depth knowledge and understanding of legal, social, ethical, environmental and sustainability issues relating to the project.

INDICATIVE CONTENT

- Systematic design procedures
- Objective design selection
- Project Planning
- Cost prediction,
- Manufacturing techniques
- Quality and reliability
- Technical report writing
- Group working and management
- Communication skills
- Legal, social, and ethical aspects of projects
- Environmental and sustainability

Study Time Allocation

The study time for the module is divided as follows:

Activity type	Hours	Percentage
Scheduled learning	24	12%
Independent learning	176	88%
Placement learning	0	0%
TOTAL	**200**	**100%**

ASSESSMENT

Assessment Component 1
(Tick one)

☐ **Written exam** ☒ **Coursework** ☐ **Practical**

Mode of assessment	Volume	Weighting
Portfolio of work	5,000 words equivalent	100%

Students will produce a portfolio of work appropriate to the nature of their project. Portfolio elements could include a selection of the following:

- Written Report
- Presentation slides
- Demonstration of work
- Ethical approval form
- Logbook

Assessment Summary

Activity type	Percentage
Written exam	0%
Coursework	100%
Practical	0%
TOTAL	**100%**

INDICATIVE READING LIST

Module Code	**ACDA5022**	
Module Title	**Work-Based Group Project**	
Classification	**Reading List entry**	**Electronic***
Essential	The Work Based and Placement Learning Association (2013) *Good Practice Guide for Workbased Learning and Placement Learning in Higher Education,* Sheffield : ASET	☒
Essential	McCormac, C. and Davis, J. (2012) *Research Project Success: The Essential Guide for Science and Engineering Students,* Royal Society of Chemistry	☐

Essential	O'Leary, Z. (2013) *Doing Your Research Project, 2nd Edition*, SAGE Publications Ltd	☐
Essential	Gray, D. E. (2018) *Doing Real World Research,* London : SAGE	☐
Further	Kerzner, H. (2017) *Project Management: A Systems Approach to Planning, Scheduling, and Controlling*, New Jersey : John Wiley	☐
Further	Curedale, R. (2016) *Design Thinking Process and Methods - 3rd ed,* Design Community College	☐
Further	McKeown, M. (2014) The Innovation Book: How to Manage Ideas and Execution for Outstanding Results (The X Book), FT Publishing International.	☒
Further	Yin, R. K, (2008) *Case Study Research: Design and Methods - 4th ed*, Sage : Beverly Hills	☐

Module Code	**ACDA5023**
Title	**Nuclear Safety**
Date	**11/07/2023**
Level	**5**
Credits	**10**
Pre-Requisites	**None**

AIM(S)

- To provide students with an understanding of the principles and practices of nuclear safety. Students will gain an appreciation of the importance of nuclear safety, the regulatory framework governing nuclear safety, and the techniques and technologies used to maintain safe nuclear operations to support the production of safety cases.

LEARNING OUTCOMES

Upon the successful completion of this module, the student should be able to:

- critically evaluate and explain the regulatory framework governing nuclear safety and safety cases;
- analyse the techniques and technologies used to maintain safe nuclear operations and understand the human, environmental and business consequences associated with nuclear safety and security;
- understand the theory of nuclear weapons systems and components concept, assessment, design for modifications and life extension including through-life requirements;
- understand the significance of safe nuclear operations and the need for well managed maintenance of interfacing equipment and supporting infrastructure.

INDICATIVE CONTENT

- Radiation physics.
- Nuclear Safety and Security Culture and Human Factors.
- Introduction to nuclear safety and its importance.
- Regulatory framework governing nuclear safety, including international conventions and national regulations.
- Nuclear safety systems and equipment.
- Nuclear Safety cases.
- Radiation protections.
- Nuclear emergency response and accident management.
- Theory of Nuclear systems and components concept, assessment, design for modifications and life extension.

- Nuclear infrastructure concept, assessment, design, modifications and life Extension through-life.

- Nuclear interfacing equipment maintenance and supporting infrastructure maintenance.

Study Time Allocation

The study time for the module is divided as follows:

Activity type	Hours	Percentage
Scheduled learning	24	24%
Independent learning	76	76%
Placement learning	0	0%
TOTAL	**100**	**100%**

ASSESSMENT

Assessment Component 1

☐ **Written exam** ☒ **Coursework** ☐ **Practical**

Mode of assessment	Volume	Weighting
Report	2,500 words	100%

INDICATIVE READING LIST

Module Code	**ACDA5023**	
Module Title	**Nuclear Safety**	
Classification	**Reading List entry**	**Electronic***
Essential	Nuclear Safety: A Human Factors Perspective by J. Harvey & E. Spencer. (2020). London: Routledge.	☐
Essential	Nuclear Weapons by Mark Wolverton (2022). MIT Press	☐
Essential	Nuclear Safety: A Guide to the International Atomic Energy Agency Regulations by M. Collins & J. Smith. (2021). London: Springer.	☐
Further	The Fukushima Daiichi Nuclear Accident: Final Report of the Independent Investigation Commission. (2020). Tokyo: The National Diet of Japan	☐
Further	Safety Culture in Nuclear Installations: Guidance for Use in the Enhancement of Safety Culture. (2021). Vienna: International Atomic Energy Agency	☐
Further	Nuclear Power Plant Safety and Mechanical Integrity: Design and Operability of Mechanical Systems, Equipment and Supporting Structures. (2022). Oxford: Woodhead Publishing	☐
Further	Nuclear Safety in Light Water Reactors: Severe Accident Phenomenology by B. Boyack & K. Olsen. (2021). New York: Elsevier.	☐
Further	Decommissioning of Nuclear Power Plants: Strategies and Technologies by J. Lee & C. Kim. (2022). Hoboken: John Wiley & Sons.	☐

Module Code	**ACDA5024**
Title	**Technical Authoring**
Date	**11/07/2023**
Level	**5**
Credits	**20**
Pre-Requisites	**None**

AIM(S)

- To underpin the importance of technical authoring and communication and provide a comprehensive understanding of the knowledge required, including; preparing technical instructions and manuals and supporting documents, communicating complex and technical information, gathering and disseminating technical information to customers, designers, and manufacturers.

LEARNING OUTCOMES

Upon the successful completion of this module, the student should be able to:

- systematically understand the requirements for visual aids, the principles of cognitive psychology, analyse source material and communicate ideas effectively;

- design and deliver instructional materials, manage complex writing and design projects and use appropriate multimedia applications.

INDICATIVE CONTENT

- Process analysis.

- Cognitive and educational psychology that relate to visual aids, such as visual perception, gestalt grouping, matching of intellectual and visual inferences.

- Professional communication for engineers and scientists.

- Editing and visual design.

- Document control and publications management.

- Specialized documents; proposal writing and document design.

- The advantages of a multimedia approach to technical authoring.

- Manipulate data using a variety of tools to provide insight and information.

- Develop ways of writing and communicating with different audiences.

Study Time Allocation

The study time for the module is divided as follows:

Activity type	Hours	Percentage
Scheduled learning	48	24%
Independent learning	152	76%
Placement learning	0	0%
TOTAL	**200**	**100%**

ASSESSMENT

Assessment Component 1

☐ **Written exam** ☒ **Coursework** ☐ **Practical**

Mode of assessment	Volume	Weighting
Technical Report	2,500 words	50%

Assessment Component 2

☐ **Written exam** ☐ **Coursework** ☒ **Practical**

Mode of assessment	Volume	Weighting
Formal Presentation	20 min presentation	50%

Assessment Summary

Activity type	Percentage
Written exam	0%
Coursework	50%
Practical	50%
TOTAL	**100%**

INDICATIVE READING LIST

Module Code	**ACDA5024**	
Module Title	**Technical Authoring**	
Classification	**Reading List entry**	**Electronic***
Essential	Riordan, D, Technical Report Writing Today, Wadsworth Publishing, 2013	☒
Further	R. Lachman, J. L. Lachman and E. C. Butterfield, Cognitive Psychology and Information Processing: An Introduction, Psychology Press; 22 Dec. 2015	☒
Further	Smith, S.C.H, Academic Presentations: EAP Foundation, Evident Press, 2018	☒

Module Code	**ACDA5025**
Title	**Engineering and Project Management**
Date	**~~29/06/2023~~19/07/2023**
Level	**5**
Credits	**20**
Pre-Requisites	**None**

AIM(S)

- To develop the skills necessary to successfully specify and manage an engineering project accounting for various factors.

LEARNING OUTCOMES

Upon the successful completion of this module, the student should be able to:

- evaluate the environmental and societal impact of solutions to broadly-defined problems;
- identify and analyse ethical concerns and make reasoned ethical choices informed by professional codes of conduct;
- use a risk management process to identify, evaluate and mitigate risks (the effects of uncertainty) associated with a particular project or activity;
- recognise the responsibilities, benefits and importance of supporting equality, diversity and inclusion.

INDICATIVE CONTENT

- Equality, diversity, and inclusivity in engineering.
- PREVENT.
- Engineering codes of conduct.
- Legal, ethical, and societal considerations of engineering.
- Environmental effects of engineering.
- Specifying, planning, and managing engineering projects.
- Identifying, managing, and mitigating risks.
- Statistical techniques: descriptive statistics, parametric and non-parametric testing.
- Design of experiments.
- Statistical Data Analysis.

Study Time Allocation

The study time for the module is divided as follows:

Activity type	Hours	Percentage
Scheduled learning	48	24%
Independent learning	152	76%
Placement learning	0	0
TOTAL	**200**	**100%**

ASSESSMENT

Assessment Component 1
(Tick one)

☐ **Written exam** ☒ **Coursework** ☐ **Practical**

Mode of assessment	Volume	Weighting
Portfolio	3 elements - 2500 words equivalent Portfolio consisting of 3 elements such as: • PREVENT certificate • Equality & Diversity Training certificate • Project proposal	50%

Assessment Component 2
(Tick one)

☐ **Written exam** ☐ **Coursework** ☒ **Practical**

Mode of assessment	Volume	Weighting
Presentation	15 minutes	50%

Assessment Summary

Activity type	Percentage
Written exam	0%
Coursework	50%
Practical	50%
TOTAL	**100%**

INDICATIVE READING LIST

Module Code	**ACDA5025**	
Module Title	**Engineering and Project Management**	
Classification	**Reading List entry**	**Electronic***
Essential	Lock, D. (2013). *Project Management* (10th ed.). Burlington, Vt: Gower.	☒
Essential	Maylor, H., & Turner, N. (2022). *Project Management* (5th ed.). Harlow: Pearson.	☐
Essential	Bowen, W. R. (2014). *Engineering Ethics Challenges and Opportunities* (1st ed.). Cham: Springer	☒

	International Publishing. doi: 10.1007/978-3-319-04096-7.	
Essential	Rugg, G. (2007). *Using Statistics: A Gentle Introduction*. Maidenhead: Open University Press.	☐
Further	Saeed, S., Saeed, S., Khan, M. A., & Ahmad, R. (2013). *Business Strategies and Approaches for Effective Engineering Management*. Hershey, Pa: Business Science Reference.	☒
Further	Wong, Z. (2010). *Human Factors in Project Management: Concepts, Tools, and Techniques for Inspiring Teamwork and Motivation* (1st ed.). San Francisco: Jossey-Bass.	☒

Module Code	**ACDB5002**
Title	**Electronics I**
Date	**03/10/2022**
Level	**5**
Credits	**20**
Pre-Requisites	**None**

AIM(S)

- To build on the basic component level theory studied at Level 4, and thus provide the student with knowledge of how these components are utilised in real life scenarios as functional building blocks or as parts of holistic working systems, with emphasis given to design solutions based on embedded microcontroller / microprocessors.

LEARNING OUTCOMES

Upon the successful completion of this module, the student should be able to:

- Demonstrate and critically analyse the deployment of discrete components and microcontrollers in the design of functional building blocks and complete circuits.
- Critically analyse and demonstrate an understanding of existing hardware designs andsoftware-based design tools.

INDICATIVE CONTENT

- Design of simple linear power supplies. Single, Split and multi rail.
- SMPS principles. Buck, Boost configurations etc.
- DC Power Control. Using e.g. PWM techniques.
- AC Power Control. Using e.g. phase angle firing.
- Data acquisition via custom devices/modules
- Serial and Parallel bus interfacing
- System Input, Output and UI design considerations
- Case studies of existing embedded system designs.
- Awareness and evaluation of various design approaches. E.g. microcontroller vs ASIC vs Embedded PC etc.
- Design of simple microcontroller-based circuits to achieve a specified outcome.
- Awareness and evaluation of software tools used in the design process.

Study Time Allocation

The study time for the module is divided as follows:

Activity type	Hours	Percentage
Scheduled learning	48	24%
Independent learning	152	76%
Placement learning	0	0
TOTAL	**200**	**100%**

ASSESSMENT

Assessment Component 1

☐ **Written exam** ☒ **Coursework** ☐ **Practical**

Mode of assessment	Volume	Weighting
Assignment	2500 Words	60%

Assessment Component 2

☐ **Written exam** ☐ **Coursework** ☒ **Practical**

Mode of assessment	Volume	Weighting
Timed Lab exercise	2 hr timed session	40%

Assessment Summary

Activity type	Percentage
Written exam	0%
Coursework	60%
Practical	40%
TOTAL	**100%**

INDICATIVE READING LIST

Module Code	**ACDB5002**	
Module Title	**Electronics I**	
Classification	**Reading List entry**	**Electronic***
Essential	Horowitz, P. and Hill, W. (2015) *The Art of Electronics,* 3rd ed Cambridge: Cambridge University Press	☒
Essential	Scherz, P. and, Monk, S. (2016) *Practical Electronics for Inventors*, New York: McGraw Hill	☒
Further	Embedded Control Handbook – Microchip Technologies http://ww1.microchip.com/downloads/cn/devicedoc/cn_00711a.pdf	☐
Further	*Elektor* – Electronics Design Magazine. UWTSD Owen Library.	☐

Module Code	**ACDB5007**
Title	**Computer Aided Engineering**
Date	**17/08/2022**
Level	**5**
Credits	**20**
Pre-Requisites	**None**

AIM(S)

- To introduce students to a range of Computer Aided Engineering (CAE) methods and their applicability.
- To introduce the idea of verification and validation of CAE solutions and the relation to OME.

LEARNING OUTCOMES

Upon the successful completion of this module, the student should be able to:

- Demonstrate knowledge and critical understanding of CAE tools and their limitations.
- Proficiently use CAE tools to analyse and solve problems.

INDICATIVE CONTENT

- Introduction to Finite Element Analysis including the benefits of using CAE models in test & evaluation
- The finite element method and its relation to other numerical simulation methods including finite difference
- The Lagrangian and Eulerian frameworks
- Verification and Validation
- Three-dimensional vector systems and their relation to numerical simulations
  - (i) Example of using symmetry to aid analysis: principal planes and principal stresses
  - (ii) Use of thin and thick-walled pressure vessels as an example of verification and validation by relation to exact analytic solutions
  - (iii) EM Example: predict the radiation pattern of a dipole antenna using method of moments and finite element analysis (e.g. using FeKo), and compare results to analytic solution.
- Computer aided design
- 3D Parametric Modelling
- Assemblies in CAD
- Manufacturing drawings
- Motion simulation

- Finite element analysis in CAD
- Pre- and post-processing and its relation to data visualisation
- Fast-running engineering models and their utility

Study Time Allocation

The study time for the module is divided as follows:

Activity type	Hours	Percentage
Scheduled learning	48	24%
Independent learning	152	76%
Placement learning	0	0%
TOTAL	**200**	**100%**

ASSESSMENT

Assessment Component 1
(Tick one)

☐ **Written exam** ☒ **Coursework** ☐ **Practical**

Mode of assessment	Volume	Weighting
Assignment Report	5,000 Words equivalent	100%

Assessment Summary

Activity type	Percentage
Written exam	0%
Coursework	100%
Practical	0%
TOTAL	**100%**

INDICATIVE READING LIST

Module Code	**ACDB5007**	
Module Title	**Computer Aided Engineering**	
Classification	**Reading List entry**	**Electronic***
Essential	Bird, J.O. and Ross, C. (2014) *Mechanical Engineering Principles – 3rd ed*, Abingdon-on-Thames : Routledge	☒
Further	MacDonald, B.J. (2020) *Practical Stress Analysis with Finite Elements – 3rd ed,* Dublin : Macdohnil	☐
Further	Beer, F., Johnson, E. et al (2015) *Mechanics of Materials,* New York : McGraw-Hill	☒
Further	Benham, P.P., Crawford, R.J. and Armstrong, C.G. (2006) *Mechanics of Engineering Materials,* New Jersey : Prentice Hall	☐
Further	Bacon, D.H. (1998) *Mechanical Technology,* Oxford : Butterworth-Heinemann	☒

Module Code	**ACDB5011**
Title	**Instrumentation and Control**
Date	**17/08/2022**
Level	**5**
Credits	**10**
Pre-Requisites	**None**

AIM(S)

- To develop an understanding of instrumentation and control systems in terms of measurement systems, instrument design and system responses through the use of practical exercises and software simulation.

LEARNING OUTCOMES

Upon the successful completion of this module, the student should be able to:

- Critically analyse the range of responses of specified instrumentation and control system scenarios in order to develop solutions to specified problems;

- Create with simulation software mathematical models of control and instrumentation systems, solve their time response and compare their transient and steady-state responses with given specifications.

INDICATIVE CONTENT

- Transducers, sensors and actuators

- Characteristics of measurement systems

- Control mechanisms

- Display devices and recorders

- Data acquisition system and signal conditioning

Study Time Allocation

The study time for the module is divided as follows:

Activity type	Hours	Percentage
Scheduled learning	24	24%
Independent learning	76	76%
Placement learning	0	0%
TOTAL	**100**	**100%**

ASSESSMENT

Assessment Component 1
(Tick one)

☐ **Written exam** ☒ **Coursework** ☐ **Practical**

Mode of assessment	Volume	Weighting
Report	2,500 words	100%

Assessment Summary

Activity type	Percentage
Written exam	0%
Coursework	100%
Practical	0%
TOTAL	**100%**

INDICATIVE READING LIST

Module Code	**ACDB5011**	
Module Title	**Instrumentation and Control**	
Classification	**Reading List entry**	**Electronic***
Essential	Nise, N.S. (2013) *Control Systems Engineering; International Student Version - 7th ed,* New Jersey : John Wiley	☐
Further	Dorf, R.C. and Bishop, R.H. (2016) *Modern Control Systems: International Version,* New Jersey : Pearson	☐
Further	Distenfano, J., Stubberd, A. and Williams, I. (2013) *Schaum's Outline of Feedback and Control Systems* - 2nd ed, New York : Schaum's Outlines	☐
Further	Franklin, G.F., Powell, J.D. and Emami-Naeini, A. (2014) *Feedback Control of Dynamic Systems, 7th ed,* New Jersey : Pearson	☒
Further	Patranabis, A. (2011) *Instrumentation and Control,* New Jersey : Prentice Hall	☒
Further	Prasad, J., Jayaswal, M. and Priye, V. (2013) *Instrumentation and Process Control,* New Delhi, India : IK International Publishing	☒
Further	Ogata, K. (2015) *Modern Control Engineering; International Version - 5th ed,* New Jersey : Pearson	☐
Further	**Journals** IEEE Xplore ACM Digital Library	☒

Module Code	ACDB5013
Title	Safety and Hazard Assessment
Date	17/08/2022
Level	5
Credits	10
Pre-Requisites	None

AIM(S)

- To develop an understanding of safety and hazard assessment

LEARNING OUTCOMES

Upon the successful completion of this module, the student should be able to:

- Critically analyse the requirements for Safety Led Design, hazard identification (HazID) and hazard operability (HazOp)
- Effectively communicate to specialist and non-specialist audiences the outcomes of HazID & HazOp processes.
- Demonstrate an awareness of the legislation relevant to the manufacture, storage, transportation and use of explosives.

INDICATIVE CONTENT

- Safety Led Design
- Explosives legislation
- HazID and HazOp.
- Hazard and Risk Assessment.
- Principles of ALARP.
- Safety Cases.
- Explosives Legislation

Study Time Allocation

The study time for the module is divided as follows:

Activity type	Hours	Percentage
Scheduled learning	24	24%
Independent learning	76	76%
Placement learning	0	0%
TOTAL	**100**	**100%**

ASSESSMENT

Assessment Component 1
(Tick one)

☐ **Written exam** ☒ **Coursework** ☐ **Practical**

Mode of assessment	Volume	Weighting
Case Study/Report	Produce a report as part of a small group (2,500 words per person) an output of a safety case. Each student's contribution is assessed; group marks are not used.	100%

Assessment Summary

Activity type	Percentage
Written exam	0%
Coursework	100%
Practical	0%
TOTAL	**100%**

INDICATIVE READING LIST

Module Code	**ACDB5013**	
Module Title	**Safety and Hazard Assessment**	
Classification	**Reading List entry**	**Electronic***
Essential	Mannan, S. (2013) *Lees' Process Safety Essentials - Hazard Identification, Assessment and Control*, Oxford : Butterworth-Heinemann	☒
Further	Cherrie, J., Howie, R. and Semple, S. (2010) *Monitoring for Health Hazards at Work, 4th ed*, New Jersey : Wiley-Blackwell	☒

Module Code	**ACDB5015**
Title	**Advanced Physics of OME**
Date	**17/08/2022**
Level	**5**
Credits	**20**
Pre-Requisites	**Physics (OME)**

AIM(S)

- To build on the concepts introduced in the level 4 Physics (OME) module. Expanding and extending ideas developed, introducing more detailed explanation of the physics principles associated with OME devices.

LEARNING OUTCOMES

Upon the successful completion of this module, the student should be able to:

- Demonstrate a critical understanding of complex mechanics, structural aspects of physics and engineering science relevant to OME
- Critically analyse ballistics, blast and shock waves
- Model OME systems and effects

INDICATIVE CONTENT

- Euler equations, shockwaves, Rankine-Hugoniot equations
- Fluid and Material models appropriate for OME systems
- Ballistics
- Modelling of explosive and shockwave effects
- Thermal dynamics

Study Time Allocation

The study time for the module is divided as follows:

Activity type	Hours	Percentage
Scheduled learning	48	24%
Independent learning	152	76%
Placement learning	0	0%
TOTAL	**200**	**100%**

ASSESSMENT

Assessment Component 1
(Tick one)

☐ **Written exam** ☒ **Coursework** ☐ **Practical**

Mode of assessment	Volume	Weighting
Laboratory Report	5,000 words	100%

Assessment Summary

Activity type	Percentage
Written exam	0
Coursework	100%
Practical	0
TOTAL	**100%**

INDICATIVE READING LIST

Module Code	**ACDB5015**	
Module Title	**Advanced Physics of OME**	
Classification	**Reading List entry**	**Electronic***
Essential	Hearn, E.J. (1997) *Mechanics of Materials Volume1,* Oxford : Butterworth-Heinemann	☐
Essential	Needham, C.E. (2013) *Blast Waves*, New York : Springer	☒
Further	Rosenberg, Z. and Dekel, E. (2016) *Terminal Ballistics*, New York : Springer	☒
Further	Bacon, D.H. (1998) *Mechanical Technology,* Oxford : Butterworth-Heinemann	☒
Further	Benham, P.P., Crawford, R.J. and Armstrong, C.G. (2006) *Mechanics of Engineering Materials,* New Jersey : Prentice Hall	☐
Essential	**Journals** Abaqus Online Material IEEE Xplore, ACM Digital Library	☒

Module Code	**ACDC5009**
Title	**Electromagnetic Radiation**
Date	**03/10/2022**
Level	**5**
Credits	**20**
Pre-Requisites	**None**

AIM(S)

- To develop a comprehensive understanding of the theoretical and practical aspects of electromagnetics
- To develop an ability to interpret results gained from electromagnetic simulation;

LEARNING OUTCOMES

Upon the successful completion of this module, the student should be able to:

- Provide evidence of a systematic understanding of the scientific concepts underpinning magneto-static and AC time-harmonic problems;
- Analyse results obtained from the application of specific electromagnetic modelling techniques and correlate those results with physical characteristics.

INDICATIVE CONTENT

- Electromagnetic Theory:
- Simulation and modelling of electromagnetic systems using a range of software tools;
- Electromagnetic spectrum;
- Electromagnetic wave properties;
- Wave guides;
- Waves and beams, phased array systems, tracking systems;
- Material Properties, Magnetization and Hysteresis, Magnetic Circuit Theory, Electromagnetic Induction, Maxwell's Equations, Complex Impedance and Transient Circuit Theory;
- Electromagnetic compatibility testing;
- Ionising and non-ionising radiation;
- Radar Hardware;
- Lasers: properties, hazards and selection;
- Doppler effects;
- Hazards, health and safety.

- Issues arise with EMC

Study Time Allocation

The study time for the module is divided as follows:

Activity type	Hours	Percentage
Scheduled learning	48	24%
Independent learning	152	76%
Placement learning	0	0%
TOTAL	**200**	**100%**

ASSESSMENT

Assessment Component 1

☐ **Written exam** ☒ **Coursework** ☐ **Practical**

Mode of assessment	Volume	Weighting
Report	2,500 Words	50%

Assessment Component 2

☒ **Written exam** ☐ **Coursework** ☐ **Practical**

Mode of assessment	Volume	Weighting
Written Exam	2 Hours	50%

Assessment Summary

Activity type	Percentage
Written exam	50%
Coursework	50%
Practical	0%
TOTAL	**100%**

INDICATIVE READING LIST

Module Code	**ACDC5009**	
Module Title	**Electromagnetic Radiation**	
Classification	**Reading List entry**	**Electronic***
Essential	Edminister, J. A. and Mahmood, N. (2018) *Electromagnetics, Schaum's Outline Series*, New York: McGraw Hill	☒
Further	UK Ministry of Defence (2005) *JSP 390 Military Laser Safety*, London : Joint Services Publications (JSP)	☐
Further	UK Ministry of Defence (2020) *JSP 375 Management of Health and Safety in Defence*, London : Joint Services Publications (JSP)	☐
Further	**Journals** IEEE Xplore ACM Digital Library	☒